**CTL Engineering , Inc.**
2860 Fisher Road, P.O. Box 44548, Columbus, Ohio 43204-3538
Phone: 614/276-8123 Fax: 614/276-6377
Email: ctl@ctleng.com





January 16, 2017

TTL Associates, Inc.
1915 North 12th Street
Toledo, Ohio 43604

Attention: Ms. Katherine Chulski, P.E
Geotechnical Engineer

Reference: Laboratory Soil Testing
Oregon Energy
CTL Project No: 17050001COL
Client Project No.: 14837.01

Dear Ms. Chulski:

CTL Engineering, Inc. has completed the Thermal Resistivity, Water Soluble Chlorides, Water Soluble Sulfates, pH, and Redox Potential testing on the Shelby Tube Samples delivered to our laboratory, for the above referenced project. Testing was performed in accordance with IEEE and ASTM standards. A copy of the test results is attached to this letter.

Samples will be retained for 30 days after date of final report submission, after which it will be discarded, unless otherwise specified.

Thank you for the opportunity to be of service to you on this project. If you have any questions, please contact our office.

Respectfully Submitted,

**CTL ENGINEERING, INC.**

Joe Kupchik
Laboratory Manager

Sastry Malladi, P.E.
Project Engineer

Enclosure

**CTL Engineering, Inc.**
2860 Fisher Road, PO Box 44548
Columbus, Ohio 43204
Phone: 614/276-8123 Fax: 614/276-6377

*AN EMPLOYEE OWNED COMPANY*

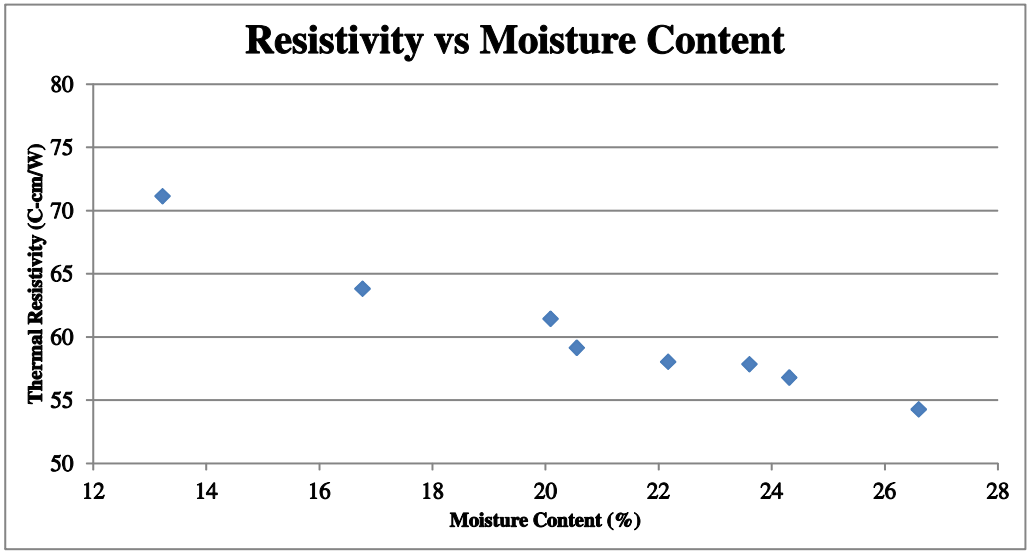
*Consulting Engineers – Testing – Inspection Services – Analytical Laboratories* *Established 1927*

## Thermal Conductivity Test- IEEE 442-1981

| | |
|---|---|
| Client: TTL Associates, Inc. | Date Tested: 1/6/17-1/16/17 |
| Project: Oregon Energy | Project #: 17050001COL |
| Sample: ERTR-02, ST-2, 8'-10' | Client Project # 14837.01 |
| | Technician(s): JK |

Physical Description: Gray and Brown, LEAN CLAY with SAND (CL)
Method of needle insertion: ■ Pushed
□ Pre Drilled

Total Time of data included in analysis (seconds): 2100
Thermal Needle ID: TR-1-02902
Current (Amp): 0.089 Initial Moisture Content (%): 26.6
Calibration Coefficent C: 1.013 Dry Density (pcf): 97.2



**CTL Engineering, Inc.**
2860 Fisher Road, PO Box 44548
Columbus, Ohio 43204
Phone: 614/276-8123 Fax: 614/276-6377

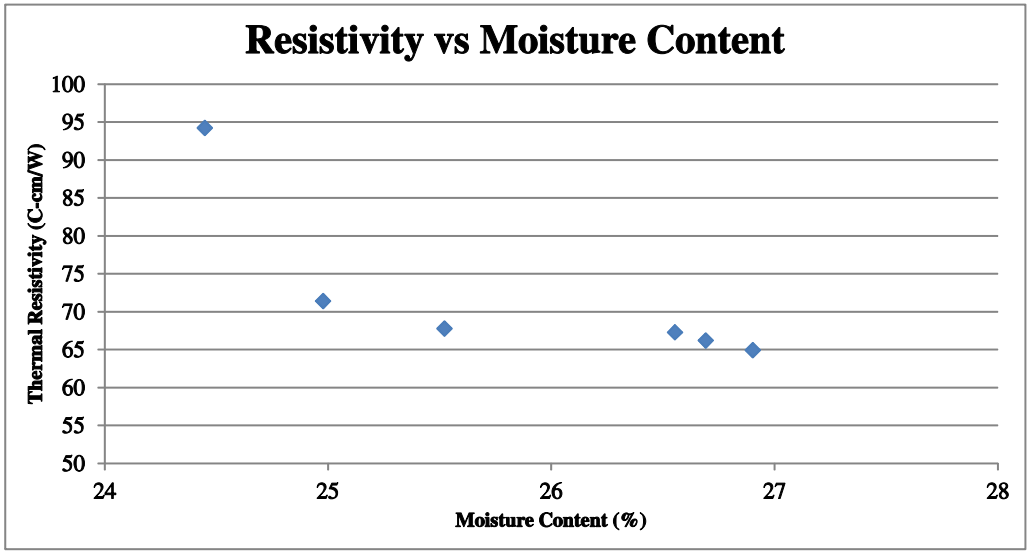


## Thermal Conductivity Test- IEEE 442-1981

| | |
|---|---|
| Client: TTL Associates, Inc. | Date Tested: 1/9/17-1/13/17 |
| Project: Oregon Energy | Project #: 17050001COL |
| Sample: ERTR-03, ST-1, 3'-5' | Client Project # 14837.01 |
| | Technician(s): JK |

Physical Description: Gray and Brown, LEAN CLAY with SAND (CL)
Method of needle insertion: ■ Pushed
□ Pre Drilled

Total Time of data included in analysis (seconds): 1500
Thermal Needle ID: TR-1-02902
Current (Amp): 0.089 Initial Moisture Content (%): 26.9
Calibration Coefficent C: 1.013 Dry Density (pcf): 96.3



**CTL Engineering, Inc.**
2860 Fisher Road, PO Box 44548
Columbus, Ohio 43204
Phone: 614/276-8123 Fax: 614/276-6377

*AN EMPLOYEE OWNED COMPANY*

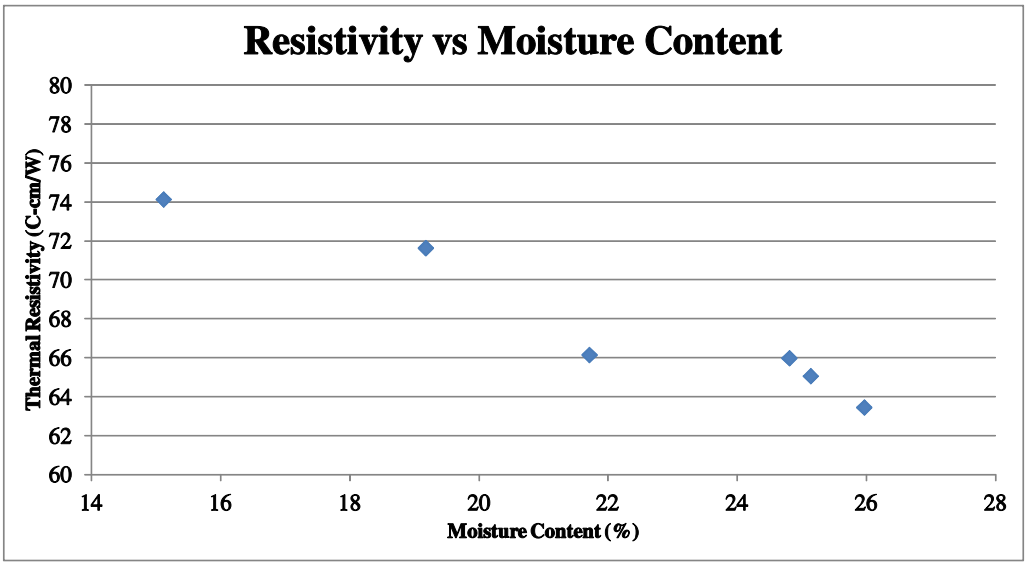
*Consulting Engineers – Testing – Inspection Services – Analytical Laboratories* *Established 1927*

## Thermal Conductivity Test- IEEE 442-1981

| | | | |
|---|---|---|---|
| Client: | TTL Associates, Inc. | Date Tested: | 1/9/17-1/16/17 |
| Project: | Oregon Energy | Project #: | 17050001COL |
| Sample: | ERTR-04, ST-1, 1'-3' | Client Project # | 14837.01 |
| | | Technician(s): | JK |

Physical Description: Gray and Brown, LEAN CLAY with SAND (CL)
Method of needle insertion: ■ Pushed
□ Pre Drilled

Total Time of data included in analysis (seconds): 1500
Thermal Needle ID: TR-1-02902
Current (Amp): 0.089 Initial Moisture Content (%): 26.0
Calibration Coefficent C: 1.013 Dry Density (pcf): 96.6



**CTL Engineering, Inc.**
2860 Fisher Road, P.O. Box 44548, Columbus, Ohio 43204
Phone: 614/276-8123 Fax: 614/276-6377
Email: jtjioe@ctleng.com

**AN EMPLOYEE OWNED COMPANY**

*Consulting Engineers – Testing – Inspection Services – Analytical Laboratories*

**Established 1927**

# Report on Samples of Soil

CTL Project No. 17050001COL January 11, 2017

Client: TTL Associates, Inc.
1915 North 12th Street
Toledo, Ohio 43604 – Attn: Katherine Chulski

P.O. No.: 005672
Client Proj. No.: 14837.01

Identification: Three soil samples collected by the client from Oregon Energy Project, Oregon, Ohio on December 12, 2016.

Test Methods: **ASTM D1498, "Standard Test Method for Ox**idation-Reduction Potential of **Water." ASTM D512, "Standard Test Methods for Chloride Ion in Water."** ASTM C1580, "Standard Test Method for Sulfate in Soil." ASTM D4792, "Standard Test Method for pH of Soils."

Test Results:

| Sample | Water Soluble Chlorides (mg/Kg) | Water Soluble Sulfates (mg/Kg) | pH (S.U.) |
|---|---|---|---|
| ERTR-02 ST-2, 8'-10' | 2.80 | < 2 | 8.20 |
| ERTR-03 ST-1, 3'-5' | 4.44 | < 2 | 7.88 |
| ERTR-04 ST-1, 1'-3' | 5.00 | 29.8 | 7.20 |

| Sample | Redox Potential (mV) |
|---|---|
| ERTR-02 ST-2, 8'-10' | 137 |
| ERTR-03 ST-1, 3'-5' | 263 |
| ERTR-04 ST-1, 1'-3' | 288 |

Respectfully submitted,

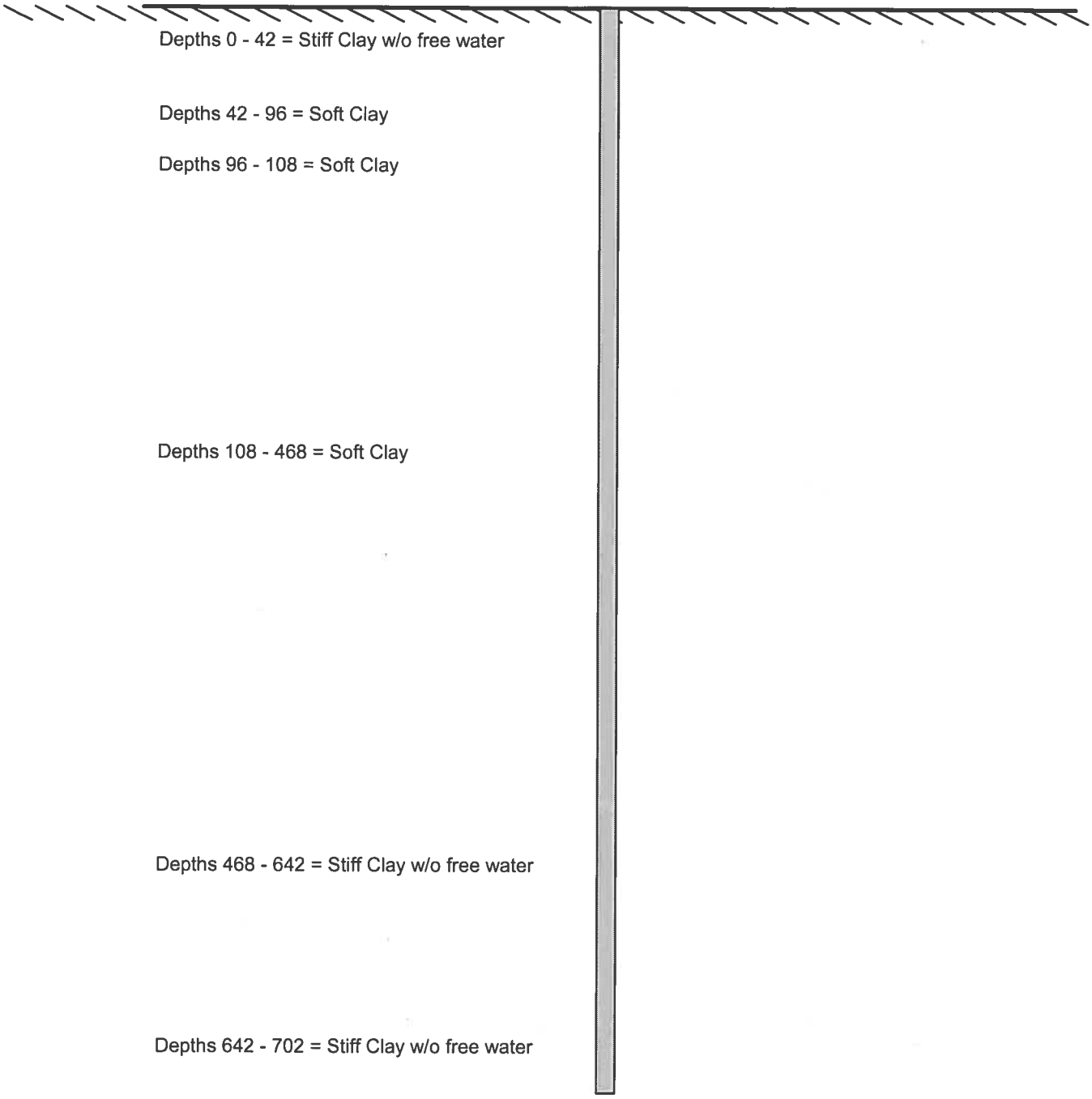
Johnny Tjioe

Johnny Tjioe, Chemist

JT/gm

# ATTACHMENT C

## Engineering Analysis


Depths 0 - 42 = Stiff Clay w/o free water
Depths 42 - 96 = Soft Clay
Depths 96 - 108 = Soft Clay
Depths 108 - 468 = Soft Clay
Depths 468 - 642 = Stiff Clay w/o free water
Depths 642 - 702 = Stiff Clay w/o free water
Depths 702 - 871.2 = Stiff Clay w/o free water

12inCIP.lpo

LPILE Plus for Windows, Version 5.0 (5.0.24)

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



This program is licensed to:

Kate Chulski
TTL Associates

Path to file locations: C:\Program Files\Ensoft\LpileP5\14837.01 - Oregon Energy\
Name of input data file: 12inCIP.lpd
Name of output file: 12inCIP.lpo
Name of plot output file: 12inCIP.lpp
Name of runtime file: 12inCIP.lpr

## Time and Date of Analysis

Date: February 27, 2017 Time: 10:42:31

## Problem Title

14837.01 Proposed Oregon Energy Project

## Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant 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 additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100

12inCIP.lpo

- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

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

---

## Pile Structural Properties and Geometry

---

Pile Length = 702.00 in
Depth of ground surface below top of pile = .00 in
Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|
| 1 | 0.0000 | 12.00000000 | 1017.8800 | 113.1000 | 3605000. |
| 2 | 702.0000 | 12.00000000 | 1017.8800 | 113.1000 | 3605000. |

---

## Soil and Rock Layering Information

---

The soil profile is modelled using 7 layers

Layer 1 is stiff clay without free water
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 42.000 in

Layer 2 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 42.000 in
Distance from top of pile to bottom of layer = 96.000 in

Layer 3 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 108.000 in

Layer 4 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 108.000 in
Distance from top of pile to bottom of layer = 468.000 in

Layer 5 is stiff clay without free water
Distance from top of pile to top of layer = 468.000 in
Distance from top of pile to bottom of layer = 642.000 in

Layer 6 is stiff clay without free water
Distance from top of pile to top of layer = 642.000 in
Distance from top of pile to bottom of layer = 702.000 in

Layer 7 is stiff clay without free water
Distance from top of pile to top of layer = 702.000 in
Distance from top of pile to bottom of layer = 871.200 in

12inCIP.lpo
(Depth of lowest layer extends 169.20 in below pile tip)

---

## Effective Unit Weight of Soil vs. Depth

---

Distribution of effective unit weight of soil with depth
is defined using 14 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07234 |
| 2 | 42.00 | .07234 |
| 3 | 42.00 | .07523 |
| 4 | 96.00 | .07523 |
| 5 | 96.00 | .03912 |
| 6 | 108.00 | .03912 |
| 7 | 108.00 | .03912 |
| 8 | 468.00 | .03912 |
| 9 | 468.00 | .03912 |
| 10 | 642.00 | .03912 |
| 11 | 642.00 | .04201 |
| 12 | 702.00 | .04201 |
| 13 | 702.00 | .04201 |
| 14 | 871.20 | .04201 |

---

## Shear Strength of Soils

---

Distribution of shear strength parameters with depth
defined using 14 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | E50 or k_rm | RQD % |
|---|---|---|---|---|---|
| 1 | .000 | 6.94440 | .00 | .00700 | .0 |
| 2 | 42.000 | 6.94440 | .00 | .00700 | .0 |
| 3 | 42.000 | 3.47220 | .00 | .02000 | .0 |
| 4 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 5 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 6 | 108.000 | 3.47220 | .00 | .02000 | .0 |
| 7 | 108.000 | 5.90278 | .00 | .01000 | .0 |
| 8 | 468.000 | 5.90278 | .00 | .01000 | .0 |
| 9 | 468.000 | 10.41670 | .00 | .00700 | .0 |
| 10 | 642.000 | 10.41670 | .00 | .00700 | .0 |
| 11 | 642.000 | 17.36110 | .00 | .00500 | .0 |
| 12 | 702.000 | 17.36110 | .00 | .00500 | .0 |
| 13 | 702.000 | 31.25000 | .00 | .00500 | .0 |
| 14 | 871.200 | 31.25000 | .00 | .00500 | .0 |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

12inCIP.lpo

---

Loading Type

---

Static loading criteria was used for computation of p-y curves

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Deflection at pile head = .500 in
Slope at pile head = .000 in/in
Axial load at pile head = 120000.000 lbs

Load Case Number 2

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = .500 in
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 120000.000 lbs

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Specified deflection at pile head = .500000 in
Specified slope at pile head = 0.000E+00 in/in
Specified axial load at pile head = 120000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | -711068. | 17019.4123 | 0.0000 | 5252.4714 | -155.2726 |
| 7.020 | .495225 | -595301. | 15799.4248 | -.0012496 | 4570.0690 | -173.7793 |
| 14.040 | .482456 | -487138. | 14517.6890 | -.0022850 | 3932.4923 | -191.4039 |
| 21.060 | .463144 | -387622. | 13115.6958 | -.0031217 | 3345.8886 | -208.0244 |
| 28.080 | .438626 | -297734. | 11600.9410 | -.0037773 | 2816.0313 | -223.5297 |
| 35.100 | .410110 | -218381. | 9981.6243 | -.0042710 | 2348.2784 | -237.8141 |
| 42.120 | .378661 | -150396. | 8793.5971 | -.0046238 | 1947.5333 | -100.6552 |
| 49.140 | .345193 | -87128.9291 | 8070.6890 | -.0048510 | 1574.5985 | -105.3015 |
| 56.160 | .310554 | -28910.6835 | 7318.1692 | -.0049620 | 1231.4250 | -109.0916 |
| 63.180 | .275527 | 23978.0771 | 6542.2365 | -.0049667 | 1202.3492 | -111.9719 |
| 70.200 | .240822 | 71310.1769 | 5749.4579 | -.0048755 | 1481.3532 | -113.8910 |
| 77.220 | .207074 | 112915. | 4946.7570 | -.0046993 | 1726.5958 | -114.7988 |
| 84.240 | .174843 | 148680. | 4141.4083 | -.0044491 | 1937.4180 | -114.6453 |
| 91.260 | .144609 | 178556. | 3341.0398 | -.0041361 | 2113.5247 | -113.3799 |
| 98.280 | .116773 | 202557. | 2561.6701 | -.0037715 | 2254.9996 | -108.6627 |
| 105.300 | .091657 | 220876. | 1828.4329 | -.0033665 | 2362.9849 | -100.2367 |
| 112.320 | .069507 | 233900. | 790.0685 | -.0029315 | 2439.7544 | -195.5936 |

12inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 119.340 | .050499 | 236908. | -514.2701 | -.0024811 | 2457.4843 | -176.0129 |
| 126.360 | .034672 | 230860. | -1677.1202 | -.0020337 | 2421.8339 | -155.2834 |
| 133.380 | .021946 | 216787. | -2690.1655 | -.0016055 | 2338.8824 | -133.3334 |
| 140.400 | .012131 | 195795. | -3542.2915 | -.0012108 | 2215.1397 | -109.4375 |
| 147.420 | .004946 | 169093. | -4211.3343 | -.0008618 | 2057.7466 | -81.1730 |
| 154.440 | 3.16E-05 | 138119. | -4509.9427 | -.0005679 | 1875.1674 | -3.9006 |
| 161.460 | -.003028 | 106731. | -4282.0202 | -.0003337 | 1690.1430 | 68.8358 |
| 168.480 | -.004654 | 78562.1401 | -3761.4907 | -.0001565 | 1524.1007 | 79.4632 |
| 175.500 | -.005225 | 54182.9871 | -3192.6687 | -2.9515E-05 | 1380.3952 | 82.5944 |
| 182.520 | -.005068 | 33786.7980 | -2615.7788 | 5.4632E-05 | 1260.1678 | 81.7617 |
| 189.540 | -.004458 | 17365.4074 | -2053.8326 | .0001036 | 1163.3702 | 78.3370 |
| 196.560 | -.003614 | 4776.5073 | -1522.4863 | .0001247 | 1089.1636 | 73.0438 |
| 203.580 | -.002707 | -4220.4641 | -1033.2944 | .0001253 | 1085.8859 | 66.3271 |
| 210.600 | -.001855 | -9942.0074 | -595.2225 | .0001117 | 1119.6122 | 58.4797 |
| 217.620 | -.001138 | -12765.6252 | -215.5838 | 9.0006E-05 | 1136.2563 | 49.6795 |
| 224.640 | -.000592 | -13120.4449 | 98.9962 | 6.5244E-05 | 1138.3478 | 39.9444 |
| 231.660 | -.000222 | -11485.6419 | 335.2339 | 4.1708E-05 | 1128.7113 | 27.3597 |
| 238.680 | -6.25E-06 | -8484.0298 | 433.9706 | 2.2606E-05 | 1111.0180 | .7703691 |
| 245.700 | 9.55E-05 | -5430.7808 | 395.3579 | 9.2955E-06 | 1093.0203 | -11.7711 |
| 252.720 | .000124 | -2948.8659 | 300.2668 | 1.2800E-06 | 1078.3904 | -15.3203 |
| 259.740 | .000113 | -1217.1917 | 197.3986 | -2.7050E-06 | 1068.1828 | -13.9868 |
| 266.760 | 8.63E-05 | -172.8321 | 110.9659 | -4.0347E-06 | 1062.0267 | -10.6379 |
| 273.780 | 5.68E-05 | 347.5674 | 49.0473 | -3.8675E-06 | 1063.0567 | -7.0027 |
| 280.800 | 3.20E-05 | 522.3086 | 10.6274 | -3.0354E-06 | 1064.0868 | -3.9431 |
| 287.820 | 1.42E-05 | 501.8895 | -9.3497 | -2.0557E-06 | 1063.9664 | -1.7483 |
| 294.840 | 3.12E-06 | 394.5029 | -16.8362 | -1.1983E-06 | 1063.3334 | -.3845800 |
| 301.860 | -2.64E-06 | 267.5282 | -17.0420 | -5.6504E-07 | 1062.5849 | .3259577 |
| 308.880 | -4.81E-06 | 156.1857 | -13.8146 | -1.5974E-07 | 1061.9286 | .5935218 |
| 315.900 | -4.89E-06 | 73.8405 | -9.6166 | 6.0289E-08 | 1061.4432 | .6024735 |
| 322.920 | -3.97E-06 | 21.0664 | -5.7850 | 1.5107E-07 | 1061.1321 | .4891600 |
| 329.940 | -2.77E-06 | -7.6356 | -2.8713 | 1.6392E-07 | 1061.0530 | .3409646 |
| 336.960 | -1.67E-06 | -19.5225 | -.9534919 | 1.3794E-07 | 1061.1230 | .2054123 |
| 343.980 | -8.29E-07 | -21.2550 | .1261760 | 9.8936E-08 | 1061.1332 | .1021854 |
| 351.000 | -2.77E-07 | -17.9176 | .6047219 | 6.1465E-08 | 1061.1136 | .0341525 |
| 358.020 | 3.42E-08 | -12.8683 | .7098120 | 3.2017E-08 | 1061.0838 | -.0042123 |
| 365.040 | 1.73E-07 | -8.0058 | .6203698 | 1.2050E-08 | 1061.0551 | -.0212698 |
| 372.060 | 2.03E-07 | -4.1786 | .4577128 | 3.9511E-10 | 1061.0326 | -.0250712 |
| 379.080 | 1.78E-07 | -1.5802 | .2926552 | -5.1134E-09 | 1061.0173 | -.0219537 |
| 386.100 | 1.32E-07 | -.0611134 | .1586662 | -6.6834E-09 | 1061.0083 | -.0162198 |
| 393.120 | 8.42E-08 | .6587448 | .0652850 | -6.1118E-09 | 1061.0118 | -.0103846 |
| 400.140 | 4.57E-08 | .8657848 | .0090381 | -4.6535E-09 | 1061.0131 | -.0056402 |
| 407.160 | 1.89E-08 | .7934797 | -.0189348 | -3.0663E-09 | 1061.0126 | -.0023293 |
| 414.180 | 2.70E-09 | .6051064 | -.0282771 | -1.7285E-09 | 1061.0115 | -.0003323 |
| 421.200 | -5.38E-09 | .3993816 | -.0271172 | -7.6767E-10 | 1061.0103 | .0006628 |
| 428.220 | -8.08E-09 | .2256745 | -.0212930 | -1.6977E-10 | 1061.0093 | .0009965 |
| 435.240 | -7.76E-09 | .1007136 | -.0144374 | 1.4243E-10 | 1061.0086 | .0009566 |
| 442.260 | -6.08E-09 | .0227341 | -.0084471 | 2.6052E-10 | 1061.0081 | .0007500 |
| 449.280 | -4.10E-09 | -.0183225 | -.0040397 | 2.6474E-10 | 1061.0081 | .0005057 |
| 456.300 | -2.37E-09 | -.0344294 | -.0012408 | 2.1428E-10 | 1061.0082 | .0002917 |
| 463.320 | -1.09E-09 | -.0361048 | .0002561 | 1.4681E-10 | 1061.0082 | .0001348 |
| 470.340 | -3.05E-10 | -.0310810 | .0011903 | 8.2542E-11 | 1061.0081 | .0001314 |
| 477.360 | 6.59E-11 | -.0195324 | .0015518 | 3.4128E-11 | 1061.0081 | -2.8380E-05 |
| 484.380 | 1.74E-10 | -.0093509 | .0011886 | 6.4999E-12 | 1061.0080 | -7.5102E-05 |
| 491.400 | 1.57E-10 | -.0028554 | .0006873 | -5.1760E-12 | 1061.0080 | -6.7707E-05 |
| 498.420 | 1.02E-10 | .0003080 | .0002960 | -7.6127E-12 | 1061.0080 | -4.3786E-05 |
| 505.440 | 5.02E-11 | .0013132 | 6.6328E-05 | -6.0619E-12 | 1061.0080 | -2.1648E-05 |
| 512.460 | 1.65E-11 | .0012495 | -3.4609E-05 | -3.6106E-12 | 1061.0080 | -7.1094E-06 |
| 519.480 | -4.58E-13 | .0008334 | -5.8870E-05 | -1.6182E-12 | 1061.0080 | 1.9754E-07 |
| 526.500 | -6.22E-12 | .0004257 | -4.8765E-05 | -4.1386E-13 | 1061.0080 | 2.6813E-06 |
| 533.520 | -6.27E-12 | .0001494 | -2.9871E-05 | 1.3626E-13 | 1061.0080 | 2.7015E-06 |
| 540.540 | -4.31E-12 | 6.0609E-06 | -1.3871E-05 | 2.8499E-13 | 1061.0080 | 1.8569E-06 |
| 547.560 | -2.27E-12 | -4.5804E-05 | -3.9232E-06 | 2.4697E-13 | 1061.0080 | 9.7724E-07 |
| 554.580 | -8.42E-13 | -4.9437E-05 | 7.7983E-07 | 1.5587E-13 | 1061.0080 | 3.6266E-07 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 561.600 | -7.93E-14 | -3.5118E-05 | 2.1727E-06 | 7.4988E-14 | 1061.0080 | 3.4183E-08 |
| 568.620 | 2.11E-13 | -1.9058E-05 | 1.9731E-06 | 2.3166E-14 | 1061.0080 | -9.1047E-08 |
| 575.640 | 2.46E-13 | -7.4541E-06 | 1.2816E-06 | -2.1937E-15 | 1061.0080 | -1.0598E-07 |
| 582.660 | 1.80E-13 | -1.0609E-06 | 6.3660E-07 | -1.0339E-14 | 1061.0080 | -7.7774E-08 |
| 589.680 | 1.01E-13 | 1.5012E-06 | 2.1118E-07 | -9.9176E-15 | 1061.0080 | -4.3428E-08 |
| 596.700 | 4.12E-14 | 1.9208E-06 | -3.6198E-09 | -6.6444E-15 | 1061.0080 | -1.7770E-08 |
| 603.720 | 7.49E-15 | 1.4616E-06 | -7.7319E-08 | -3.4090E-15 | 1061.0080 | -3.2274E-09 |
| 610.740 | -6.63E-15 | 8.4096E-07 | -7.8623E-08 | -1.2065E-15 | 1061.0080 | 2.8560E-09 |
| 617.760 | -9.45E-15 | 3.5973E-07 | -5.4304E-08 | -5.8028E-17 | 1061.0080 | 4.0725E-09 |
| 624.780 | -7.44E-15 | 7.8628E-08 | -2.8752E-08 | 3.6128E-16 | 1061.0080 | 3.2071E-09 |
| 631.800 | -4.38E-15 | -4.4557E-08 | -1.0873E-08 | 3.9387E-16 | 1061.0080 | 1.8866E-09 |
| 638.820 | -1.91E-15 | -7.4697E-08 | -1.3589E-09 | 2.7980E-16 | 1061.0080 | 8.2403E-10 |
| 645.840 | -4.50E-16 | -6.4107E-08 | 2.7663E-09 | 1.4703E-16 | 1061.0080 | 3.5123E-10 |
| 652.860 | 1.52E-16 | -3.6106E-08 | 3.5821E-09 | 5.1171E-17 | 1061.0080 | -1.1882E-10 |
| 659.880 | 2.69E-16 | -1.3902E-08 | 2.4277E-09 | 3.3372E-18 | 1061.0080 | -2.1005E-10 |
| 666.900 | 1.99E-16 | -2.0266E-09 | 1.1449E-09 | -1.1899E-17 | 1061.0080 | -1.5543E-10 |
| 673.920 | 1.02E-16 | 2.1921E-09 | 3.2012E-10 | -1.1741E-17 | 1061.0080 | -7.9538E-11 |
| 680.940 | 3.41E-17 | 2.4876E-09 | -5.2599E-11 | -7.2642E-18 | 1061.0080 | -2.6649E-11 |
| 687.960 | -1.80E-19 | 1.4659E-09 | -1.4564E-10 | -3.4825E-18 | 1061.0080 | 1.4086E-13 |
| 694.980 | -1.48E-17 | 4.4870E-10 | -1.0461E-10 | -1.6511E-18 | 1061.0080 | 1.1550E-11 |
| 702.000 | -2.34E-17 | 0.0000 | 0.0000 | -1.2219E-18 | 1061.0080 | 1.8252E-11 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1: Fixed

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00011074 |
| Maximum bending moment | = | -711067.79971 lbs-in |
| Maximum shear force | = | 17019.41228 lbs |
| Depth of maximum bending moment | = | 0.00000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 13 |
| Number of zero deflection points | = | 11 |

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Specified deflection at pile head = .500000 in
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 120000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | 0.0000 | 8916.4621 | -.0072779 | 1061.0080 | -155.2726 |
| 7.020 | .448909 | 64898.5016 | 7776.2799 | -.0072158 | 1443.5590 | -169.5656 |
| 14.040 | .398690 | 121336. | 6540.5532 | -.0070377 | 1776.2366 | -182.4933 |
| 21.060 | .350101 | 168585. | 5219.1646 | -.0067603 | 2054.7494 | -193.9707 |
| 28.080 | .303775 | 206003. | 3822.5791 | -.0064020 | 2275.3144 | -203.9169 |
| 35.100 | .260216 | 233040. | 2361.8275 | -.0059821 | 2434.6870 | -212.2517 |
| 42.120 | .219787 | 249242. | 1322.1113 | -.0055207 | 2530.1891 | -83.9638 |
| 49.140 | .182705 | 260904. | 728.4160 | -.0050328 | 2598.9330 | -85.1802 |

12inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 56.160 | .149127 | 267948. | 129.5766 | -.0045269 | 2640.4545 | -85.4293 |
| 63.180 | .119147 | 270350. | -467.4936 | -.0040120 | 2654.6144 | -84.6761 |
| 70.200 | .092799 | 268144. | -1055.6178 | -.0034969 | 2641.6086 | -82.8806 |
| 77.220 | .070051 | 261421. | -1627.3043 | -.0029903 | 2601.9796 | -79.9930 |
| 84.240 | .050814 | 250334. | -2174.6427 | -.0025008 | 2536.6302 | -75.9438 |
| 91.260 | .034939 | 235102. | -2689.0888 | -.0020365 | 2446.8419 | -70.6220 |
| 98.280 | .022222 | 216011. | -3156.3747 | -.0016050 | 2334.3053 | -62.5078 |
| 105.300 | .012406 | 193491. | -3556.4416 | -.0012133 | 2201.5589 | -51.4713 |
| 112.320 | .005188 | 168122. | -4026.2139 | -.0008674 | 2052.0226 | -82.3669 |
| 119.340 | .000228 | 138424. | -4413.8503 | -.0005741 | 1876.9625 | -28.0708 |
| 126.360 | -.002873 | 107119. | -4274.7388 | -.0003393 | 1692.4332 | 67.7037 |
| 133.380 | -.004536 | 78978.2372 | -3760.3628 | -.0001613 | 1526.5534 | 78.8422 |
| 140.400 | -.005137 | 54595.3819 | -3195.1221 | -3.3490E-05 | 1382.8261 | 82.1951 |
| 147.420 | -.005006 | 34175.1465 | -2620.5533 | 5.1423E-05 | 1262.4569 | 81.4998 |
| 154.440 | -.004415 | 17716.1769 | -2060.0938 | .0001011 | 1165.4378 | 78.1753 |
| 161.460 | -.003587 | 5081.1652 | -1529.6002 | .0001229 | 1090.9594 | 72.9625 |
| 168.480 | -.002690 | -3966.4143 | -1040.7380 | .0001239 | 1084.3884 | 66.3145 |
| 175.500 | -.001847 | -9739.5971 | -602.5384 | .0001108 | 1118.4190 | 58.5287 |
| 182.520 | -.001134 | -12612.7662 | -222.3507 | 8.9441E-05 | 1135.3552 | 49.7869 |
| 189.540 | -.000591 | -13012.0913 | 93.2009 | 6.4930E-05 | 1137.7091 | 40.1139 |
| 196.560 | -.000223 | -11413.6193 | 330.4229 | 4.1565E-05 | 1128.2867 | 27.4708 |
| 203.580 | -7.66E-06 | -8442.9831 | 430.1620 | 2.2571E-05 | 1110.7760 | .9449258 |
| 210.600 | 9.41E-05 | -5412.1739 | 392.7591 | 9.3184E-06 | 1092.9106 | -11.6010 |
| 217.620 | .000123 | -2944.3450 | 298.7386 | 1.3250E-06 | 1078.3637 | -15.1855 |
| 224.640 | .000113 | -1220.1167 | 196.6673 | -2.6585E-06 | 1068.2001 | -13.8947 |
| 231.660 | 8.58E-05 | -178.6567 | 110.7486 | -3.9965E-06 | 1062.0611 | -10.5836 |
| 238.680 | 5.66E-05 | 341.5273 | 49.1120 | -3.8407E-06 | 1063.0211 | -6.9767 |
| 245.700 | 3.19E-05 | 517.3460 | 10.8107 | -3.0191E-06 | 1064.0575 | -3.9353 |
| 252.720 | 1.42E-05 | 498.3967 | -9.1467 | -2.0475E-06 | 1063.9458 | -1.7506 |
| 259.740 | 3.17E-06 | 392.3762 | -16.6637 | -1.1954E-06 | 1063.3209 | -.3910363 |
| 266.760 | -2.59E-06 | 266.4528 | -16.9173 | -5.6524E-07 | 1062.5786 | .3187859 |
| 273.780 | -4.76E-06 | 155.8100 | -13.7365 | -1.6133E-07 | 1061.9264 | .5874151 |
| 280.800 | -4.85E-06 | 73.8641 | -9.5755 | 5.8362E-08 | 1061.4434 | .5980540 |
| 287.820 | -3.95E-06 | 21.2715 | -5.7691 | 1.4936E-07 | 1061.1333 | .4863886 |
| 294.840 | -2.75E-06 | -7.3859 | -2.8702 | 1.6265E-07 | 1061.0515 | .3395017 |
| 301.860 | -1.66E-06 | -19.3007 | -.9595854 | 1.3712E-07 | 1061.1217 | .2048445 |
| 308.880 | -8.28E-07 | -21.0895 | .1179491 | 9.8484E-08 | 1061.1323 | .1021454 |
| 315.900 | -2.79E-07 | -17.8106 | .5971052 | 6.1274E-08 | 1061.1129 | .0343663 |
| 322.920 | 3.18E-08 | -12.8094 | .7039650 | 3.1985E-08 | 1061.0835 | -.0039219 |
| 329.940 | 1.70E-07 | -7.9808 | .6164877 | 1.2098E-08 | 1061.0550 | -.0210004 |
| 336.960 | 2.02E-07 | -4.1743 | .4555031 | 4.7126E-10 | 1061.0326 | -.0248642 |
| 343.980 | 1.77E-07 | -1.5864 | .2916553 | -5.0391E-09 | 1061.0173 | -.0218161 |
| 351.000 | 1.31E-07 | -.0709632 | .1584242 | -6.6244E-09 | 1061.0084 | -.0161414 |
| 358.020 | 8.39E-08 | .6490844 | .0654420 | -6.0714E-09 | 1061.0118 | -.0103492 |
| 365.040 | 4.57E-08 | .8580718 | .0093487 | -4.6297E-09 | 1061.0130 | -.0056318 |
| 372.060 | 1.89E-08 | .7881402 | -.0186151 | -3.0550E-09 | 1061.0126 | -.0023351 |
| 379.080 | 2.79E-09 | .6018625 | -.0280170 | -1.7254E-09 | 1061.0115 | -.0003435 |
| 386.100 | -5.29E-09 | .3976884 | -.0269354 | -7.6930E-10 | 1061.0103 | .0006516 |
| 393.120 | -8.02E-09 | .2249852 | -.0211797 | -1.7369E-10 | 1061.0093 | .0009882 |
| 400.140 | -7.72E-09 | .1006186 | -.0143686 | 1.3777E-10 | 1061.0086 | .0009523 |
| 407.160 | -6.08E-09 | .0230179 | -.0083946 | 2.5603E-10 | 1061.0081 | .0007497 |
| 414.180 | -4.13E-09 | -.0176731 | -.0039762 | 2.6114E-10 | 1061.0081 | .0005091 |
| 421.200 | -2.41E-09 | -.0332484 | -.0011446 | 2.1244E-10 | 1061.0082 | .0002977 |
| 428.220 | -1.15E-09 | -.0341005 | .0003964 | 1.4801E-10 | 1061.0082 | .0001413 |
| 435.240 | -3.36E-10 | -.0279324 | .0010380 | 8.8676E-11 | 1061.0081 | 4.1463E-05 |
| 442.260 | 9.86E-11 | -.0196760 | .0011409 | 4.3137E-11 | 1061.0081 | -1.2163E-05 |
| 449.280 | 2.69E-10 | -.0119872 | .0009816 | 1.2850E-11 | 1061.0080 | -3.3208E-05 |
| 456.300 | 2.79E-10 | -.0059157 | .0007443 | -4.2754E-12 | 1061.0080 | -3.4405E-05 |
| 463.320 | 2.09E-10 | -.0015301 | .0005329 | -1.1398E-11 | 1061.0080 | -2.5807E-05 |
| 470.340 | 1.19E-10 | .0015861 | .0002623 | -1.1344E-11 | 1061.0080 | -5.1296E-05 |
| 477.360 | 5.00E-11 | .0021720 | 6.5663E-06 | -7.7492E-12 | 1061.0080 | -2.1568E-05 |
| 484.380 | 1.02E-11 | .0016914 | -8.4619E-05 | -4.0537E-12 | 1061.0080 | -4.4105E-06 |
| 491.400 | -6.86E-12 | .0009907 | -8.9716E-05 | -1.4882E-12 | 1061.0080 | 2.9583E-06 |

12inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 498.420 | -1.07E-11 | .0004343 | -6.3210E-05 | -1.2508E-13 | 1061.0080 | 4.5933E-06 |
| 505.440 | -8.62E-12 | .0001035 | -3.4048E-05 | 3.8931E-13 | 1061.0080 | 3.7150E-06 |
| 512.460 | -5.19E-12 | -4.4405E-05 | -1.3153E-05 | 4.4582E-13 | 1061.0080 | 2.2379E-06 |
| 519.480 | -2.36E-12 | -8.1937E-05 | -1.7259E-06 | 3.2497E-13 | 1061.0080 | 1.0177E-06 |
| 526.500 | -6.30E-13 | -6.9185E-05 | 2.7998E-06 | 1.8042E-13 | 1061.0080 | 2.7170E-07 |
| 533.520 | 1.71E-13 | -4.2931E-05 | 3.4942E-06 | 7.3171E-14 | 1061.0080 | -7.3884E-08 |
| 540.540 | 3.97E-13 | -2.0250E-05 | 2.6346E-06 | 1.2736E-14 | 1061.0080 | -1.7101E-07 |
| 547.560 | 3.50E-13 | -5.9628E-06 | 1.5045E-06 | -1.2337E-14 | 1061.0080 | -1.5094E-07 |
| 554.580 | 2.24E-13 | 8.9508E-07 | 6.3649E-07 | -1.7184E-14 | 1061.0080 | -9.6367E-08 |
| 561.600 | 1.09E-13 | 3.0025E-06 | 1.3337E-07 | -1.3456E-14 | 1061.0080 | -4.6971E-08 |
| 568.620 | 3.47E-14 | 2.7903E-06 | -8.3980E-08 | -7.9152E-15 | 1061.0080 | -1.4952E-08 |
| 575.640 | -2.13E-15 | 1.8367E-06 | -1.3324E-07 | -3.4892E-15 | 1061.0080 | 9.1797E-10 |
| 582.660 | -1.43E-14 | 9.2547E-07 | -1.0840E-07 | -8.4704E-16 | 1061.0080 | 6.1584E-09 |
| 589.680 | -1.40E-14 | 3.1619E-07 | -6.5577E-08 | 3.4067E-16 | 1061.0080 | 6.0428E-09 |
| 596.700 | -9.51E-15 | 4.1945E-09 | -2.9985E-08 | 6.4713E-16 | 1061.0080 | 4.0973E-09 |
| 603.720 | -4.94E-15 | -1.0589E-07 | -8.1362E-09 | 5.4985E-16 | 1061.0080 | 2.1275E-09 |
| 610.740 | -1.79E-15 | -1.1096E-07 | 2.0358E-09 | 3.4242E-16 | 1061.0080 | 7.7053E-10 |
| 617.760 | -1.29E-16 | -7.7886E-08 | 4.9361E-09 | 1.6177E-16 | 1061.0080 | 5.5764E-11 |
| 624.780 | 4.83E-16 | -4.1935E-08 | 4.4009E-09 | 4.7157E-17 | 1061.0080 | -2.0824E-10 |
| 631.800 | 5.33E-16 | -1.6178E-08 | 2.8642E-09 | -8.4299E-18 | 1061.0080 | -2.2955E-10 |
| 638.820 | 3.65E-16 | -1.7068E-09 | 1.5066E-09 | -2.5537E-17 | 1061.0080 | -1.5724E-10 |
| 645.840 | 1.74E-16 | 5.0181E-09 | 4.7716E-10 | -2.2370E-17 | 1061.0080 | -1.3605E-10 |
| 652.860 | 5.08E-17 | 5.0303E-09 | -1.3969E-10 | -1.2758E-17 | 1061.0080 | -3.9691E-11 |
| 659.880 | -4.98E-18 | 3.0784E-09 | -2.6535E-10 | -5.0017E-18 | 1061.0080 | 3.8894E-12 |
| 666.900 | -1.94E-17 | 1.3132E-09 | -1.9845E-10 | -8.0100E-19 | 1061.0080 | 1.5171E-11 |
| 673.920 | -1.62E-17 | 2.9351E-10 | -1.0071E-10 | 7.3587E-19 | 1061.0080 | 1.2675E-11 |
| 680.940 | -9.09E-18 | -1.0198E-10 | -3.1295E-11 | 9.1907E-19 | 1061.0080 | 7.0998E-12 |
| 687.960 | -3.32E-18 | -1.4743E-10 | 2.7310E-12 | 6.8050E-19 | 1061.0080 | 2.5943E-12 |
| 694.980 | 4.66E-19 | -6.4785E-11 | 1.0558E-11 | 4.7751E-19 | 1061.0080 | -3.6444E-13 |
| 702.000 | 3.38E-18 | 0.0000 | 0.0000 | 4.1554E-19 | 1061.0080 | -2.6434E-12 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2: Free

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00727788 |
| Maximum bending moment | = | 270350.01466 lbs-in |
| Maximum shear force | = | 8916.46206 lbs |
| Depth of maximum bending moment | = | 63.18000000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 11 |
| Number of zero deflection points | = | 12 |

---

Summary of Pile Response(s)

---

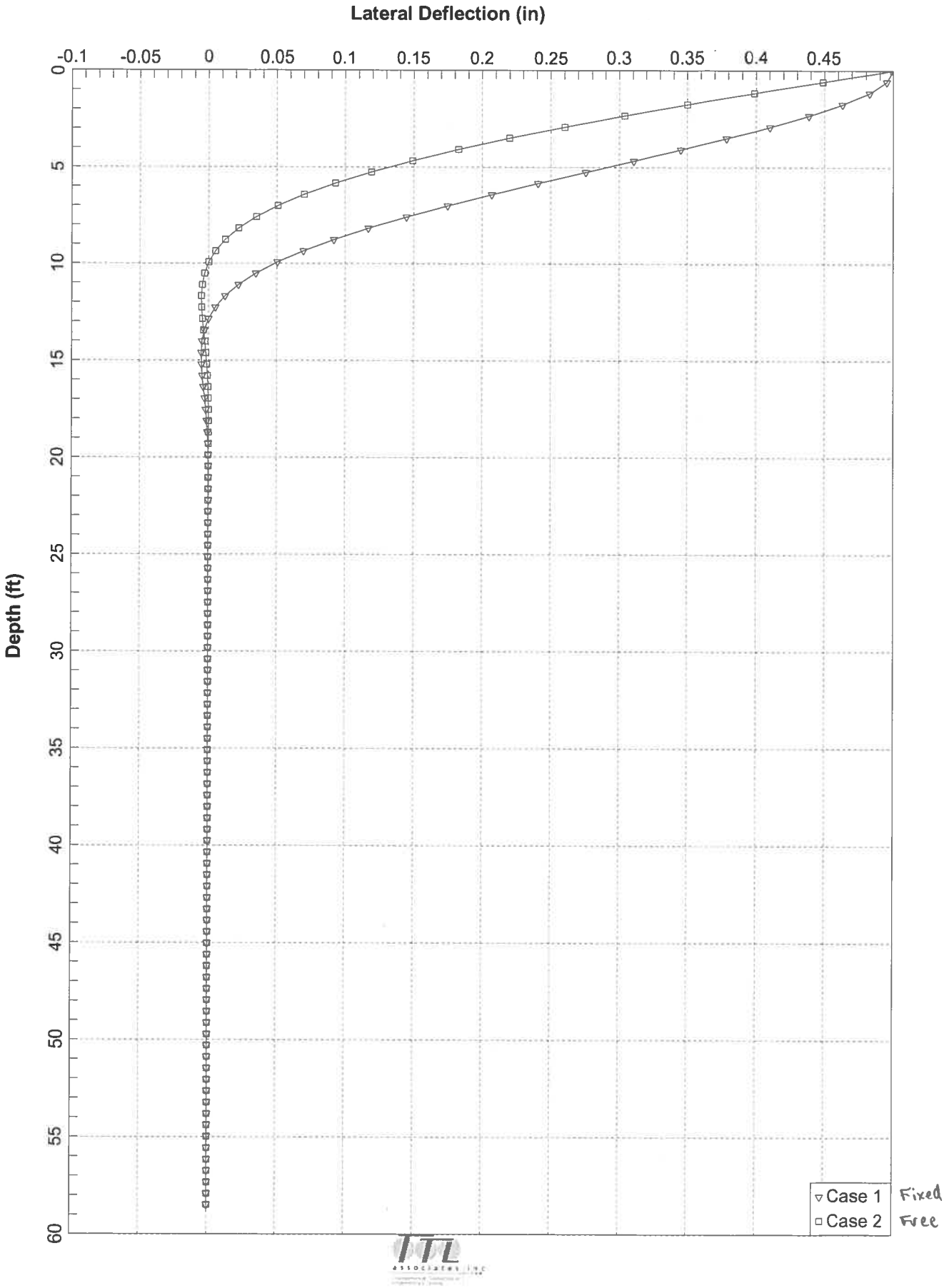
Definition of Symbols for Pile-Head Loading Conditions:

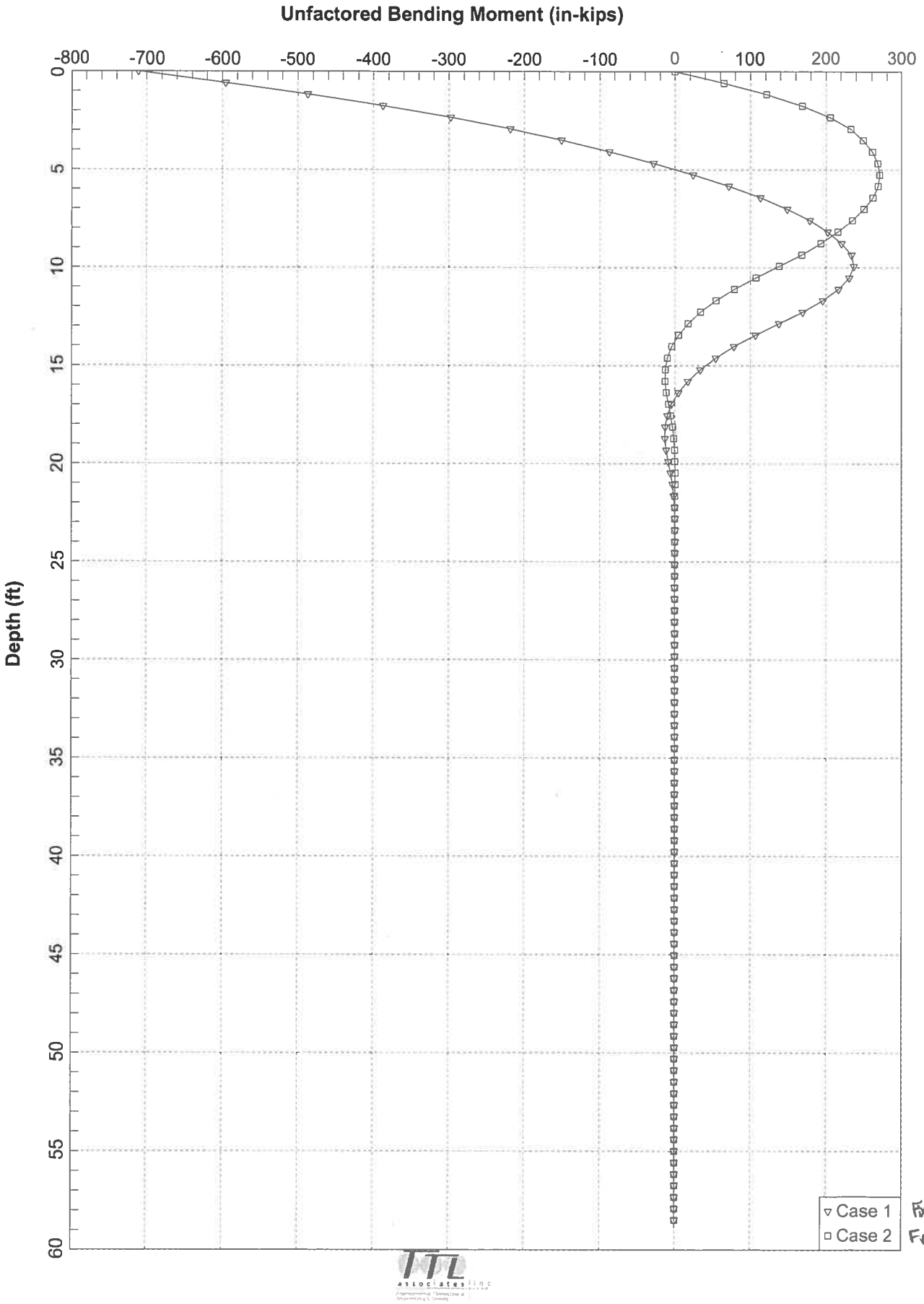
Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

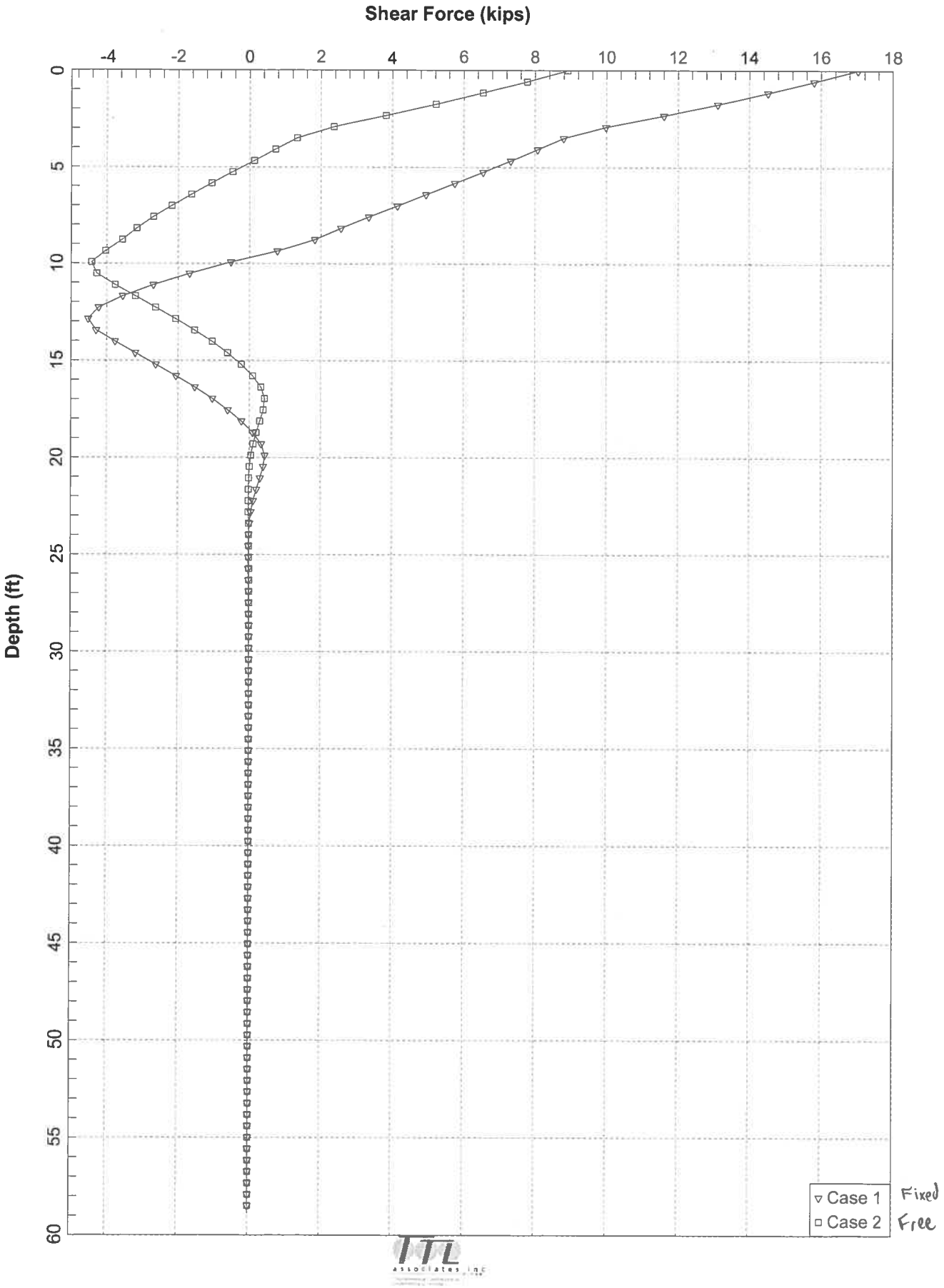
12inCIP.lpo

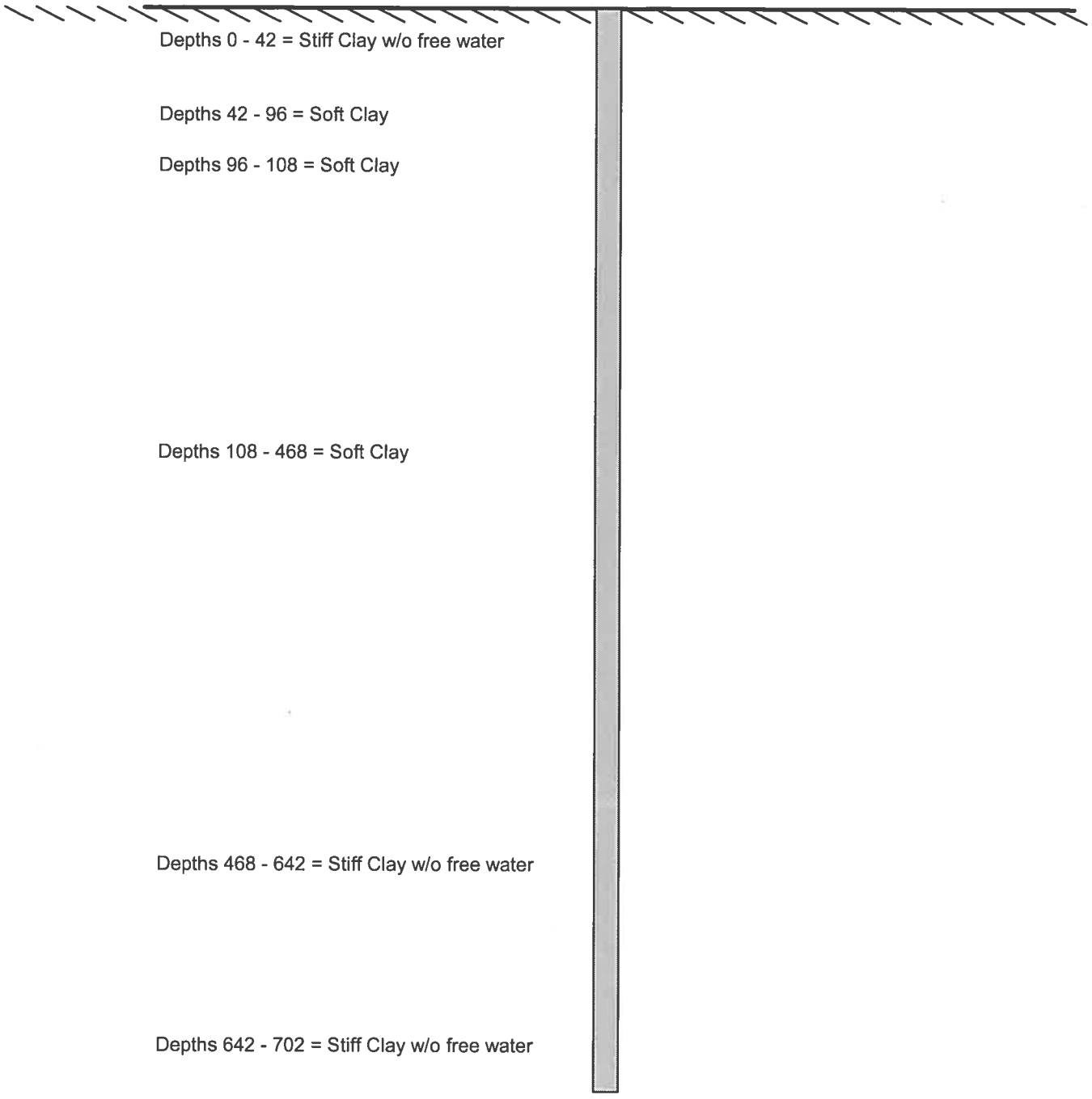
| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs | |
|---|---|---|---|---|---|---|---|
| 5 | y= .500000 | S= 0.000 | 120000. | .5000000 | -711068. | 17019.4123 | Fixed |
| 4 | y= .500000 | M= 0.000 | 120000. | .5000000 | 270350. | 8916.4621 | Free |

The analysis ended normally.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free


Unfactored Bending Moment (in-kips)
-800
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free


Shear Force (kips)
-4
-2
0
2
4
6
8
10
12
14
16
18
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free


Depths 0 - 42 = Stiff Clay w/o free water
Depths 42 - 96 = Soft Clay
Depths 96 - 108 = Soft Clay
Depths 108 - 468 = Soft Clay
Depths 468 - 642 = Stiff Clay w/o free water
Depths 642 - 702 = Stiff Clay w/o free water
Depths 702 - 871.2 = Stiff Clay w/o free water

16inCIP.lpo

LPILE Plus for Windows, Version 5.0 (5.0.24)

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



This program is licensed to:

Kate Chulski
TTL Associates

Path to file locations: C:\Program Files\Ensoft\LpileP5\14837.01 - Oregon Energy\
Name of input data file: 16inCIP.lpd
Name of output file: 16inCIP.lpo
Name of plot output file: 16inCIP.lpp
Name of runtime file: 16inCIP.lpr

## Time and Date of Analysis

Date: March 3, 2017 Time: 13:49:43

## Problem Title

14837.01 Proposed Oregon-Energy Project

## Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant 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 additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100

16inCIP.lpo

- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

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

---

## Pile Structural Properties and Geometry

---

Pile Length = 702.00 in
Depth of ground surface below top of pile = .00 in
Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|
| 1 | 0.0000 | 16.00000000 | 3216.9900 | 201.1000 | 3605000. |
| 2 | 702.0000 | 16.00000000 | 3216.9900 | 201.1000 | 3605000. |

---

## Soil and Rock Layering Information

---

The soil profile is modelled using 7 layers

Layer 1 is stiff clay without free water
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 42.000 in

Layer 2 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 42.000 in
Distance from top of pile to bottom of layer = 96.000 in

Layer 3 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 108.000 in

Layer 4 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 108.000 in
Distance from top of pile to bottom of layer = 468.000 in

Layer 5 is stiff clay without free water
Distance from top of pile to top of layer = 468.000 in
Distance from top of pile to bottom of layer = 642.000 in

Layer 6 is stiff clay without free water
Distance from top of pile to top of layer = 642.000 in
Distance from top of pile to bottom of layer = 702.000 in

Layer 7 is stiff clay without free water
Distance from top of pile to top of layer = 702.000 in
Distance from top of pile to bottom of layer = 871.200 in

16inCIP.lpo
(Depth of lowest layer extends 169.20 in below pile tip)

## Effective Unit Weight of Soil vs. Depth

Distribution of effective unit weight of soil with depth
is defined using 14 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07234 |
| 2 | 42.00 | .07234 |
| 3 | 42.00 | .07523 |
| 4 | 96.00 | .07523 |
| 5 | 96.00 | .03912 |
| 6 | 108.00 | .03912 |
| 7 | 108.00 | .03912 |
| 8 | 468.00 | .03912 |
| 9 | 468.00 | .03912 |
| 10 | 642.00 | .03912 |
| 11 | 642.00 | .04201 |
| 12 | 702.00 | .04201 |
| 13 | 702.00 | .04201 |
| 14 | 871.20 | .04201 |

## Shear Strength of Soils

Distribution of shear strength parameters with depth
defined using 14 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | E50 or k_rm | RQD % |
|---|---|---|---|---|---|
| 1 | .000 | 6.94440 | .00 | .00700 | .0 |
| 2 | 42.000 | 6.94440 | .00 | .00700 | .0 |
| 3 | 42.000 | 3.47220 | .00 | .02000 | .0 |
| 4 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 5 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 6 | 108.000 | 3.47220 | .00 | .02000 | .0 |
| 7 | 108.000 | 5.90278 | .00 | .01000 | .0 |
| 8 | 468.000 | 5.90278 | .00 | .01000 | .0 |
| 9 | 468.000 | 10.41670 | .00 | .00700 | .0 |
| 10 | 642.000 | 10.41670 | .00 | .00700 | .0 |
| 11 | 642.000 | 17.36110 | .00 | .00500 | .0 |
| 12 | 702.000 | 17.36110 | .00 | .00500 | .0 |
| 13 | 702.000 | 31.25000 | .00 | .00500 | .0 |
| 14 | 871.200 | 31.25000 | .00 | .00500 | .0 |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

16inCIP.lpo

---

Loading Type

---

Static loading criteria was used for computation of p-y curves

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Deflection at pile head = .500 in
Slope at pile head = .000 in/in
Axial load at pile head = 190000.000 lbs

Load Case Number 2

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = .500 in
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 190000.000 lbs

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Specified deflection at pile head = .500000 in
Specified slope at pile head = 0.000E+00 in/in
Specified axial load at pile head = 190000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | -1431878. | 26430.3908 | 0.0000 | 4505.5920 | -192.6633 |
| 7.020 | .496958 | -1250960. | 24948.2464 | -.0008120 | 4055.6877 | -211.1258 |
| 14.040 | .488600 | -1079438. | 23403.7650 | -.0015173 | 3629.1453 | -228.9093 |
| 21.060 | .475655 | -918324. | 21737.0800 | -.0021219 | 3228.4886 | -245.9298 |
| 28.080 | .458808 | -768589. | 19953.8673 | -.0026325 | 2856.1269 | -262.1081 |
| 35.100 | .438695 | -631149. | 18060.3074 | -.0030561 | 2514.3435 | -277.3677 |
| 42.120 | .415900 | -506869. | 16679.5597 | -.0034006 | 2205.2843 | -116.0077 |
| 49.140 | .390951 | -387897. | 15844.9675 | -.0036714 | 1909.4243 | -121.7678 |
| 56.160 | .364354 | -274612. | 14972.2119 | -.0038719 | 1627.7082 | -126.8805 |
| 63.180 | .336590 | -167358. | 14065.9833 | -.0040057 | 1360.9899 | -131.3043 |
| 70.200 | .308114 | -66440.2650 | 13131.2564 | -.0040764 | 1110.0270 | -134.9996 |
| 77.220 | .279357 | 27878.6768 | 12173.2795 | -.0040881 | 1014.1322 | -137.9282 |
| 84.240 | .250718 | 115378. | 11197.5649 | -.0040447 | 1231.7251 | -140.0532 |
| 91.260 | .222569 | 195882. | 10209.8788 | -.0039505 | 1431.9228 | -141.3389 |
| 98.280 | .195252 | 269263. | 9217.6770 | -.0038097 | 1614.4061 | -141.3397 |
| 105.300 | .169080 | 335461. | 8231.3745 | -.0036267 | 1779.0275 | -139.6582 |
| 112.320 | .144333 | 394506. | 6818.2515 | -.0034058 | 1925.8602 | -262.9410 |

16inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 119.340 | .121263 | 440275. | 4994.8488 | -.0031531 | 2039.6774 | -256.5470 |
| 126.360 | .100063 | 473045. | 3221.9831 | -.0028767 | 2121.1707 | -248.5430 |
| 133.380 | .080874 | 493185. | 1511.1047 | -.0025843 | 2171.2552 | -238.8867 |
| 140.400 | .063780 | 501155. | -125.9799 | -.0022833 | 2191.0738 | -227.5192 |
| 147.420 | .048816 | 497508. | -1664.5574 | -.0019811 | 2182.0037 | -210.8220 |
| 154.440 | .035966 | 483069. | -3072.8985 | -.0016843 | 2146.0985 | -190.4148 |
| 161.460 | .025168 | 458857. | -4334.6486 | -.0013992 | 2085.8879 | -169.0582 |
| 168.480 | .016321 | 425943. | -5441.6871 | -.0011314 | 2004.0379 | -146.3374 |
| 175.500 | .009283 | 385474. | -6380.9602 | -.0008858 | 1903.3990 | -121.2618 |
| 182.520 | .003884 | 338718. | -7125.0349 | -.0006667 | 1787.1255 | -90.7253 |
| 189.540 | -7.66E-05 | 287217. | -7410.3154 | -.0004772 | 1659.0535 | 9.4488 |
| 196.560 | -.002816 | 235950. | -7091.4767 | -.0003189 | 1531.5628 | 81.3884 |
| 203.580 | -.004554 | 188503. | -6470.4042 | -.0001904 | 1413.5726 | 95.5554 |
| 210.600 | -.005490 | 145613. | -5778.0062 | -8.9285E-05 | 1306.9142 | 101.7090 |
| 217.620 | -.005807 | 107618. | -5057.2485 | -1.2642E-05 | 1212.4280 | 103.6351 |
| 224.640 | -.005667 | 74643.2480 | -4332.6772 | 4.2521E-05 | 1130.4262 | 102.7955 |
| 231.660 | -.005210 | 46673.9096 | -3621.0347 | 7.9238E-05 | 1060.8721 | 99.9516 |
| 238.680 | -.004555 | 23592.5440 | -2934.7629 | .0001005 | 1003.4734 | 95.5674 |
| 245.700 | -.003799 | 5201.7311 | -2283.5807 | .0001092 | 957.7392 | 89.9546 |
| 252.720 | -.003021 | -8760.2842 | -1675.3330 | .0001081 | 966.5886 | 83.3354 |
| 259.740 | -.002281 | -18608.4265 | -1116.5154 | 9.9860E-05 | 991.0790 | 75.8719 |
| 266.760 | -.001619 | -24702.5453 | -612.6602 | 8.6751E-05 | 1006.2338 | 67.6765 |
| 273.780 | -.001063 | -27441.5932 | -168.7182 | 7.0969E-05 | 1013.0452 | 58.8027 |
| 280.800 | -.000623 | -27260.6673 | 210.3546 | 5.4413E-05 | 1012.5953 | 49.1953 |
| 287.820 | -.000299 | -24633.3673 | 512.3341 | 3.8707E-05 | 1006.0618 | 36.8387 |
| 294.840 | -7.94E-05 | -20170.7513 | 676.0014 | 2.5147E-05 | 994.9641 | 9.7901 |
| 301.860 | 5.43E-05 | -15209.3895 | 686.8796 | 1.4439E-05 | 982.6262 | -6.6909 |
| 308.880 | .000123 | -10565.4784 | 610.0299 | 6.6377E-06 | 971.0778 | -15.2036 |
| 315.900 | .000147 | -6662.2762 | 492.8502 | 1.4236E-06 | 961.3713 | -18.1809 |
| 322.920 | .000143 | -3649.6593 | 367.0208 | -1.6974E-06 | 953.8795 | -17.6679 |
| 329.940 | .000124 | -1504.7756 | 251.5047 | -3.2574E-06 | 948.5457 | -15.2427 |
| 336.960 | 9.76E-05 | -109.8443 | 155.7802 | -3.7461E-06 | 945.0767 | -12.0292 |
| 343.980 | 7.10E-05 | 692.3719 | 82.8167 | -3.5698E-06 | 946.5254 | -8.7581 |
| 351.000 | 4.74E-05 | 1062.4248 | 31.5428 | -3.0387E-06 | 947.4456 | -5.8498 |
| 358.020 | 2.84E-05 | 1143.3393 | -1.2683 | -2.3711E-06 | 947.6468 | -3.4981 |
| 365.040 | 1.42E-05 | 1050.9436 | -19.6728 | -1.7070E-06 | 947.4171 | -1.7454 |
| 372.060 | 4.41E-06 | 871.6865 | -27.7059 | -1.1251E-06 | 946.9713 | -.5432638 |
| 379.080 | -1.64E-06 | 664.9533 | -28.9032 | -6.6001E-07 | 946.4572 | .2021657 |
| 386.100 | -4.86E-06 | 467.6461 | -26.0903 | -3.1722E-07 | 945.9665 | .5992208 |
| 393.120 | -6.09E-06 | 299.4912 | -21.3501 | -8.5035E-08 | 945.5484 | .7512724 |
| 400.140 | -6.05E-06 | 168.1174 | -16.0932 | 5.6491E-08 | 945.2217 | .7464182 |
| 407.160 | -5.30E-06 | 73.3918 | -11.1795 | 1.2959E-07 | 944.9861 | .6534858 |
| 414.180 | -4.23E-06 | 10.8109 | -7.0532 | 1.5507E-07 | 944.8305 | .5221030 |
| 421.200 | -3.12E-06 | -26.0493 | -3.8691 | 1.5046E-07 | 944.8684 | .3850562 |
| 428.220 | -2.12E-06 | -43.9127 | -1.5991 | 1.2928E-07 | 944.9128 | .2616568 |
| 435.240 | -1.31E-06 | -48.8461 | -.1146905 | 1.0121E-07 | 944.9251 | .1612636 |
| 442.260 | -7.01E-07 | -45.7929 | .7548242 | 7.2566E-08 | 944.9175 | .0864614 |
| 449.280 | -2.89E-07 | -38.4419 | 1.1834 | 4.7072E-08 | 944.8992 | .0356504 |
| 456.300 | -4.04E-08 | -29.3031 | 1.3260 | 2.6568E-08 | 944.8765 | .0049794 |
| 463.320 | 8.39E-08 | -19.8951 | 1.3072 | 1.1678E-08 | 944.8531 | -.0103395 |
| 470.340 | 1.24E-07 | -10.9807 | 1.0840 | 2.3330E-09 | 944.8309 | -.0532501 |
| 477.360 | 1.17E-07 | -4.6815 | .7207343 | -2.4073E-09 | 944.8152 | -.0502540 |
| 484.380 | 8.98E-08 | -.8551224 | .4085581 | -4.0830E-09 | 944.8057 | -.0386852 |
| 491.400 | 5.93E-08 | 1.0655 | .1830910 | -4.0193E-09 | 944.8062 | -.0255505 |
| 498.420 | 3.33E-08 | 1.7262 | .0429808 | -3.1744E-09 | 944.8079 | -.0143670 |
| 505.440 | 1.47E-08 | 1.6775 | -.0297163 | -2.1442E-09 | 944.8078 | -.0063444 |
| 512.460 | 3.23E-09 | 1.3147 | -.0568769 | -1.2386E-09 | 944.8068 | -.0013936 |
| 519.480 | -2.67E-09 | .8822076 | -.0577329 | -5.7373E-10 | 944.8058 | .0011497 |
| 526.500 | -4.82E-09 | .5056613 | -.0464049 | -1.5368E-10 | 944.8048 | .0020776 |
| 533.520 | -4.83E-09 | .2310931 | -.0318131 | 6.9303E-11 | 944.8042 | .0020796 |
| 540.540 | -3.85E-09 | .0588200 | -.0186931 | 1.5705E-10 | 944.8037 | .0016583 |
| 547.560 | -2.62E-09 | -.0317776 | -.0089083 | 1.6523E-10 | 944.8037 | .0011294 |
| 554.580 | -1.53E-09 | -.0666933 | -.0026324 | 1.3543E-10 | 944.8037 | .0006586 |

16inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 561.600 | -7.19E-10 | -.0690979 | .0007674 | 9.4330E-11 | 944.8038 | .0003100 |
| 568.620 | -2.04E-10 | -.0561701 | .0021640 | 5.6417E-11 | 944.8037 | 8.7896E-05 |
| 575.640 | 7.27E-11 | -.0388654 | .0023625 | 2.7654E-11 | 944.8037 | -3.1345E-05 |
| 582.660 | 1.84E-10 | -.0230741 | .0019737 | 8.9071E-12 | 944.8036 | -7.9417E-05 |
| 589.680 | 1.98E-10 | -.0111778 | .0013958 | -1.4595E-12 | 944.8036 | -8.5236E-05 |
| 596.700 | 1.64E-10 | -.0034729 | .0008489 | -5.8936E-12 | 944.8036 | -7.0587E-05 |
| 603.720 | 1.15E-10 | .0007561 | .0004271 | -6.7159E-12 | 944.8036 | -4.9578E-05 |
| 610.740 | 6.95E-11 | .0025414 | .0001479 | -5.7179E-12 | 944.8036 | -2.9954E-05 |
| 617.760 | 3.48E-11 | .0028484 | -9.7950E-06 | -4.0866E-12 | 944.8036 | -1.4983E-05 |
| 624.780 | 1.21E-11 | .0024147 | -8.0739E-05 | -2.4937E-12 | 944.8036 | -5.2286E-06 |
| 631.800 | -2.42E-13 | .0017215 | -9.8725E-05 | -1.2418E-12 | 944.8036 | 1.0432E-07 |
| 638.820 | -5.30E-12 | .0010319 | -9.0339E-05 | -4.0851E-13 | 944.8036 | 2.2850E-06 |
| 645.840 | -5.98E-12 | .0004542 | -6.5927E-05 | 4.1285E-14 | 944.8036 | 4.6699E-06 |
| 652.860 | -4.72E-12 | .0001062 | -3.6585E-05 | 2.1090E-13 | 944.8036 | 3.6896E-06 |
| 659.880 | -3.02E-12 | -6.0025E-05 | -1.5363E-05 | 2.2488E-13 | 944.8036 | 2.3567E-06 |
| 666.900 | -1.57E-12 | -.0001101 | -2.7984E-06 | 1.7339E-13 | 944.8036 | 1.2230E-06 |
| 673.920 | -5.82E-13 | -9.9777E-05 | 3.0904E-06 | 1.0988E-13 | 944.8036 | 4.5474E-07 |
| 680.940 | -2.27E-14 | -6.6983E-05 | 4.7488E-06 | 5.9408E-14 | 944.8036 | 1.7743E-08 |
| 687.960 | 2.52E-13 | -3.3261E-05 | 4.1200E-06 | 2.9068E-14 | 944.8036 | -1.9689E-07 |
| 694.980 | 3.85E-13 | -9.2152E-06 | 2.3721E-06 | 1.6212E-14 | 944.8036 | -3.0110E-07 |
| 702.000 | 4.80E-13 | 0.0000 | 0.0000 | 1.3423E-14 | 944.8036 | -3.7472E-07 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1: Fixed

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00005476 |
| Maximum bending moment | = | -1431878. lbs-in |
| Maximum shear force | = | 26430.39080 lbs |
| Depth of maximum bending moment | = | 0.00000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 14 |
| Number of zero deflection points | = | 8 |

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Specified deflection at pile head = .500000 in
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 190000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | 0.0000 | 13407.8055 | -.0056915 | 944.8036 | -192.6633 |
| 7.020 | .460046 | 96966.8503 | 12004.6667 | -.0056621 | 1185.9404 | -207.0914 |
| 14.040 | .420503 | 183650. | 10503.8929 | -.0055772 | 1401.5035 | -220.4795 |
| 21.060 | .381742 | 259319. | 8912.9784 | -.0054431 | 1589.6779 | -232.7725 |
| 28.080 | .344082 | 323308. | 7239.8028 | -.0052668 | 1748.8054 | -243.9157 |
| 35.100 | .307796 | 375016. | 5492.6331 | -.0050555 | 1877.3918 | -253.8535 |
| 42.120 | .273103 | 413911. | 4247.6841 | -.0048167 | 1974.1154 | -100.8329 |
| 49.140 | .240169 | 447502. | 3530.4251 | -.0045560 | 2057.6509 | -103.5144 |

16inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 56.160 | .209137 | 475631. | 2796.9699 | -.0042766 | 2127.6022 | -105.4472 |
| 63.180 | .180126 | 498180. | 2052.6682 | -.0039818 | 2183.6759 | -106.6046 |
| 70.200 | .153232 | 515073. | 1303.0594 | -.0036752 | 2225.6850 | -106.9592 |
| 77.220 | .128527 | 526279. | 553.8845 | -.0033600 | 2253.5521 | -106.4810 |
| 84.240 | .106058 | 531813. | -188.8938 | -.0030398 | 2267.3132 | -105.1368 |
| 91.260 | .085848 | 531736. | -919.0590 | -.0027179 | 2267.1220 | -102.8875 |
| 98.280 | .067899 | 526159. | -1629.0729 | -.0023977 | 2253.2544 | -99.3957 |
| 105.300 | .052185 | 515260. | -2309.2427 | -.0020825 | 2226.1493 | -94.3849 |
| 112.320 | .038660 | 499293. | -3235.4977 | -.0017754 | 2186.4429 | -169.5054 |
| 119.340 | .027258 | 474569. | -4378.0186 | -.0014807 | 2124.9610 | -155.9991 |
| 126.360 | .017872 | 441775. | -5416.9231 | -.0012033 | 2043.4085 | -139.9851 |
| 133.380 | .010363 | 401726. | -6331.0737 | -.0009481 | 1943.8139 | -120.4567 |
| 140.400 | .004561 | 355416. | -7085.4873 | -.0007189 | 1828.6507 | -94.4760 |
| 147.420 | .000269 | 304163. | -7533.6249 | -.0005193 | 1701.1958 | -33.1985 |
| 154.440 | -.002730 | 251029. | -7367.3688 | -.0003512 | 1569.0617 | 80.5649 |
| 161.460 | -.004662 | 201662. | -6746.4676 | -.0002142 | 1446.2969 | 96.3300 |
| 168.480 | -.005738 | 156880. | -6045.9746 | -.0001057 | 1334.9325 | 103.2406 |
| 175.500 | -.006146 | 117059. | -5312.7972 | -2.2805E-05 | 1235.9053 | 105.6418 |
| 182.520 | -.006058 | 82349.2720 | -4572.9702 | 3.7547E-05 | 1149.5895 | 105.1351 |
| 189.540 | -.005619 | 52754.2482 | -3844.0405 | 7.8437E-05 | 1075.9927 | 102.5372 |
| 196.560 | -.004957 | 28169.7042 | -3138.9644 | .0001029 | 1014.8559 | 98.3392 |
| 203.580 | -.004174 | 8408.6127 | -2467.8245 | .0001140 | 965.7141 | 92.8688 |
| 210.600 | -.003356 | -6782.6582 | -1838.7367 | .0001145 | 961.6707 | 86.3585 |
| 217.620 | -.002567 | -17712.6708 | -1258.4021 | .0001071 | 988.8514 | 78.9790 |
| 224.640 | -.001853 | -24736.2664 | -732.4968 | 9.4231E-05 | 1006.3176 | 70.8516 |
| 231.660 | -.001244 | -28248.2962 | -266.0304 | 7.8195E-05 | 1015.0513 | 62.0448 |
| 238.680 | -.000755 | -28679.9256 | 136.1610 | 6.0965E-05 | 1016.1247 | 52.5396 |
| 245.700 | -.000388 | -26499.2265 | 468.3220 | 4.4265E-05 | 1010.7018 | 42.0931 |
| 252.720 | -.000133 | -22222.7657 | 673.7354 | 2.9519E-05 | 1000.0671 | 16.4292 |
| 259.740 | 2.68E-05 | -17118.7247 | 719.8255 | 1.7612E-05 | 987.3744 | -3.2981 |
| 266.760 | .000114 | -12163.3963 | 658.9094 | 8.7491E-06 | 975.0515 | -14.0569 |
| 273.780 | .000150 | -7890.9755 | 544.8346 | 2.6795E-06 | 964.4268 | -18.4431 |
| 280.800 | .000152 | -4521.0664 | 414.4794 | -1.0771E-06 | 956.0466 | -18.6952 |
| 287.820 | .000134 | -2068.8121 | 290.6684 | -3.0716E-06 | 949.9483 | -16.5786 |
| 294.840 | .000109 | -431.8880 | 185.5200 | -3.8284E-06 | 945.8776 | -13.3782 |
| 301.860 | 8.07E-05 | 546.1019 | 103.6328 | -3.7939E-06 | 946.1616 | -9.9515 |
| 308.880 | 5.52E-05 | 1033.2366 | 44.7966 | -3.3159E-06 | 947.3730 | -6.8109 |
| 315.900 | 3.42E-05 | 1183.8917 | 6.1073 | -2.6448E-06 | 947.7477 | -4.2117 |
| 322.920 | 1.81E-05 | 1126.0380 | -16.5124 | -1.9457E-06 | 947.6038 | -2.2327 |
| 329.940 | 6.84E-06 | 957.2486 | -27.3101 | -1.3152E-06 | 947.1841 | -.8435996 |
| 336.960 | -3.57E-07 | 746.1133 | -30.1168 | -7.9965E-07 | 946.6590 | .0439568 |
| 343.980 | -4.38E-06 | 536.5418 | -28.0649 | -4.1145E-07 | 946.1379 | .5406185 |
| 351.000 | -6.13E-06 | 353.1791 | -23.5132 | -1.4217E-07 | 945.6819 | .7561815 |
| 358.020 | -6.38E-06 | 206.7961 | -18.0976 | 2.7315E-08 | 945.3178 | .7867112 |
| 365.040 | -5.75E-06 | 99.0156 | -12.8480 | 1.1987E-07 | 945.0498 | .7088987 |
| 372.060 | -4.70E-06 | 26.0900 | -8.3268 | 1.5774E-07 | 944.8685 | .5792112 |
| 379.080 | -3.54E-06 | -18.3129 | -4.7639 | 1.6009E-07 | 944.8491 | .4358549 |
| 386.100 | -2.45E-06 | -41.2220 | -2.1737 | 1.4207E-07 | 944.9061 | .3020929 |
| 393.120 | -1.54E-06 | -49.2105 | -.4466947 | 1.1470E-07 | 944.9260 | .1899274 |
| 400.140 | -8.40E-07 | -47.7995 | .5833885 | 8.5340E-08 | 944.9224 | .1035436 |
| 407.160 | -3.42E-07 | -41.2473 | 1.0950 | 5.8389E-08 | 944.9062 | .0422024 |
| 414.180 | -2.00E-08 | -32.5821 | 1.2518 | 3.6044E-08 | 944.8846 | .0024711 |
| 421.200 | 1.64E-07 | -23.7688 | 1.1896 | 1.8989E-08 | 944.8627 | -.0201903 |
| 428.220 | 2.47E-07 | -15.9312 | 1.0120 | 6.9733E-09 | 944.8432 | -.0303990 |
| 435.240 | 2.62E-07 | -9.5789 | .7920612 | -7.4757E-10 | 944.8274 | -.0322612 |
| 442.260 | 2.36E-07 | -4.8087 | .5766661 | -5.1021E-09 | 944.8155 | -.0291049 |
| 449.280 | 1.90E-07 | -1.4689 | .3922708 | -7.0021E-09 | 944.8072 | -.0234294 |
| 456.300 | 1.38E-07 | .7174675 | .2504192 | -7.2295E-09 | 944.8054 | -.0169842 |
| 463.320 | 8.85E-08 | 2.0663 | .1524931 | -6.3870E-09 | 944.8087 | -.0109150 |
| 470.340 | 4.81E-08 | 2.8755 | .0414526 | -4.8913E-09 | 944.8107 | -.0207205 |
| 477.360 | 1.99E-08 | 2.6613 | -.0613091 | -3.2155E-09 | 944.8102 | -.0085564 |
| 484.380 | 2.94E-09 | 2.0233 | -.0957841 | -1.7977E-09 | 944.8086 | -.0012656 |
| 491.400 | -5.38E-09 | 1.3213 | -.0920822 | -7.8542E-10 | 944.8069 | .0023202 |

16inCIP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 498.420 | -8.09E-09 | .7325675 | -.0717006 | -1.6380E-10 | 944.8054 | .0034865 |
| 505.440 | -7.68E-09 | .3150596 | -.0478405 | 1.5327E-10 | 944.8044 | .0033113 |
| 512.460 | -5.94E-09 | .0604783 | -.0272353 | 2.6693E-10 | 944.8037 | .0025591 |
| 519.480 | -3.94E-09 | -.0680367 | -.0122989 | 2.6464E-10 | 944.8037 | .0016963 |
| 526.500 | -2.22E-09 | -.1129046 | -.0029826 | 2.0988E-10 | 944.8039 | .0009580 |
| 533.520 | -9.90E-10 | -.1104728 | .0018765 | 1.4227E-10 | 944.8039 | .0004264 |
| 540.540 | -2.25E-10 | -.0869382 | .0037142 | 8.2526E-11 | 944.8038 | 9.7157E-05 |
| 547.560 | 1.69E-10 | -.0585455 | .0037994 | 3.8494E-11 | 944.8037 | -7.2897E-05 |
| 554.580 | 3.15E-10 | -.0336979 | .0030670 | 1.0576E-11 | 944.8037 | -.0001357 |
| 561.600 | 3.18E-10 | -.0155126 | .0021101 | -4.3181E-12 | 944.8036 | -.0001369 |
| 568.620 | 2.54E-10 | -.0040606 | .0012449 | -1.0242E-11 | 944.8036 | -.0001096 |
| 575.640 | 1.74E-10 | .0019926 | .0005971 | -1.0868E-11 | 944.8036 | -7.4917E-05 |
| 582.660 | 1.02E-10 | .0043523 | .0001802 | -8.9476E-12 | 944.8036 | -4.3864E-05 |
| 589.680 | 4.82E-11 | .0045469 | -4.6678E-05 | -6.2542E-12 | 944.8036 | -2.0781E-05 |
| 596.700 | 1.40E-11 | .0037137 | -.0001408 | -3.7541E-12 | 944.8036 | -6.0244E-06 |
| 603.720 | -4.48E-12 | .0025806 | -.0001551 | -1.8491E-12 | 944.8036 | 1.9321E-06 |
| 610.740 | -1.20E-11 | .0015406 | -.0001302 | -6.0178E-13 | 944.8036 | 5.1631E-06 |
| 617.760 | -1.29E-11 | .0007538 | -9.2542E-05 | 9.2631E-14 | 944.8036 | 5.5730E-06 |
| 624.780 | -1.07E-11 | .0002410 | -5.6825E-05 | 3.9372E-13 | 944.8036 | 4.6026E-06 |
| 631.800 | -7.40E-12 | -4.5088E-05 | -2.9470E-05 | 4.5303E-13 | 944.8036 | 3.1909E-06 |
| 638.820 | -4.32E-12 | -.0001739 | -1.1736E-05 | 3.8674E-13 | 944.8036 | 1.8617E-06 |
| 645.840 | -1.97E-12 | -.0002109 | 2.1366E-07 | 2.7027E-13 | 944.8036 | 1.5427E-06 |
| 652.860 | -5.25E-13 | -.0001717 | 7.0695E-06 | 1.5449E-13 | 944.8036 | 4.1050E-07 |
| 659.880 | 1.94E-13 | -.0001120 | 7.9773E-06 | 6.8630E-14 | 944.8036 | -1.5187E-07 |
| 666.900 | 4.38E-13 | -5.9834E-05 | 6.2428E-06 | 1.6609E-14 | 944.8036 | -3.4228E-07 |
| 673.920 | 4.28E-13 | -2.4441E-05 | 3.8689E-06 | -8.8977E-15 | 944.8036 | -3.3405E-07 |
| 680.940 | 3.13E-13 | -5.4913E-06 | 1.8375E-06 | -1.7957E-14 | 944.8036 | -2.4468E-07 |
| 687.960 | 1.75E-13 | 1.4050E-06 | 4.9749E-07 | -1.9194E-14 | 944.8036 | -1.3709E-07 |
| 694.980 | 4.37E-14 | 1.5447E-06 | -1.0355E-07 | -1.8301E-14 | 944.8036 | -3.4152E-08 |
| 702.000 | -8.15E-14 | 0.0000 | 0.0000 | -1.7834E-14 | 944.8036 | 6.3654E-08 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2: Free

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00569150 |
| Maximum bending moment | = | 531812.53110 lbs-in |
| Maximum shear force | = | 13407.80546 lbs |
| Depth of maximum bending moment | = | 84.24000000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 12 |
| Number of zero deflection points | = | 9 |

---

Summary of Pile Response(s)

---

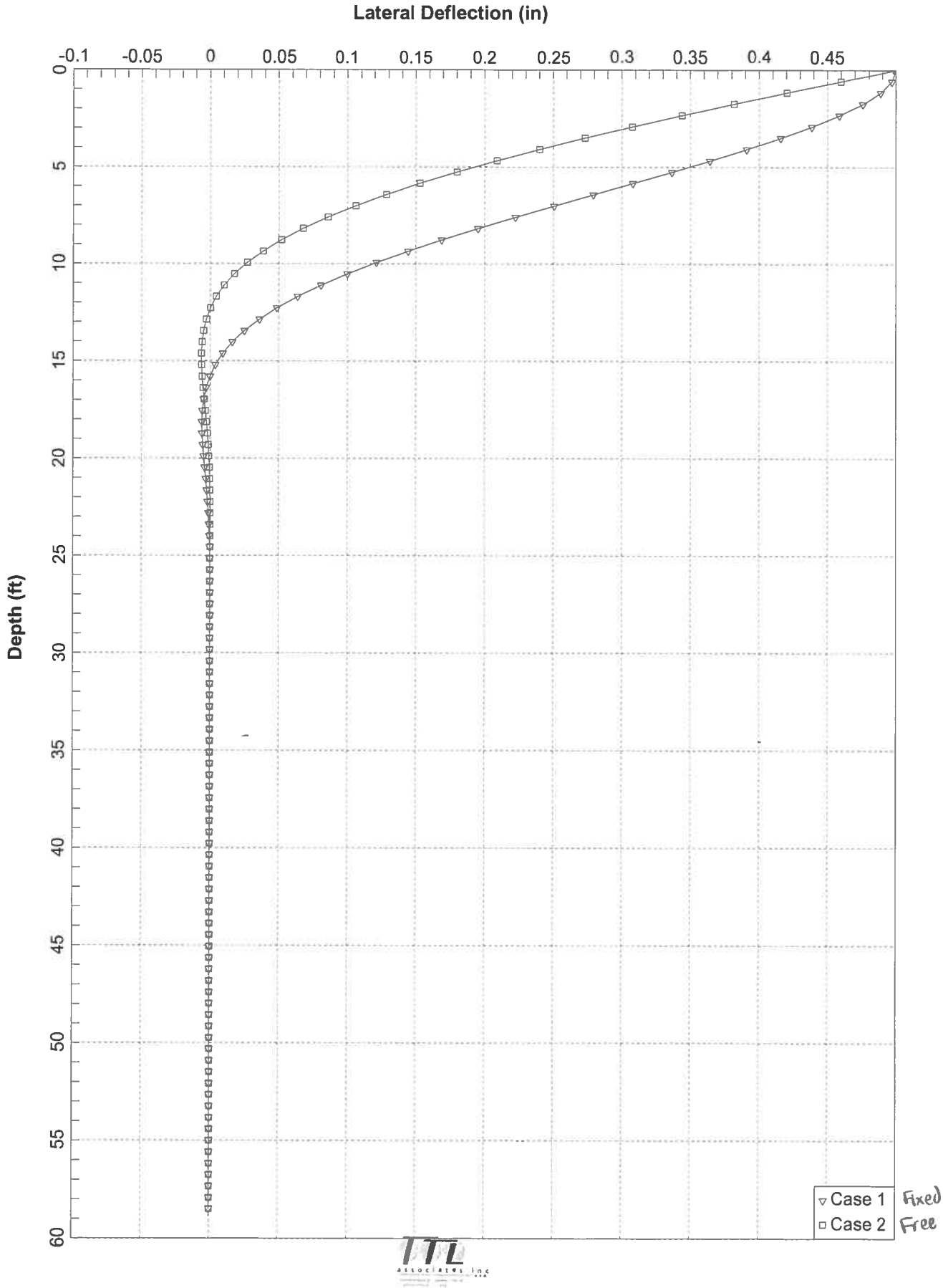
Definition of Symbols for Pile-Head Loading Conditions:

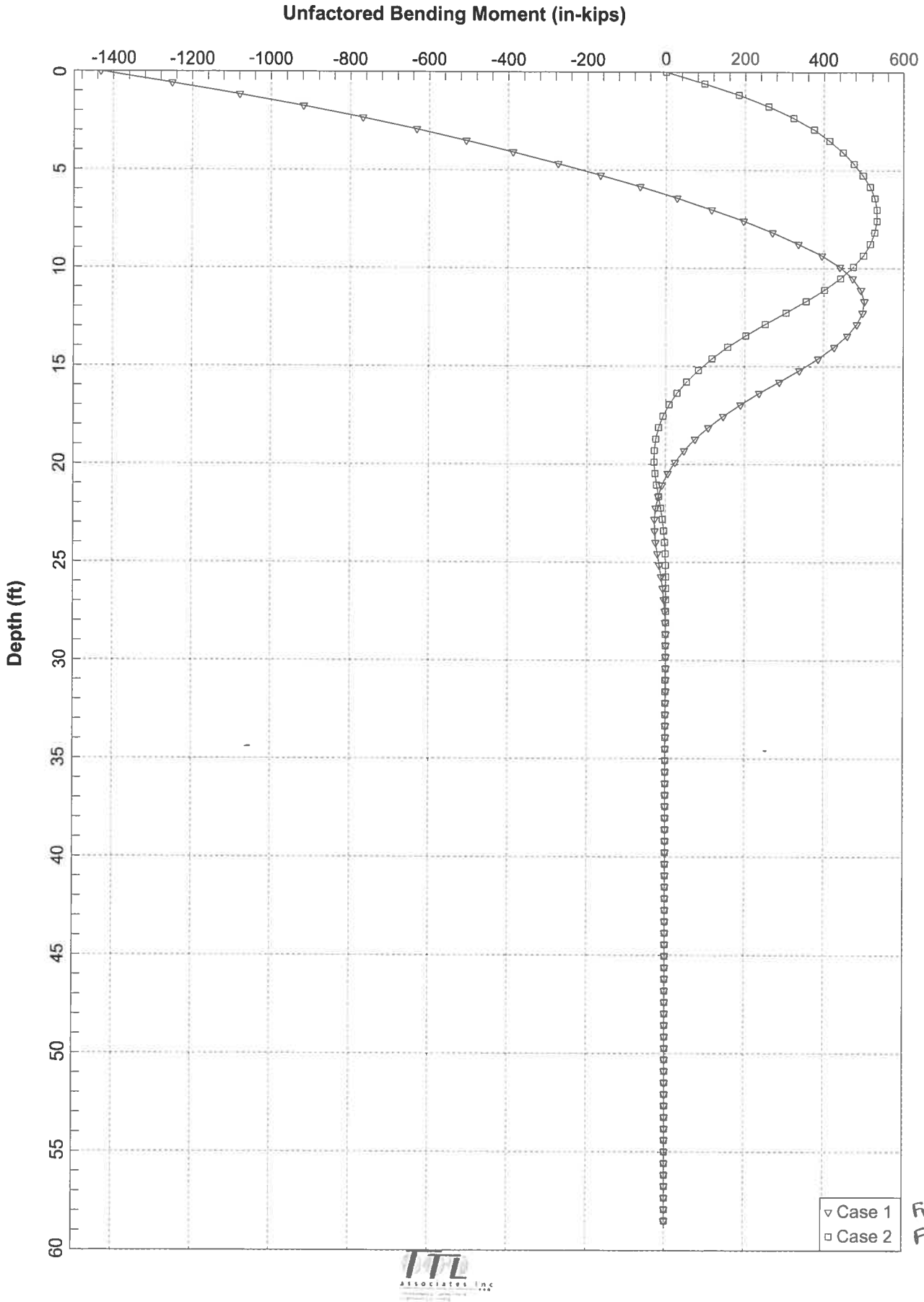
Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

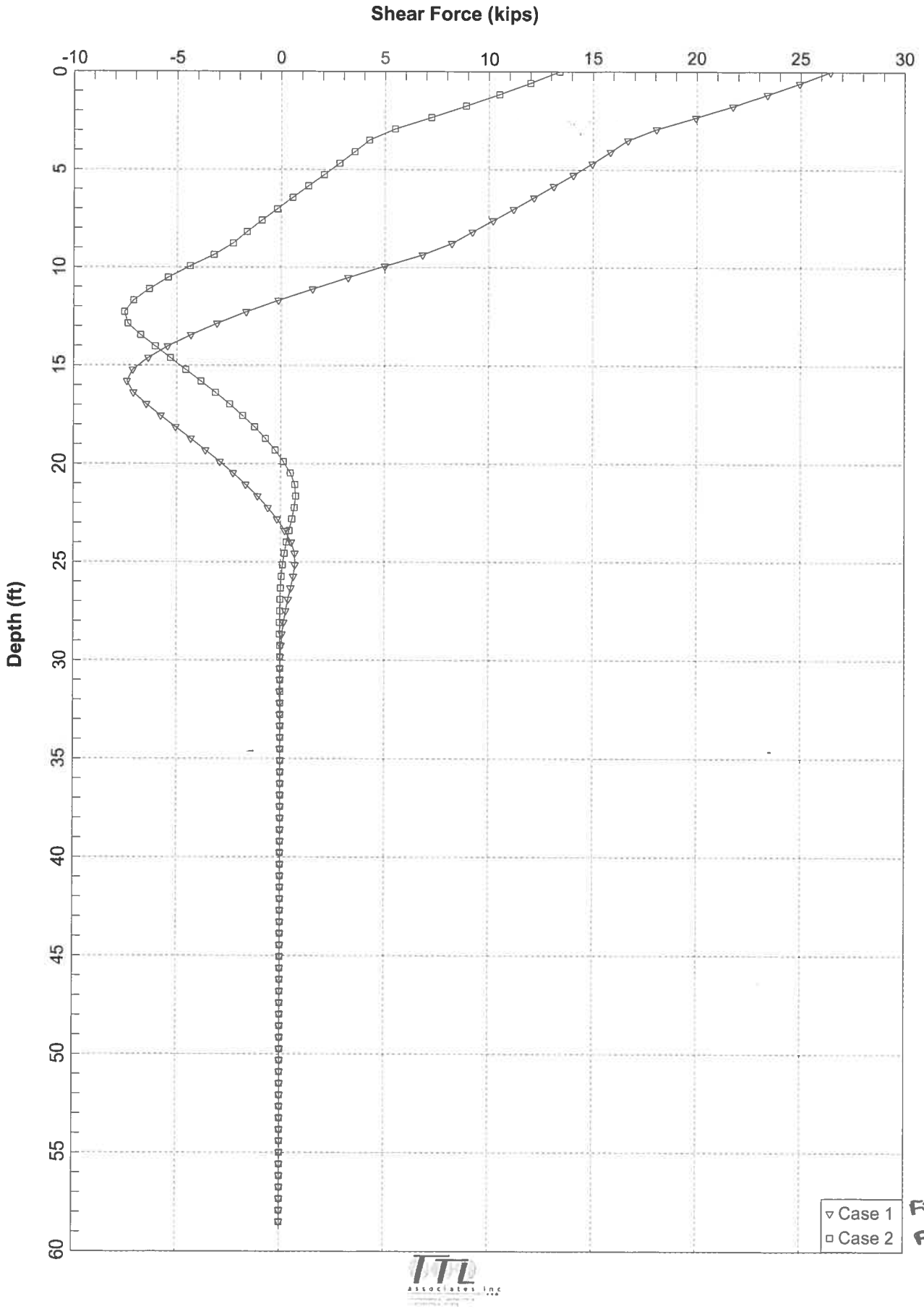
16inCIP.lpo

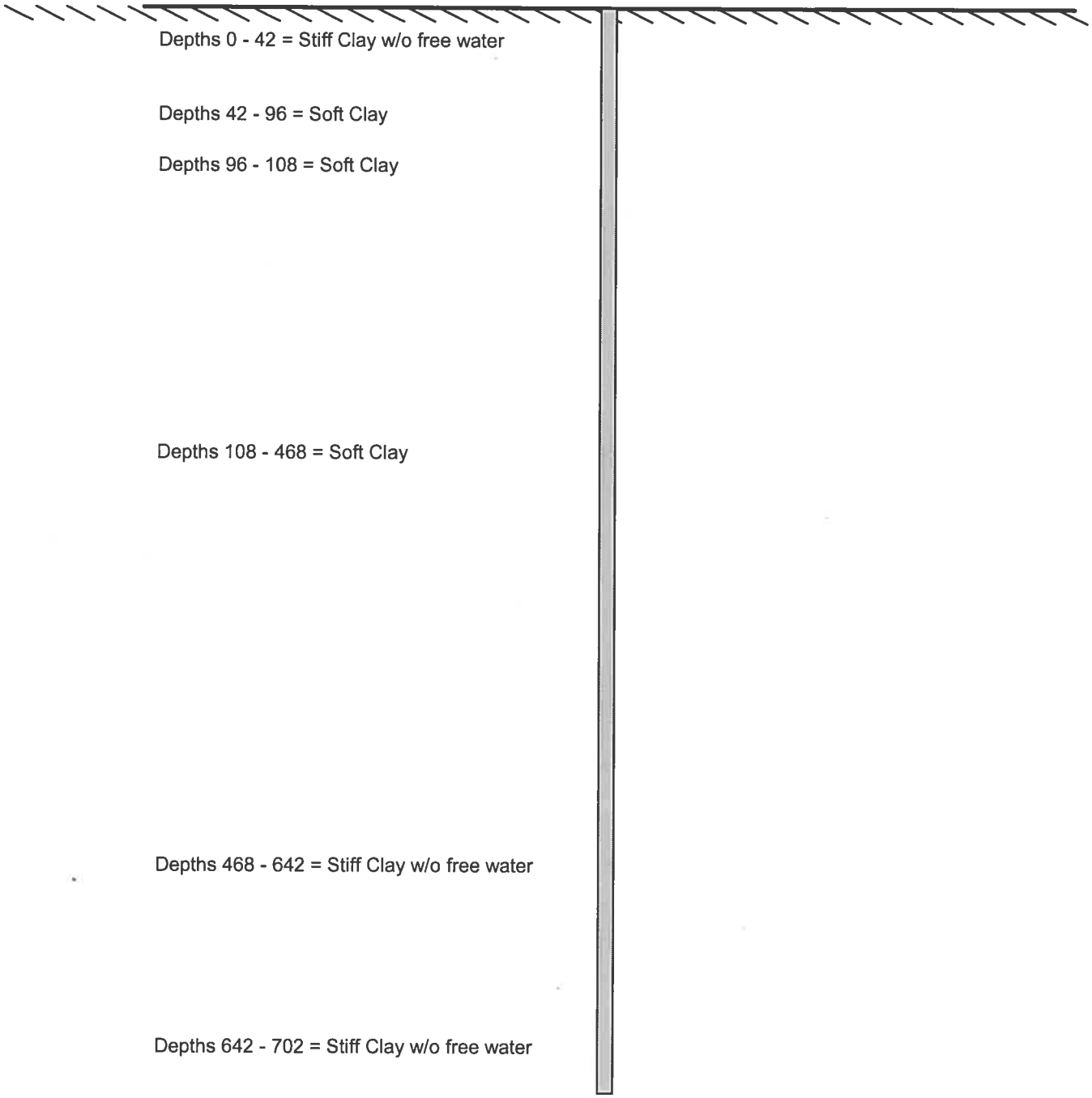
| Load Type | Pile-Head Condition 1 | | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs | |
|---|---|---|---|---|---|---|---|---|
| 5 | y= .500000 | S= | 0.000 | 190000. | .5000000 | -1431878. | 26430.3908 | Fixed |
| 4 | y= .500000 | M= | 0.000 | 190000. | .5000000 | 531813. | 13407.8055 | Free |

The analysis ended normally.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free


Unfactored Bending Moment (in-kips)
-1400
-1200
-1000
-800
-600
-400
-200
0
200
400
600
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free


Shear Force (kips)
-10
-5
0
5
10
15
20
25
30
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free


Depths 0 - 42 = Stiff Clay w/o free water
Depths 42 - 96 = Soft Clay
Depths 96 - 108 = Soft Clay
Depths 108 - 468 = Soft Clay
Depths 468 - 642 = Stiff Clay w/o free water
Depths 642 - 702 = Stiff Clay w/o free water
Depths 702 - 871.2 = Stiff Clay w/o free water

HP10x42.lpo

LPILE Plus for Windows, Version 5.0 (5.0.24)

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



This program is licensed to:

Kate Chulski
TTL Associates

Path to file locations: C:\Program Files\Ensoft\LpileP5\14837.01 - Oregon Energy\
Name of input data file: HP10x42.lpd
Name of output file: HP10x42.lpo
Name of plot output file: HP10x42.lpp
Name of runtime file: HP10x42.lpr

## Time and Date of Analysis

Date: February 27, 2017 Time: 11:19:48

## Problem Title

14837.01 Proposed Oregon Energy Project

## Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant 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 additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100

HP10x42.lpo

- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

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

---

## Pile Structural Properties and Geometry

---

Pile Length = 702.00 in
Depth of ground surface below top of pile = .00 in
Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|
| 1 | 0.0000 | 10.07500000 | 210.0000 | 12.4000 | 29000000. |
| 2 | 702.0000 | 10.07500000 | 210.0000 | 12.4000 | 29000000. |

---

## Soil and Rock Layering Information

---

The soil profile is modelled using 7 layers

Layer 1 is stiff clay without free water
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 42.000 in

Layer 2 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 42.000 in
Distance from top of pile to bottom of layer = 96.000 in

Layer 3 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 108.000 in

Layer 4 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 108.000 in
Distance from top of pile to bottom of layer = 468.000 in

Layer 5 is stiff clay without free water
Distance from top of pile to top of layer = 468.000 in
Distance from top of pile to bottom of layer = 642.000 in

Layer 6 is stiff clay without free water
Distance from top of pile to top of layer = 642.000 in
Distance from top of pile to bottom of layer = 702.000 in

Layer 7 is stiff clay without free water
Distance from top of pile to top of layer = 702.000 in
Distance from top of pile to bottom of layer = 871.200 in

HP10x42.lpo
(Depth of lowest layer extends 169.20 in below pile tip)

---

## Effective Unit Weight of Soil vs. Depth

---

Distribution of effective unit weight of soil with depth
is defined using 14 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07234 |
| 2 | 42.00 | .07234 |
| 3 | 42.00 | .07523 |
| 4 | 96.00 | .07523 |
| 5 | 96.00 | .03912 |
| 6 | 108.00 | .03912 |
| 7 | 108.00 | .03912 |
| 8 | 468.00 | .03912 |
| 9 | 468.00 | .03912 |
| 10 | 642.00 | .03912 |
| 11 | 642.00 | .04201 |
| 12 | 702.00 | .04201 |
| 13 | 702.00 | .04201 |
| 14 | 871.20 | .04201 |

---

## Shear Strength of Soils

---

Distribution of shear strength parameters with depth
defined using 14 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | E50 or k_rm | RQD % |
|---|---|---|---|---|---|
| 1 | .000 | 6.94440 | .00 | .00700 | .0 |
| 2 | 42.000 | 6.94440 | .00 | .00700 | .0 |
| 3 | 42.000 | 3.47220 | .00 | .02000 | .0 |
| 4 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 5 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 6 | 108.000 | 3.47220 | .00 | .02000 | .0 |
| 7 | 108.000 | 5.90278 | .00 | .01000 | .0 |
| 8 | 468.000 | 5.90278 | .00 | .01000 | .0 |
| 9 | 468.000 | 10.41670 | .00 | .00700 | .0 |
| 10 | 642.000 | 10.41670 | .00 | .00700 | .0 |
| 11 | 642.000 | 17.36110 | .00 | .00500 | .0 |
| 12 | 702.000 | 17.36110 | .00 | .00500 | .0 |
| 13 | 702.000 | 31.25000 | .00 | .00500 | .0 |
| 14 | 871.200 | 31.25000 | .00 | .00500 | .0 |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

HP10x42.lpo

---

Loading Type

---

Static loading criteria was used for computation of p-y curves

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Deflection at pile head = .500 in
Slope at pile head = .000 in/in
Axial load at pile head = 110000.000 lbs

Load Case Number 2

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = .500 in
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 110000.000 lbs

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Specified deflection at pile head = .500000 in
Specified slope at pile head = 0.000E+00 in/in
Specified axial load at pile head = 110000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | -909914. | 18693.7337 | 0.0000 | 30698.0596 | -136.1892 |
| 7.020 | .496318 | -782099. | 17605.3324 | -.0009752 | 27632.0256 | -155.0378 |
| 14.040 | .486308 | -661228. | 16453.0679 | -.0018071 | 24732.5688 | -173.2530 |
| 21.060 | .470947 | -548307. | 15175.5248 | -.0025042 | 22023.8031 | -190.7194 |
| 28.080 | .451149 | -444296. | 13778.3627 | -.0030763 | 19528.7873 | -207.3324 |
| 35.100 | .427756 | -350108. | 12267.9164 | -.0035341 | 17269.3813 | -222.9941 |
| 42.120 | .401530 | -266597. | 11145.4871 | -.0038896 | 15266.1107 | -96.7863 |
| 49.140 | .373147 | -187618. | 10446.4464 | -.0041514 | 13371.5628 | -102.3706 |
| 56.160 | .343245 | -113517. | 9710.6320 | -.0043249 | 11594.0256 | -107.2631 |
| 63.180 | .312425 | -44601.1687 | 8943.0645 | -.0044161 | 9940.8648 | -111.4171 |
| 70.200 | .281243 | 18863.7362 | 8149.0833 | -.0044309 | 9323.4728 | -114.7884 |
| 77.220 | .250215 | 76655.0322 | 7334.3315 | -.0043758 | 10709.7760 | -117.3346 |
| 84.240 | .219807 | 128596. | 6504.7447 | -.0042575 | 11955.7360 | -119.0149 |
| 91.260 | .190439 | 174557. | 5687.4657 | -.0040828 | 13058.2576 | -113.8281 |
| 98.280 | .162484 | 214753. | 4908.9834 | -.0038584 | 14022.4909 | -107.9617 |
| 105.300 | .136266 | 249438. | 4172.6780 | -.0035909 | 14854.5126 | -101.8119 |
| 112.320 | .112068 | 278884. | 3098.1822 | -.0032864 | 15560.8519 | -204.3122 |

HP10x42.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 119.340 | .090125 | 298012. | 1714.1440 | -.0029539 | 16019.7102 | -190.0006 |
| 126.360 | .070595 | 307512. | 432.4745 | -.0026049 | 16247.5973 | -175.1474 |
| 133.380 | .053553 | 308107. | -742.9833 | -.0022501 | 16261.8690 | -159.7409 |
| 140.400 | .039004 | 300556. | -1808.1563 | -.0018993 | 16080.7254 | -143.7272 |
| 147.420 | .026887 | 285654. | -2758.3103 | -.0015614 | 15723.2581 | -126.9719 |
| 154.440 | .017081 | 264240. | -3587.1477 | -.0012445 | 15209.5925 | -109.1641 |
| 161.460 | .009414 | 237212. | -4284.5359 | -.0009555 | 14561.2372 | -89.5220 |
| 168.480 | .003666 | 205561. | -4828.4037 | -.0007003 | 13801.9890 | -65.4261 |
| 175.500 | -.000418 | 170503. | -4948.0378 | -.0004835 | 12961.0087 | 31.3423 |
| 182.520 | -.003122 | 136838. | -4620.9299 | -.0003064 | 12153.4387 | 61.8508 |
| 189.540 | -.004720 | 106098. | -4154.5547 | -.0001664 | 11416.0635 | 71.0196 |
| 196.560 | -.005458 | 78764.5066 | -3643.5726 | -5.9831E-05 | 10760.3782 | 74.5593 |
| 203.580 | -.005560 | 55034.9301 | -3118.5382 | 1.7285E-05 | 10191.1509 | 75.0231 |
| 210.600 | -.005216 | 34953.5354 | -2597.4168 | 6.9150E-05 | 9709.4365 | 73.4445 |
| 217.620 | -.004589 | 18460.4021 | -2092.6087 | 9.9936E-05 | 9313.7976 | 70.3755 |
| 224.640 | -.003813 | 5418.9687 | -1613.3757 | .0001137 | 9000.9585 | 66.1581 |
| 231.660 | -.002993 | -4366.9892 | -1166.9664 | .0001143 | 8975.7235 | 61.0240 |
| 238.680 | -.002208 | -11141.7723 | -759.2424 | .0001054 | 9138.2376 | 55.1367 |
| 245.700 | -.001513 | -15189.4808 | -395.1004 | 9.0190E-05 | 9235.3345 | 48.6075 |
| 252.720 | -.000942 | -16828.2717 | -78.8609 | 7.1737E-05 | 9274.6459 | 41.4892 |
| 259.740 | -.000506 | -16407.4781 | 185.1278 | 5.2581E-05 | 9264.5519 | 33.7212 |
| 266.760 | -.000203 | -14310.2834 | 390.7516 | 3.4877E-05 | 9214.2442 | 24.8610 |
| 273.780 | -1.63E-05 | -10975.1887 | 485.0843 | 2.0303E-05 | 9134.2416 | 2.0144 |
| 280.800 | 8.18E-05 | -7531.0560 | 456.7615 | 9.6372E-06 | 9051.6234 | -10.0836 |
| 287.820 | .000119 | -4577.1415 | 369.8840 | 2.6586E-06 | 8980.7646 | -14.6679 |
| 294.840 | .000119 | -2341.9911 | 266.8532 | -1.3293E-06 | 8927.1476 | -14.6856 |
| 301.860 | .000100 | -828.4703 | 171.8989 | -3.1566E-06 | 8890.8412 | -12.3668 |
| 308.880 | 7.48E-05 | 76.3449 | 96.1238 | -3.5901E-06 | 8872.7991 | -9.2215 |
| 315.900 | 4.99E-05 | 526.6527 | 42.1617 | -3.2425E-06 | 8883.6011 | -6.1523 |
| 322.920 | 2.93E-05 | 673.3028 | 7.9009 | -2.5509E-06 | 8887.1190 | -3.6086 |
| 329.940 | 1.41E-05 | 641.5212 | -10.8606 | -1.7931E-06 | 8886.3566 | -1.7366 |
| 336.960 | 4.09E-06 | 523.5892 | -18.7272 | -1.1216E-06 | 8883.5276 | -.5046149 |
| 343.980 | -1.66E-06 | 380.3235 | -19.7789 | -6.0065E-07 | 8880.0910 | .2049745 |
| 351.000 | -4.34E-06 | 246.8205 | -17.1812 | -2.3919E-07 | 8876.8885 | .5351215 |
| 358.020 | -5.02E-06 | 139.4688 | -13.1302 | -1.6551E-08 | 8874.3133 | .6190197 |
| 365.040 | -4.57E-06 | 62.4985 | -8.9786 | 9.9853E-08 | 8872.4670 | .5637723 |
| 372.060 | -3.62E-06 | 13.2555 | -5.4337 | 1.4351E-07 | 8871.2857 | .4461711 |
| 379.080 | -2.56E-06 | -14.0119 | -2.7607 | 1.4308E-07 | 8871.3039 | .3153452 |
| 386.100 | -1.61E-06 | -25.7264 | -.9571534 | 1.2018E-07 | 8871.5849 | .1984987 |
| 393.120 | -8.70E-07 | -27.6359 | .1162669 | 8.9420E-08 | 8871.6307 | .1073190 |
| 400.140 | -3.55E-07 | -24.2321 | .6463832 | 5.9525E-08 | 8871.5490 | .0437112 |
| 407.160 | -3.47E-08 | -18.6526 | .8148302 | 3.4808E-08 | 8871.4152 | .0042794 |
| 414.180 | 1.34E-07 | -12.8456 | .7717847 | 1.6654E-08 | 8871.2759 | -.0165431 |
| 421.200 | 1.99E-07 | -7.8425 | .6275493 | 4.7306E-09 | 8871.1559 | -.0245496 |
| 428.220 | 2.01E-07 | -4.0422 | .4545712 | -2.1191E-09 | 8871.0647 | -.0247319 |
| 435.240 | 1.69E-07 | -1.4570 | .2944688 | -5.2886E-09 | 8871.0027 | -.0208813 |
| 442.260 | 1.26E-07 | .1003572 | .1664995 | -6.0705E-09 | 8870.9701 | -.0155772 |
| 449.280 | 8.41E-08 | .8900026 | .0754142 | -5.4997E-09 | 8870.9891 | -.0103731 |
| 456.300 | 4.91E-08 | 1.1677 | .0177447 | -4.3138E-09 | 8870.9958 | -.0060570 |
| 463.320 | 2.36E-08 | 1.1458 | -.0137147 | -2.9804E-09 | 8870.9952 | -.0029058 |
| 470.340 | 7.28E-09 | .9797146 | -.0349283 | -1.7554E-09 | 8870.9912 | -.0031380 |
| 477.360 | -1.08E-09 | .6581168 | -.0443136 | -8.1140E-10 | 8870.9835 | .0004641 |
| 484.380 | -4.11E-09 | .3588044 | -.0364675 | -2.2529E-10 | 8870.9763 | .0017712 |
| 491.400 | -4.24E-09 | .1464603 | -.0238371 | 6.5920E-11 | 8870.9713 | .0018272 |
| 498.420 | -3.18E-09 | .0240304 | -.0126065 | 1.6418E-10 | 8870.9683 | .0013724 |
| 505.440 | -1.93E-09 | -.0307881 | -.0048626 | 1.6029E-10 | 8870.9685 | .0008338 |
| 512.460 | -9.34E-10 | -.0444878 | -.0005227 | 1.1690E-10 | 8870.9688 | .0004026 |
| 519.480 | -2.94E-10 | -.0383070 | .0013346 | 6.9184E-11 | 8870.9687 | .0001265 |
| 526.500 | 3.71E-11 | -.0258567 | .0017227 | 3.2203E-11 | 8870.9684 | -1.5970E-05 |
| 533.520 | 1.59E-10 | -.0141703 | .0014269 | 9.1329E-12 | 8870.9681 | -6.8306E-05 |
| 540.540 | 1.65E-10 | -.0058375 | .0009371 | -2.3987E-12 | 8870.9679 | -7.1227E-05 |
| 547.560 | 1.25E-10 | -.0010096 | .0004983 | -6.3450E-12 | 8870.9678 | -5.3793E-05 |
| 554.580 | 7.62E-11 | .0011683 | .0001942 | -6.2535E-12 | 8870.9678 | -3.2838E-05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 561.600 | 3.70E-11 | .0017269 | 2.2951E-05 | -4.5848E-12 | 8870.9678 | -1.5957E-05 |
| 568.620 | 1.18E-11 | .0014976 | -5.0951E-05 | -2.7263E-12 | 8870.9678 | -5.0980E-06 |
| 575.640 | -1.25E-12 | .0010158 | -6.6955E-05 | -1.2777E-12 | 8870.9678 | 5.3843E-07 |
| 582.660 | -6.11E-12 | .0005596 | -5.5825E-05 | -3.6976E-13 | 8870.9678 | 2.6326E-06 |
| 589.680 | -6.44E-12 | .0002326 | -3.6842E-05 | 8.6796E-14 | 8870.9677 | 2.7756E-06 |
| 596.700 | -4.89E-12 | 4.2167E-05 | -1.9702E-05 | 2.4515E-13 | 8870.9677 | 2.1075E-06 |
| 603.720 | -3.00E-12 | -4.4423E-05 | -7.7689E-06 | 2.4385E-13 | 8870.9677 | 1.2924E-06 |
| 610.740 | -1.47E-12 | -6.7285E-05 | -1.0140E-06 | 1.7946E-13 | 8870.9677 | 6.3214E-07 |
| 617.760 | -4.79E-13 | -5.8936E-05 | 1.9298E-06 | 1.0672E-13 | 8870.9677 | 2.0655E-07 |
| 624.780 | 3.14E-14 | -4.0355E-05 | 2.6074E-06 | 4.9488E-14 | 8870.9677 | -1.3521E-08 |
| 631.800 | 2.16E-13 | -2.2405E-05 | 2.2339E-06 | 1.3316E-14 | 8870.9677 | -9.2869E-08 |
| 638.820 | 2.18E-13 | -9.0113E-06 | 1.5777E-06 | -4.7908E-15 | 8870.9677 | -9.4088E-08 |
| 645.840 | 1.48E-13 | -2.4634E-07 | 8.4096E-07 | -1.0126E-14 | 8870.9677 | -1.1582E-07 |
| 652.860 | 7.62E-14 | 2.8114E-06 | 2.2561E-07 | -8.6481E-15 | 8870.9677 | -5.9499E-08 |
| 659.880 | 2.68E-14 | 2.9345E-06 | -5.6791E-08 | -5.3364E-15 | 8870.9677 | -2.0956E-08 |
| 666.900 | 1.24E-15 | 2.0223E-06 | -1.3374E-07 | -2.4795E-15 | 8870.9677 | -9.6546E-10 |
| 673.920 | -7.99E-15 | 1.0607E-06 | -1.1522E-07 | -7.0258E-16 | 8870.9677 | 6.2406E-09 |
| 680.940 | -8.63E-15 | 4.0569E-07 | -6.9655E-08 | 1.4258E-16 | 8870.9677 | 6.7410E-09 |
| 687.960 | -5.99E-15 | 8.2523E-08 | -2.9579E-08 | 4.2397E-16 | 8870.9677 | 4.6766E-09 |
| 694.980 | -2.68E-15 | -1.0256E-08 | -5.8265E-09 | 4.6562E-16 | 8870.9677 | 2.0906E-09 |
| 702.000 | 5.51E-16 | 0.0000 | 0.0000 | 4.5971E-16 | 8870.9677 | -4.3063E-10 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1: Fixed

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00007367 |
| Maximum bending moment | = | -909913.50658 lbs-in |
| Maximum shear force | = | 18693.73374 lbs |
| Depth of maximum bending moment | = | 0.00000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 17 |
| Number of zero deflection points | = | 10 |

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Specified deflection at pile head = .500000 in
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 110000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | 0.0000 | 9604.8668 | -.0063042 | 8870.9677 | -136.1892 |
| 7.020 | .455744 | 68938.5481 | 8594.1394 | -.0062645 | 10524.6722 | -151.7673 |
| 14.040 | .412047 | 130337. | 7477.9945 | -.0061496 | 11997.4940 | -166.2227 |
| 21.060 | .369404 | 183427. | 6264.5600 | -.0059688 | 13271.0339 | -179.4852 |
| 28.080 | .328245 | 227509. | 4962.4487 | -.0057319 | 14328.4800 | -191.4867 |
| 35.100 | .288927 | 261952. | 3580.7505 | -.0054498 | 15154.7036 | -202.1595 |
| 42.120 | .251729 | 286200. | 2580.4143 | -.0051339 | 15736.3526 | -82.8366 |
| 49.140 | .216847 | 306110. | 1989.8029 | -.0047925 | 16213.9658 | -85.4288 |

HP10x42.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 56.160 | .184442 | 321538. | 1383.8587 | -.0044308 | 16584.0538 | -87.2049 |
| 63.180 | .154639 | 332382. | 768.4145 | -.0040539 | 16844.1876 | -88.1353 |
| 70.200 | .127525 | 338587. | 149.5179 | -.0036672 | 16993.0357 | -88.1885 |
| 77.220 | .103152 | 340145. | -466.5490 | -.0032760 | 17030.4027 | -87.3292 |
| 84.240 | .081531 | 337097. | -1073.2333 | -.0028857 | 16957.2713 | -85.5154 |
| 91.260 | .062637 | 329534. | -1649.1986 | -.0025014 | 16775.8508 | -78.5773 |
| 98.280 | .046411 | 317805. | -2174.5851 | -.0021283 | 16494.5043 | -71.1054 |
| 105.300 | .032755 | 302289. | -2646.3851 | -.0017709 | 16122.3151 | -63.3105 |
| 112.320 | .021546 | 283385. | -3282.5787 | -.0014334 | 15668.8293 | -117.9412 |
| 119.340 | .012631 | 258416. | -4043.0632 | -.0011211 | 15069.8691 | -98.7210 |
| 126.360 | .005806 | 228352. | -4657.1013 | -.0008406 | 14348.6888 | -76.2186 |
| 133.380 | .000829 | 194328. | -5065.0547 | -.0005970 | 13532.5314 | -40.0075 |
| 140.400 | -.002575 | 158160. | -5001.9134 | -.0003938 | 12664.9301 | 57.9965 |
| 147.420 | -.004700 | 124710. | -4549.3951 | -.0002308 | 11862.5118 | 70.9261 |
| 154.440 | -.005815 | 94643.1015 | -4033.1277 | -.0001043 | 11141.2755 | 76.1587 |
| 161.460 | -.006165 | 68245.5586 | -3493.2196 | -1.0457E-05 | 10508.0487 | 77.6613 |
| 168.480 | -.005962 | 45614.4495 | -2951.0483 | 5.5166E-05 | 9965.1715 | 76.8034 |
| 175.500 | -.005390 | 26727.6414 | -2420.7946 | 9.6861E-05 | 9512.1130 | 74.2660 |
| 182.520 | -.004602 | 11476.9010 | -1912.8273 | .0001189 | 9146.2767 | 70.4540 |
| 189.540 | -.003721 | -312.0527 | -1435.1534 | .0001253 | 8878.4533 | 65.6354 |
| 196.560 | -.002843 | -8866.1889 | -994.1769 | .0001200 | 9083.6507 | 59.9989 |
| 203.580 | -.002036 | -14455.6629 | -595.1669 | .0001066 | 9217.7316 | 53.6791 |
| 210.600 | -.001346 | -17386.9404 | -242.6181 | 8.8231E-05 | 9288.0473 | 46.7621 |
| 217.620 | -.000797 | -17998.2854 | 59.3351 | 6.7837E-05 | 9302.7123 | 39.2645 |
| 224.640 | -.000394 | -16658.6419 | 306.0798 | 4.7862E-05 | 9270.5768 | 31.0332 |
| 231.660 | -.000125 | -13774.8423 | 469.2242 | 3.0321E-05 | 9201.4000 | 15.4467 |
| 238.680 | 3.18E-05 | -10117.5623 | 509.6640 | 1.6551E-05 | 9113.6688 | -3.9254 |
| 245.700 | .000107 | -6644.7210 | 449.5422 | 6.8899E-06 | 9030.3619 | -13.2033 |
| 252.720 | .000129 | -3816.6312 | 347.5580 | 8.6045E-07 | 8962.5215 | -15.8520 |
| 259.740 | .000119 | -1766.3354 | 240.3459 | -2.3573E-06 | 8913.3388 | -14.6928 |
| 266.760 | 9.55E-05 | -438.5346 | 147.4565 | -3.6281E-06 | 8881.4874 | -11.7714 |
| 273.780 | 6.82E-05 | 309.5573 | 76.6111 | -3.7024E-06 | 8878.3934 | -8.4125 |
| 280.800 | 4.35E-05 | 642.8038 | 28.2614 | -3.1535E-06 | 8886.3874 | -5.3624 |
| 287.820 | 2.40E-05 | 711.2175 | -.9277747 | -2.3731E-06 | 8888.0285 | -2.9536 |
| 294.840 | 1.02E-05 | 633.4429 | -15.6980 | -1.5981E-06 | 8886.1628 | -1.2544 |
| 301.860 | 1.52E-06 | 493.2864 | -20.7580 | -9.4875E-07 | 8882.8007 | -.1871878 |
| 308.880 | -3.15E-06 | 343.4662 | -20.0535 | -4.6648E-07 | 8879.2068 | .3878942 |
| 315.900 | -5.03E-06 | 212.4558 | -16.5147 | -1.4607E-07 | 8876.0642 | .6203056 |
| 322.920 | -5.20E-06 | 111.8252 | -12.0884 | 4.0826E-08 | 8873.6502 | .6407533 |
| 329.940 | -4.46E-06 | 42.6717 | -7.9101 | 1.2987E-07 | 8871.9914 | .5496349 |
| 336.960 | -3.37E-06 | .5663753 | -4.5210 | 1.5479E-07 | 8870.9813 | .4159437 |
| 343.980 | -2.28E-06 | -21.0416 | -2.0723 | 1.4299E-07 | 8871.4725 | .2816874 |
| 351.000 | -1.37E-06 | -28.7491 | -.4923759 | 1.1429E-07 | 8871.6574 | .1684240 |
| 358.020 | -6.80E-07 | -28.1310 | .3930810 | 8.1510E-08 | 8871.6426 | .0838430 |
| 365.040 | -2.22E-07 | -23.3561 | .7832905 | 5.1835E-08 | 8871.5280 | .0273278 |
| 372.060 | 4.77E-08 | -17.2137 | .8585538 | 2.8453E-08 | 8871.3807 | -.0058853 |
| 379.080 | 1.78E-07 | -11.3460 | .7609410 | 1.1992E-08 | 8871.2399 | -.0219246 |
| 386.100 | 2.16E-07 | -6.5486 | .5904644 | 1.6787E-09 | 8871.1248 | -.0266442 |
| 393.120 | 2.01E-07 | -3.0584 | .4097881 | -3.8584E-09 | 8871.0411 | -.0248305 |
| 400.140 | 1.62E-07 | -.7892077 | .2525548 | -6.0760E-09 | 8870.9867 | -.0199653 |
| 407.160 | 1.16E-07 | .4968206 | .1322385 | -6.2445E-09 | 8870.9797 | -.0143128 |
| 414.180 | 7.43E-08 | 1.0771 | .0498630 | -5.3374E-09 | 8870.9936 | -.0091560 |
| 421.200 | 4.12E-08 | 1.2051 | -8.3298E-05 | -4.0220E-09 | 8870.9967 | -.0050737 |
| 428.220 | 1.78E-08 | 1.0821 | -.0255923 | -2.7037E-09 | 8870.9937 | -.0021938 |
| 435.240 | 3.19E-09 | .8499999 | -.0346736 | -1.5902E-09 | 8870.9881 | -.0003935 |
| 442.260 | -4.53E-09 | .5977458 | -.0340932 | -7.5575E-10 | 8870.9821 | .0005588 |
| 449.280 | -7.42E-09 | .3724983 | -.0289210 | -1.9655E-10 | 8870.9767 | .0009147 |
| 456.300 | -7.29E-09 | .1919985 | -.0225546 | 1.2881E-10 | 8870.9723 | .0008990 |
| 463.320 | -5.61E-09 | .0556329 | -.0169708 | 2.7153E-10 | 8870.9691 | .0006918 |
| 470.340 | -3.48E-09 | -.0466908 | -.0092793 | 2.7668E-10 | 8870.9689 | .0014995 |
| 477.360 | -1.73E-09 | -.0750760 | -.0014048 | 2.0650E-10 | 8870.9695 | .0007439 |
| 484.380 | -5.80E-10 | -.0667336 | .0020843 | 1.2477E-10 | 8870.9693 | .0002501 |
| 491.400 | 2.55E-11 | -.0460057 | .0029237 | 5.9791E-11 | 8870.9688 | -1.0970E-05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 498.420 | 2.59E-10 | -.0257775 | .0024933 | 1.8419E-11 | 8870.9684 | -.0001116 |
| 505.440 | 2.84E-10 | -.0110278 | .0016718 | -2.7943E-12 | 8870.9680 | -.0001224 |
| 512.460 | 2.20E-10 | -.0023006 | .0009097 | -1.0476E-11 | 8870.9678 | -9.4728E-05 |
| 519.480 | 1.37E-10 | .0017604 | .0003700 | -1.0788E-11 | 8870.9678 | -5.9024E-05 |
| 526.500 | 6.84E-11 | .0029112 | 5.9444E-05 | -8.0950E-12 | 8870.9678 | -2.9460E-05 |
| 533.520 | 2.33E-11 | .0026075 | -7.9223E-05 | -4.9143E-12 | 8870.9678 | -1.0047E-05 |
| 540.540 | -6.35E-13 | .0018065 | -.0001135 | -2.3703E-12 | 8870.9678 | 2.7348E-07 |
| 547.560 | -9.96E-12 | .0010173 | -9.7494E-05 | -7.4278E-13 | 8870.9678 | 4.2942E-06 |
| 554.580 | -1.11E-11 | .0004388 | -6.5687E-05 | 9.6437E-14 | 8870.9678 | 4.7676E-06 |
| 561.600 | -8.61E-12 | 9.4882E-05 | -3.5929E-05 | 4.0403E-13 | 8870.9677 | 3.7107E-06 |
| 568.620 | -5.39E-12 | -6.6258E-05 | -1.4750E-05 | 4.2053E-13 | 8870.9677 | 2.3231E-06 |
| 575.640 | -2.71E-12 | -.0001129 | -2.5020E-06 | 3.1729E-13 | 8870.9677 | 1.1664E-06 |
| 582.660 | -9.36E-13 | -.0001019 | 3.0078E-06 | 1.9353E-13 | 8870.9677 | 4.0333E-07 |
| 589.680 | 1.05E-14 | -7.0926E-05 | 4.4077E-06 | 9.3936E-14 | 8870.9677 | -4.5093E-09 |
| 596.700 | 3.83E-13 | -4.0137E-05 | 3.8126E-06 | 2.9925E-14 | 8870.9677 | -1.6502E-07 |
| 603.720 | 4.31E-13 | -1.7443E-05 | 2.5821E-06 | -3.2618E-15 | 8870.9677 | -1.8556E-07 |
| 610.740 | 3.37E-13 | -3.8787E-06 | 1.4209E-06 | -1.5551E-14 | 8870.9677 | -1.4528E-07 |
| 617.760 | 2.12E-13 | 2.5297E-06 | 5.8984E-07 | -1.6328E-14 | 8870.9677 | -9.1475E-08 |
| 624.780 | 1.08E-13 | 4.4278E-06 | 1.0557E-07 | -1.2318E-14 | 8870.9677 | -4.6491E-08 |
| 631.800 | 3.93E-14 | 4.0310E-06 | -1.1709E-07 | -7.4430E-15 | 8870.9677 | -1.6946E-08 |
| 638.820 | 3.38E-15 | 2.7954E-06 | -1.8169E-07 | -3.5086E-15 | 8870.9677 | -1.4584E-09 |
| 645.840 | -9.94E-15 | 1.4855E-06 | -1.5956E-07 | -1.0413E-15 | 8870.9677 | 7.7621E-09 |
| 652.860 | -1.12E-14 | 5.5672E-07 | -1.0151E-07 | 1.3576E-16 | 8870.9677 | 8.7773E-09 |
| 659.880 | -8.03E-15 | 6.0037E-08 | -4.8685E-08 | 4.9123E-16 | 8870.9677 | 6.2730E-09 |
| 666.900 | -4.34E-15 | -1.2757E-07 | -1.4771E-08 | 4.5231E-16 | 8870.9677 | 3.3891E-09 |
| 673.920 | -1.68E-15 | -1.4804E-07 | 1.7292E-09 | 2.9346E-16 | 8870.9677 | 1.3117E-09 |
| 680.940 | -2.18E-16 | -1.0374E-07 | 6.9306E-09 | 1.4835E-16 | 8870.9677 | 1.7019E-10 |
| 687.960 | 4.04E-16 | -5.0964E-08 | 6.4207E-09 | 5.9181E-17 | 8870.9677 | -3.1547E-10 |
| 694.980 | 6.13E-16 | -1.3687E-08 | 3.6323E-09 | 2.1919E-17 | 8870.9677 | -4.7895E-10 |
| 702.000 | 7.12E-16 | 0.0000 | 0.0000 | 1.4031E-17 | 8870.9677 | -5.5590E-10 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2: Free

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00630421 |
| Maximum bending moment | = | 340145.18036 lbs-in |
| Maximum shear force | = | 9604.86682 lbs |
| Depth of maximum bending moment | = | 77.22000000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 16 |
| Number of zero deflection points | = | 10 |

---

Summary of Pile Response(s)

---

Definition of Symbols for Pile-Head Loading Conditions:

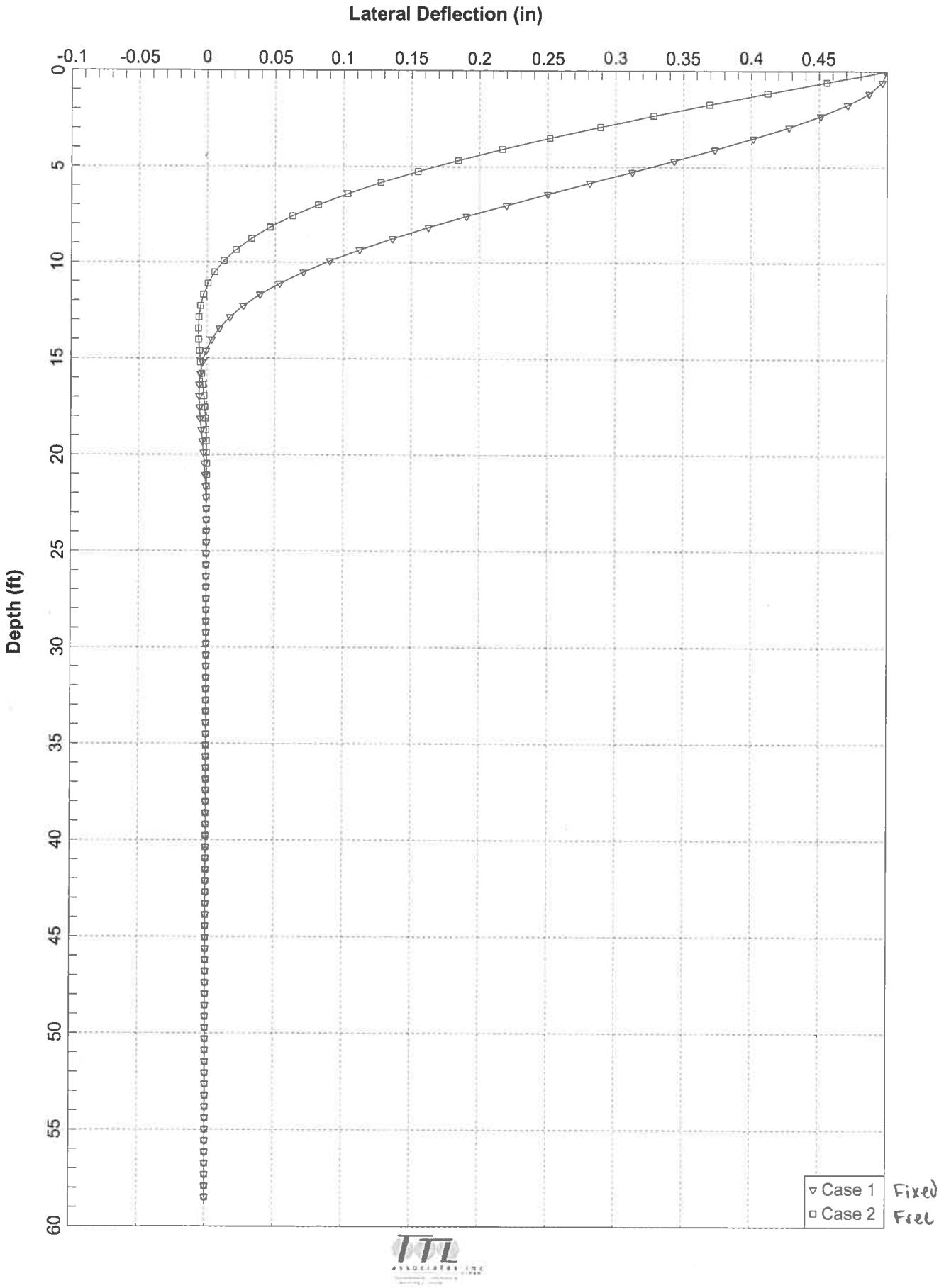
| | |
|---|---|
| Type 1 = Shear and Moment, | y = pile-head displacment in |
| Type 2 = Shear and Slope, | M = Pile-head Moment lbs-in |
| Type 3 = Shear and Rot. Stiffness, | V = Pile-head Shear Force lbs |
| Type 4 = Deflection and Moment, | S = Pile-head Slope, radians |
| Type 5 = Deflection and Slope, | R = Rot. Stiffness of Pile-head in-lbs/rad |

HP10x42.lpo

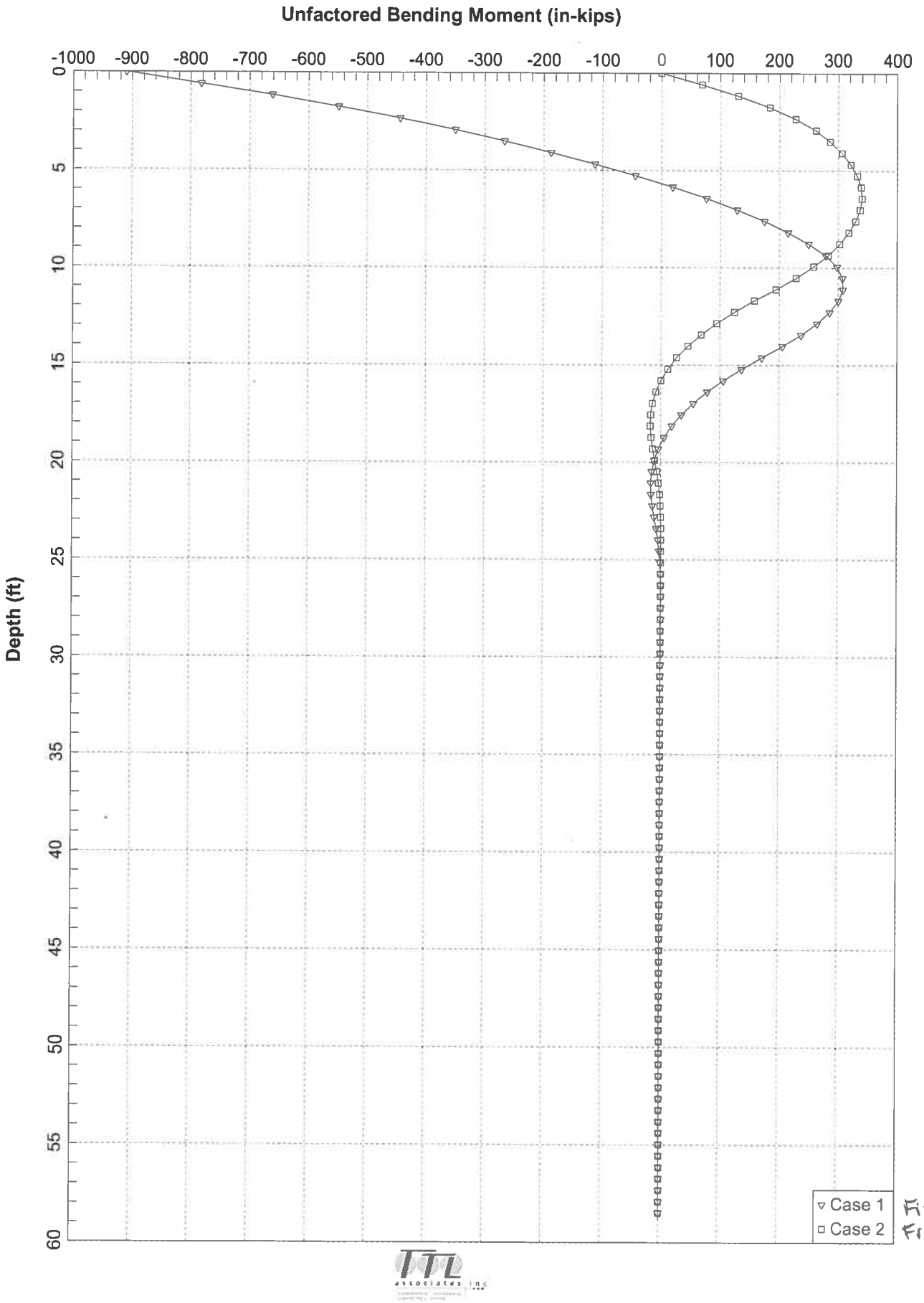
| Load Type | Pile-Head Condition 1 | | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs |
|---|---|---|---|---|---|---|---|
| 5 | y= | .500000 | S= 0.000 | 110000. | .5000000 | -909914. | 18693.7337 |
| 4 | y= | .500000 | M= 0.000 | 110000. | .5000000 | 340145. | 9604.8668 |

The analysis ended normally.

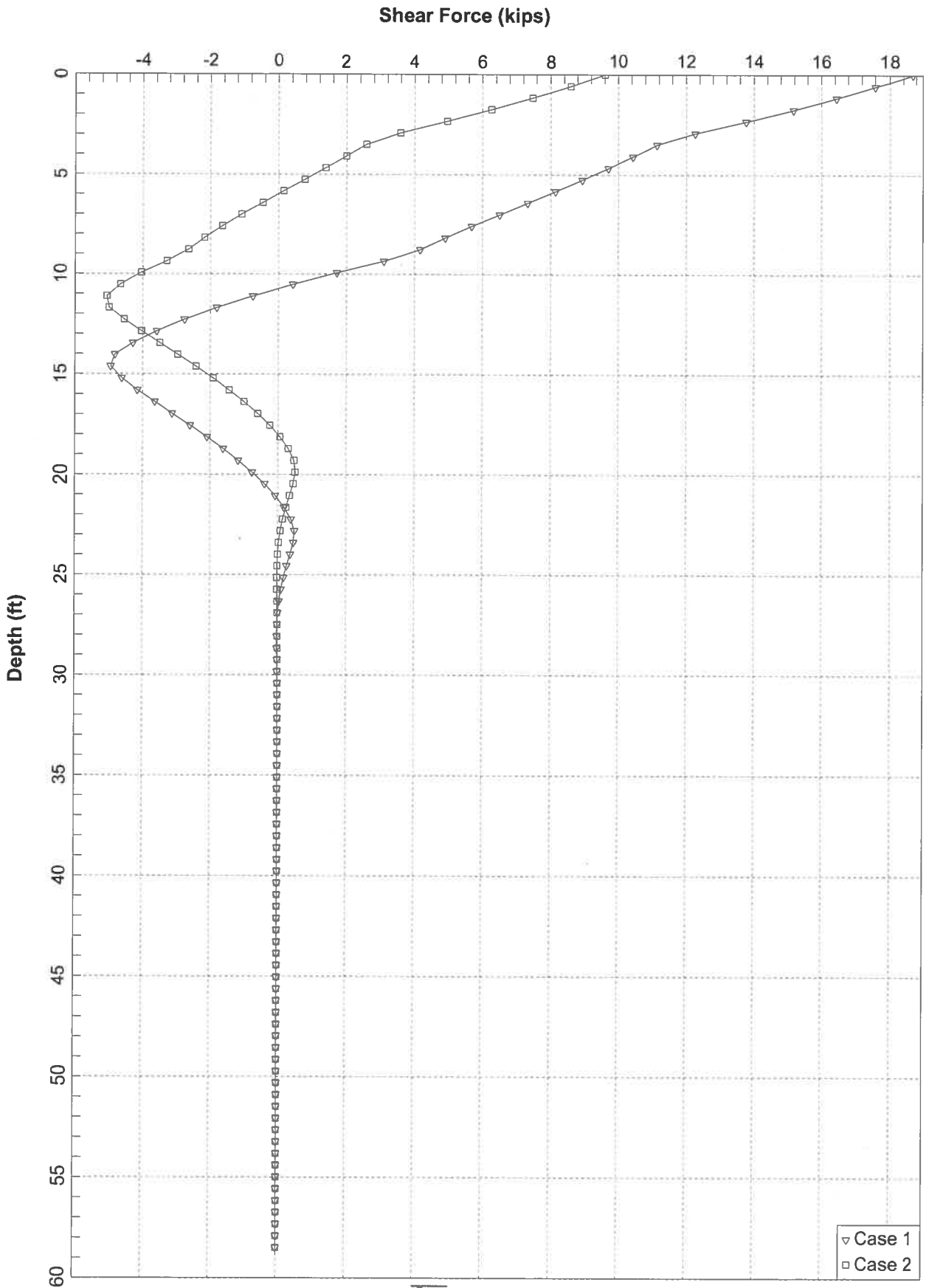
14837.01
Oregon Energy Project
HP10x42 H-Piles

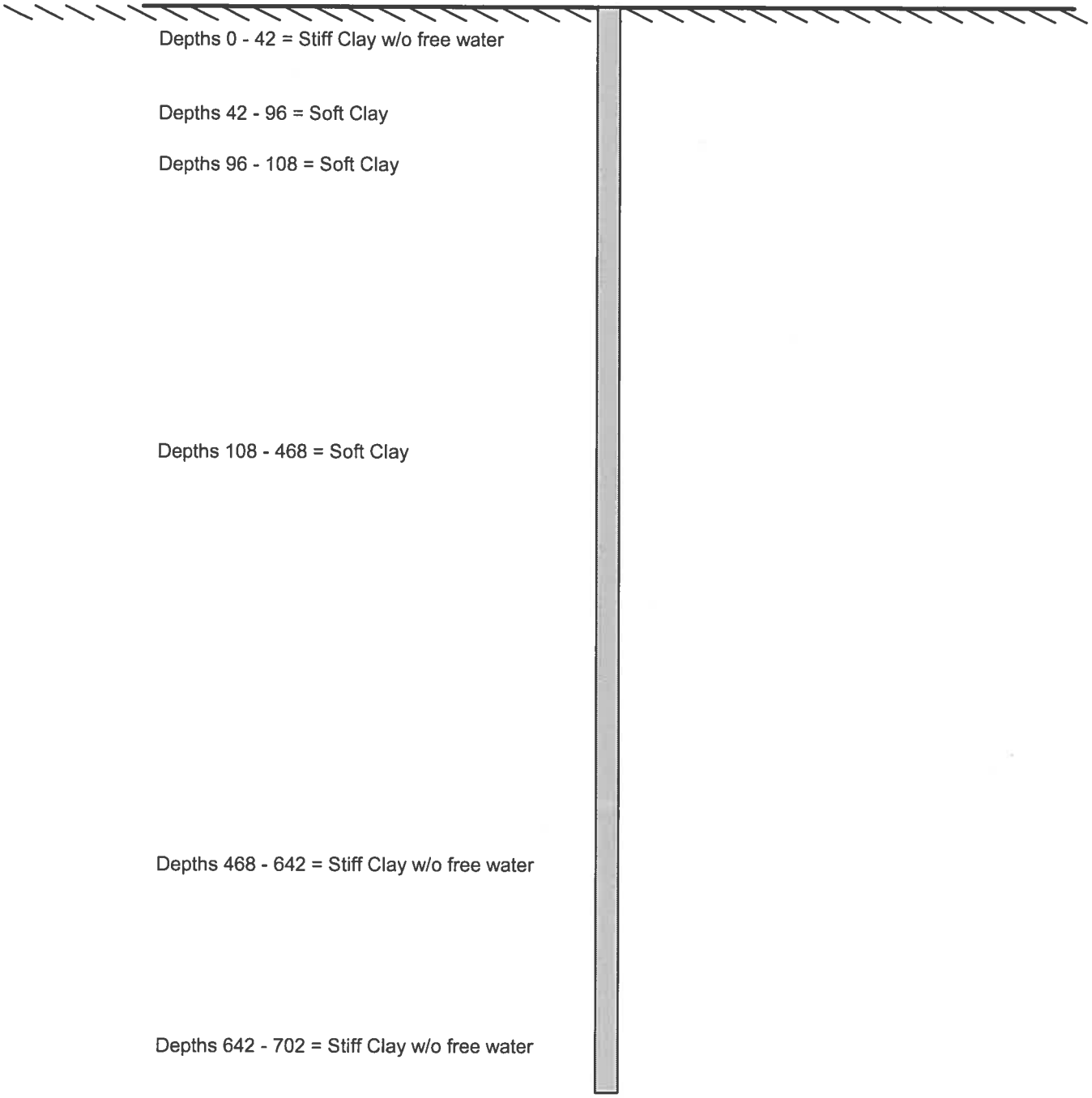


14837.01
Oregon Energy Project
HP10x42 H-Piles



14837.01
Oregon Energy Project
HP10x42 H-Piles




Depths 0 - 42 = Stiff Clay w/o free water
Depths 42 - 96 = Soft Clay
Depths 96 - 108 = Soft Clay
Depths 108 - 468 = Soft Clay
Depths 468 - 642 = Stiff Clay w/o free water
Depths 642 - 702 = Stiff Clay w/o free water
Depths 702 - 871.2 = Stiff Clay w/o free water

HP14x73.lpo

LPILE Plus for Windows, Version 5.0 (5.0.24)

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



This program is licensed to:

Kate Chulski
TTL Associates

Path to file locations: C:\Program Files\Ensoft\LpileP5\14837.01 - Oregon Energy\
Name of input data file: HP14x73.lpd
Name of output file: HP14x73.lpo
Name of plot output file: HP14x73.lpp
Name of runtime file: HP14x73.lpr

## Time and Date of Analysis

Date: February 27, 2017 Time: 11:26:14

## Problem Title

14837.01 Proposed Oregon Energy Project

## Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant 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 additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100

HP14x73.lpo

- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

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

---

## Pile Structural Properties and Geometry

---

Pile Length = 702.00 in
Depth of ground surface below top of pile = .00 in
Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|
| 1 | 0.0000 | 14.58500000 | 729.0000 | 21.4000 | 29000000. |
| 2 | 702.0000 | 14.58500000 | 729.0000 | 21.4000 | 29000000. |

---

## Soil and Rock Layering Information

---

The soil profile is modelled using 7 layers

Layer 1 is stiff clay without free water
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 42.000 in

Layer 2 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 42.000 in
Distance from top of pile to bottom of layer = 96.000 in

Layer 3 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 108.000 in

Layer 4 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 108.000 in
Distance from top of pile to bottom of layer = 468.000 in

Layer 5 is stiff clay without free water
Distance from top of pile to top of layer = 468.000 in
Distance from top of pile to bottom of layer = 642.000 in

Layer 6 is stiff clay without free water
Distance from top of pile to top of layer = 642.000 in
Distance from top of pile to bottom of layer = 702.000 in

Layer 7 is stiff clay without free water
Distance from top of pile to top of layer = 702.000 in
Distance from top of pile to bottom of layer = 871.200 in

HP14x73.lpo
(Depth of lowest layer extends 169.20 in below pile tip)

---

## Effective Unit Weight of Soil vs. Depth

---

Distribution of effective unit weight of soil with depth
is defined using 14 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07234 |
| 2 | 42.00 | .07234 |
| 3 | 42.00 | .07523 |
| 4 | 96.00 | .07523 |
| 5 | 96.00 | .03912 |
| 6 | 108.00 | .03912 |
| 7 | 108.00 | .03912 |
| 8 | 468.00 | .03912 |
| 9 | 468.00 | .03912 |
| 10 | 642.00 | .03912 |
| 11 | 642.00 | .04201 |
| 12 | 702.00 | .04201 |
| 13 | 702.00 | .04201 |
| 14 | 871.20 | .04201 |

---

## Shear Strength of Soils

---

Distribution of shear strength parameters with depth
defined using 14 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | E50 or k_rm | RQD % |
|---|---|---|---|---|---|
| 1 | .000 | 6.94440 | .00 | .00700 | .0 |
| 2 | 42.000 | 6.94440 | .00 | .00700 | .0 |
| 3 | 42.000 | 3.47220 | .00 | .02000 | .0 |
| 4 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 5 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 6 | 108.000 | 3.47220 | .00 | .02000 | .0 |
| 7 | 108.000 | 5.90278 | .00 | .01000 | .0 |
| 8 | 468.000 | 5.90278 | .00 | .01000 | .0 |
| 9 | 468.000 | 10.41670 | .00 | .00700 | .0 |
| 10 | 642.000 | 10.41670 | .00 | .00700 | .0 |
| 11 | 642.000 | 17.36110 | .00 | .00500 | .0 |
| 12 | 702.000 | 17.36110 | .00 | .00500 | .0 |
| 13 | 702.000 | 31.25000 | .00 | .00500 | .0 |
| 14 | 871.200 | 31.25000 | .00 | .00500 | .0 |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

HP14x73.lpo

---

Loading Type

---

Static loading criteria was used for computation of p-y curves

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Deflection at pile head = .500 in
Slope at pile head = .000 in/in
Axial load at pile head = 190000.000 lbs

Load Case Number 2

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = .500 in
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 190000.000 lbs

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Specified deflection at pile head = .500000 in
Specified slope at pile head = 0.000E+00 in/in
Specified axial load at pile head = 190000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | -1991824. | 31241.1621 | 0.0000 | 28803.5793 | -179.7375 |
| 7.020 | .497678 | -1776957. | 29849.0229 | -.0006257 | 26654.1651 | -198.3064 |
| 14.040 | .491215 | -1571075. | 28393.5162 | -.0011816 | 24594.6378 | -216.3760 |
| 21.060 | .481089 | -1375160. | 26813.1474 | -.0016707 | 22634.8174 | -233.8716 |
| 28.080 | .467758 | -1190161. | 25112.2192 | -.0020967 | 20784.1968 | -250.7234 |
| 35.100 | .451652 | -1016991. | 23295.4854 | -.0024631 | 19051.9030 | -266.8646 |
| 42.120 | .433175 | -856522. | 21961.2098 | -.0027742 | 17446.6604 | -113.2709 |
| 49.140 | .412702 | -701255. | 21143.5392 | -.0030328 | 15893.4626 | -119.6837 |
| 56.160 | .390595 | -551576. | 20282.6502 | -.0032408 | 14396.1587 | -125.5839 |
| 63.180 | .367202 | -407842. | 19382.2620 | -.0034001 | 12958.3205 | -130.9370 |
| 70.200 | .342857 | -270379. | 18446.3300 | -.0035127 | 11583.2237 | -135.7103 |
| 77.220 | .317883 | -139485. | 17479.0343 | -.0035808 | 10273.8306 | -139.8725 |
| 84.240 | .292584 | -15421.5291 | 16484.7686 | -.0036065 | 9032.7729 | -143.3940 |
| 91.260 | .267248 | 101582. | 15468.1296 | -.0035922 | 9894.6732 | -146.2467 |
| 98.280 | .242150 | 211333. | 14435.3639 | -.0035402 | 10992.5641 | -147.9885 |
| 105.300 | .217544 | 313698. | 13395.7205 | -.0034530 | 12016.5644 | -148.2062 |
| 112.320 | .193669 | 408621. | 11876.8262 | -.0033331 | 12966.1132 | -284.5272 |

HP14x73.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 119.340 | .170747 | 489340. | 9886.8110 | -.0031840 | 13773.5874 | -282.4287 |
| 126.360 | .148965 | 555925. | 7916.0428 | -.0030105 | 14439.6638 | -279.0437 |
| 133.380 | .128480 | 608512. | 5976.1030 | -.0028172 | 14965.7162 | -273.6457 |
| 140.400 | .109412 | 647345. | 4105.1821 | -.0026087 | 15354.1727 | -259.3802 |
| 147.420 | .091854 | 673108. | 2335.8889 | -.0023894 | 15611.8937 | -244.6919 |
| 154.440 | .075865 | 686515. | 671.1821 | -.0021637 | 15746.0060 | -229.5835 |
| 161.460 | .061476 | 688303. | -885.9538 | -.0019354 | 15763.8982 | -214.0449 |
| 168.480 | .048692 | 679239. | -2332.3948 | -.0017084 | 15673.2225 | -198.0465 |
| 175.500 | .037490 | 660114. | -3664.6976 | -.0014860 | 15481.9058 | -181.5269 |
| 182.520 | .027828 | 631751. | -4878.7960 | -.0012715 | 15198.1767 | -164.3700 |
| 189.540 | .019638 | 595007. | -5969.4397 | -.0010678 | 14830.6186 | -146.3547 |
| 196.560 | .012836 | 550788. | -6929.0350 | -.0008776 | 14388.2754 | -127.0343 |
| 203.580 | .007317 | 500065. | -7744.7771 | -.0007031 | 13880.8675 | -105.3709 |
| 210.600 | .002964 | 443927. | -8388.6298 | -.0005464 | 13319.2991 | -78.0629 |
| 217.620 | -.000355 | 383746. | -8530.2280 | -.0004090 | 12717.2810 | 37.7216 |
| 224.640 | -.002779 | 325254. | -8130.8200 | -.0002913 | 12132.1584 | 76.0699 |
| 231.660 | -.004444 | 270366. | -7551.2856 | -.0001924 | 11583.0951 | 89.0397 |
| 238.680 | -.005480 | 219747. | -6903.5293 | -.0001110 | 11076.7281 | 95.5063 |
| 245.700 | -.006003 | 173737. | -6222.6803 | -4.5684E-05 | 10616.4696 | 98.4678 |
| 252.720 | -.006121 | 132502. | -5529.1579 | 5.1601E-06 | 10203.9833 | 99.1170 |
| 259.740 | -.005931 | 96093.7711 | -4836.9949 | 4.3113E-05 | 9839.7719 | 98.0804 |
| 266.760 | -.005516 | 64476.0044 | -4156.6847 | 6.9773E-05 | 9523.4858 | 95.7401 |
| 273.780 | -.004951 | 37547.7931 | -3496.4800 | 8.6711E-05 | 9254.1114 | 92.3524 |
| 280.800 | -.004298 | 15154.1140 | -2863.0892 | 9.5461E-05 | 9030.0978 | 88.1008 |
| 287.820 | -.003611 | -2904.6323 | -2262.0933 | 9.7495E-05 | 8907.5610 | 83.1231 |
| 294.840 | -.002930 | -16865.7545 | -1698.2196 | 9.4213E-05 | 9047.2201 | 77.5247 |
| 301.860 | -.002288 | -26998.9575 | -1175.5403 | 8.6930E-05 | 9148.5868 | 71.3868 |
| 308.880 | -.001709 | -33602.2352 | -697.6406 | 7.6868E-05 | 9214.6423 | 64.7670 |
| 315.900 | -.001209 | -36998.8853 | -267.7974 | 6.5147E-05 | 9248.6204 | 57.6954 |
| 322.920 | -.000794 | -37535.8964 | 110.7570 | 5.2772E-05 | 9253.9924 | 50.1549 |
| 329.940 | -.000468 | -35584.6312 | 434.3027 | 4.0632E-05 | 9234.4730 | 42.0234 |
| 336.960 | -.000224 | -31546.6764 | 678.7481 | 2.9486E-05 | 9194.0796 | 27.6192 |
| 343.980 | -5.38E-05 | -26133.6645 | 798.9695 | 1.9910E-05 | 9139.9309 | 6.6319 |
| 351.000 | 5.55E-05 | -20382.2554 | 798.2228 | 1.2187E-05 | 9082.3971 | -6.8446 |
| 358.020 | .000117 | -14959.1250 | 723.4319 | 6.3189E-06 | 9028.1472 | -14.4633 |
| 365.040 | .000144 | -10242.1274 | 610.2481 | 2.1348E-06 | 8980.9611 | -17.7828 |
| 372.060 | .000147 | -6396.9362 | 484.0936 | -6.2777E-07 | 8942.4960 | -18.1587 |
| 379.080 | .000135 | -3443.7786 | 361.7534 | -2.2616E-06 | 8912.9543 | -16.6961 |
| 386.100 | .000116 | -1311.8860 | 253.1544 | -3.0512E-06 | 8891.6280 | -14.2438 |
| 393.120 | 9.26E-05 | 118.6484 | 163.0941 | -3.2493E-06 | 8879.6916 | -11.4144 |
| 400.140 | 6.99E-05 | 986.6226 | 92.7761 | -3.0658E-06 | 8888.3743 | -8.6192 |
| 407.160 | 4.95E-05 | 1429.4032 | 41.0855 | -2.6647E-06 | 8892.8036 | -6.1075 |
| 414.180 | 3.25E-05 | 1570.5714 | 5.5851 | -2.1666E-06 | 8894.2158 | -4.0066 |
| 421.200 | 1.91E-05 | 1513.5974 | -16.7514 | -1.6545E-06 | 8893.6458 | -2.3571 |
| 428.220 | 9.27E-06 | 1339.7948 | -29.0353 | -1.1808E-06 | 8891.9072 | -1.1426 |
| 435.240 | 2.54E-06 | 1109.0918 | -34.1449 | -7.7419E-07 | 8889.5994 | -.3131377 |
| 442.260 | -1.60E-06 | 862.4660 | -34.5506 | -4.4686E-07 | 8887.1323 | .1975584 |
| 449.280 | -3.73E-06 | 625.1939 | -32.2412 | -1.9986E-07 | 8884.7588 | .4603830 |
| 456.300 | -4.41E-06 | 410.3329 | -28.7175 | -2.7938E-08 | 8882.6094 | .5435278 |
| 463.320 | -4.13E-06 | 222.0753 | -25.0240 | 7.7060E-08 | 8880.7262 | .5087436 |
| 470.340 | -3.33E-06 | 58.7905 | -18.2067 | 1.2369E-07 | 8879.0928 | 1.4335 |
| 477.360 | -2.39E-06 | -33.8762 | -9.5604 | 1.2783E-07 | 8878.8436 | 1.0298 |
| 484.380 | -1.53E-06 | -75.7789 | -3.6288 | 1.0962E-07 | 8879.2627 | .6601144 |
| 491.400 | -8.51E-07 | -85.1174 | -.0252382 | 8.2909E-08 | 8879.3561 | .3665508 |
| 498.420 | -3.68E-07 | -76.3544 | 1.8177 | 5.6100E-08 | 8879.2685 | .1584896 |
| 505.440 | -6.30E-08 | -59.7472 | 2.4692 | 3.3503E-08 | 8879.1023 | .0271280 |
| 512.460 | 1.03E-07 | -41.7766 | 2.4092 | 1.6648E-08 | 8878.9226 | -.0442162 |
| 519.480 | 1.71E-07 | -25.9666 | 1.9957 | 5.4003E-09 | 8878.7644 | -.0735949 |
| 526.500 | 1.78E-07 | -13.7718 | 1.4675 | -1.1974E-09 | 8878.6424 | -.0768896 |
| 533.520 | 1.54E-07 | -5.3600 | .9647031 | -4.3738E-09 | 8878.5583 | -.0663502 |
| 540.540 | 1.17E-07 | -.2156694 | .5548166 | -5.2995E-09 | 8878.5068 | -.0504266 |
| 547.560 | 7.96E-08 | 2.4437 | .2574743 | -4.9296E-09 | 8878.5291 | -.0342863 |
| 554.580 | 4.78E-08 | 3.4124 | .0648204 | -3.9573E-09 | 8878.5388 | -.0206008 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 561.600 | 2.40E-08 | 3.3644 | -.0437933 | -2.8322E-09 | 8878.5383 | -.0103432 |
| 568.620 | 8.04E-09 | 2.8051 | -.0922609 | -1.8079E-09 | 8878.5327 | -.0034652 |
| 575.640 | -1.38E-09 | 2.0739 | -.1023351 | -9.9784E-10 | 8878.5254 | .0005950 |
| 582.660 | -5.97E-09 | 1.3710 | -.0912186 | -4.2590E-10 | 8878.5184 | .0025720 |
| 589.680 | -7.36E-09 | .7942805 | -.0710575 | -6.6401E-11 | 8878.5126 | .0031719 |
| 596.700 | -6.90E-09 | .3735249 | -.0494862 | 1.2749E-10 | 8878.5084 | .0029738 |
| 603.720 | -5.57E-09 | .0991536 | -.0306224 | 2.0597E-10 | 8878.5057 | .0024005 |
| 610.740 | -4.01E-09 | -.0569630 | -.0161326 | 2.1297E-10 | 8878.5052 | .0017276 |
| 617.760 | -2.58E-09 | -.1279156 | -.0061655 | 1.8228E-10 | 8878.5060 | .0011120 |
| 624.780 | -1.45E-09 | -.1440127 | -6.9315E-05 | 1.3713E-10 | 8878.5061 | .0006248 |
| 631.800 | -6.55E-10 | -.1292546 | .0031147 | 9.1757E-11 | 8878.5060 | .0002823 |
| 638.820 | -1.62E-10 | -.1005266 | .0043502 | 5.3607E-11 | 8878.5057 | 6.9658E-05 |
| 645.840 | 9.75E-11 | -.0683212 | .0043273 | 2.5574E-11 | 8878.5054 | -7.6182E-05 |
| 652.860 | 1.97E-10 | -.0398399 | .0035185 | 7.6160E-12 | 8878.5051 | -.0001542 |
| 659.880 | 2.04E-10 | -.0189413 | .0024166 | -2.1433E-12 | 8878.5049 | -.0001597 |
| 666.900 | 1.67E-10 | -.0059054 | .0013971 | -6.2686E-12 | 8878.5047 | -.0001307 |
| 673.920 | 1.16E-10 | .0006913 | .0006190 | -7.1343E-12 | 8878.5047 | -9.0961E-05 |
| 680.940 | 6.72E-11 | .0028051 | .0001156 | -6.5538E-12 | 8878.5047 | -5.2464E-05 |
| 687.960 | 2.44E-11 | .0023322 | -.0001355 | -5.7008E-12 | 8878.5047 | -1.9075E-05 |
| 694.980 | -1.29E-11 | .0009182 | -.0001671 | -5.1612E-12 | 8878.5047 | 1.0067E-05 |
| 702.000 | -4.80E-11 | 0.0000 | 0.0000 | -5.0087E-12 | 8878.5047 | 3.7537E-05 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1: Fixed

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00003567 |
| Maximum bending moment | = | -1991824. lbs-in |
| Maximum shear force | = | 31241.16207 lbs |
| Depth of maximum bending moment | = | 0.00000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 17 |
| Number of zero deflection points | = | 7 |

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Specified deflection at pile head = .500000 in
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 190000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | 0.0000 | 15438.1903 | -.0049284 | 8878.5047 | -179.7375 |
| 7.020 | .465403 | 110521. | 14122.8261 | -.0049101 | 9984.0921 | -195.0101 |
| 14.040 | .431063 | 211383. | 12703.2614 | -.0048566 | 10993.0551 | -209.4243 |
| 21.060 | .397216 | 301830. | 11185.6790 | -.0047714 | 11897.8410 | -222.9353 |
| 28.080 | .364072 | 381158. | 9576.5761 | -.0046580 | 12691.3886 | -235.4985 |
| 35.100 | .331817 | 448711. | 7882.7664 | -.0045202 | 13367.1531 | -247.0683 |
| 42.120 | .300608 | 503890. | 6663.5586 | -.0043621 | 13919.1315 | -100.2844 |
| 49.140 | .270574 | 553904. | 5946.6149 | -.0041864 | 14419.4400 | -103.9731 |

HP14x73.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 56.160 | .241831 | 598548. | 5205.9707 | -.0039951 | 14866.0385 | -107.0367 |
| 63.180 | .214483 | 637653. | 4446.0905 | -.0037899 | 15257.2190 | -109.4534 |
| 70.200 | .188621 | 671081. | 3671.5919 | -.0035726 | 15591.6167 | -111.2014 |
| 77.220 | .164324 | 698732. | 2887.2499 | -.0033451 | 15868.2220 | -112.2578 |
| 84.240 | .141655 | 720542. | 2098.0037 | -.0031095 | 16086.3914 | -112.5986 |
| 91.260 | .120666 | 736483. | 1308.9666 | -.0028676 | 16245.8604 | -112.1983 |
| 98.280 | .101394 | 746569. | 526.5324 | -.0026214 | 16346.7557 | -110.7175 |
| 105.300 | .083862 | 750868. | -240.6982 | -.0023728 | 16389.7627 | -107.8668 |
| 112.320 | .068080 | 749519. | -1324.1723 | -.0021237 | 16376.2675 | -200.8153 |
| 119.340 | .054046 | 737942. | -2704.6668 | -.0018767 | 16260.4551 | -192.4880 |
| 126.360 | .041732 | 716552. | -4021.2219 | -.0016352 | 16046.4818 | -182.5990 |
| 133.380 | .031088 | 685846. | -5260.7283 | -.0014024 | 15739.3175 | -170.5367 |
| 140.400 | .022042 | 646432. | -6393.1053 | -.0011812 | 15345.0446 | -152.0778 |
| 147.420 | .014504 | 599238. | -7391.2261 | -.0009744 | 14872.9375 | -132.2871 |
| 154.440 | .008362 | 545259. | -8242.0950 | -.0007843 | 14332.9614 | -110.1257 |
| 161.460 | .003492 | 485611. | -8917.7463 | -.0006132 | 13736.2806 | -82.3676 |
| 168.480 | -.000247 | 421689. | -9100.1332 | -.0004625 | 13096.8433 | 30.4055 |
| 175.500 | -.003002 | 359079. | -8719.1840 | -.0003329 | 12470.5268 | 78.1271 |
| 182.520 | -.004921 | 300160. | -8121.4658 | -.0002235 | 11881.1339 | 92.1630 |
| 189.540 | -.006140 | 245650. | -7449.6592 | -.0001328 | 11335.8451 | 99.2348 |
| 196.560 | -.006786 | 195921. | -6741.1907 | -5.9530E-05 | 10838.3881 | 102.6080 |
| 203.580 | -.006975 | 151162. | -6017.5501 | -1.9048E-06 | 10390.6459 | 103.5574 |
| 210.600 | -.006813 | 111440. | -5293.4265 | 4.1695E-05 | 9993.2851 | 102.7456 |
| 217.620 | -.006390 | 76731.3559 | -4579.7729 | 7.2936E-05 | 9646.0814 | 100.5745 |
| 224.640 | -.005789 | 46945.2510 | -3885.1910 | 9.3470E-05 | 9348.1182 | 97.3121 |
| 231.660 | -.005078 | 21933.9336 | -3216.6690 | .0001049 | 9097.9192 | 93.1500 |
| 238.680 | -.004316 | 1503.3716 | -2580.0201 | .0001088 | 8893.5435 | 88.2314 |
| 245.700 | -.003550 | -14579.7755 | -1980.1679 | .0001066 | 9024.3524 | 82.6666 |
| 252.720 | -.002819 | -26582.6210 | -1421.3493 | 9.9792E-05 | 9144.4220 | 76.5409 |
| 259.740 | -.002149 | -34801.7256 | -907.2788 | 8.9601E-05 | 9226.6413 | 69.9179 |
| 266.760 | -.001561 | -39559.8341 | -441.3091 | 7.7254E-05 | 9274.2387 | 62.8370 |
| 273.780 | -.001064 | -41203.7886 | -26.6414 | 6.3845E-05 | 9290.6839 | 55.3019 |
| 280.800 | -.000664 | -40104.1930 | 333.2994 | 5.0346E-05 | 9279.6841 | 47.2453 |
| 287.820 | -.000358 | -36658.5680 | 633.9588 | 3.7601E-05 | 9245.2161 | 38.4127 |
| 294.840 | -.000136 | -31303.7160 | 827.8049 | 2.6318E-05 | 9191.6492 | 16.8141 |
| 301.860 | 1.19E-05 | -25106.3924 | 881.6779 | 1.6952E-05 | 9129.6547 | -1.4657 |
| 308.880 | .000102 | -18970.1786 | 832.5532 | 9.6339E-06 | 9068.2715 | -12.5300 |
| 315.900 | .000147 | -13443.0443 | 724.8939 | 4.2524E-06 | 9012.9812 | -18.1422 |
| 322.920 | .000161 | -8804.0124 | 591.3973 | 5.5878E-07 | 8966.5750 | -19.8910 |
| 329.940 | .000155 | -5141.3173 | 454.5056 | -1.7565E-06 | 8929.9355 | -19.1095 |
| 336.960 | .000137 | -2418.0687 | 328.2864 | -3.0116E-06 | 8902.6937 | -16.8504 |
| 343.980 | .000113 | -524.1431 | 220.3653 | -3.5001E-06 | 8883.7479 | -13.8963 |
| 351.000 | 8.75E-05 | 685.1976 | 133.7105 | -3.4734E-06 | 8885.3590 | -10.7916 |
| 358.020 | 6.39E-05 | 1362.4184 | 68.1595 | -3.1334E-06 | 8892.1335 | -7.8839 |
| 365.040 | 4.35E-05 | 1650.5151 | 21.6465 | -2.6332E-06 | 8895.0155 | -5.3677 |
| 372.060 | 2.70E-05 | 1673.3601 | -8.8676 | -2.0813E-06 | 8895.2440 | -3.3258 |
| 379.080 | 1.43E-05 | 1531.5666 | -26.7359 | -1.5492E-06 | 8893.8256 | -1.7649 |
| 386.100 | 5.22E-06 | 1302.1209 | -35.1915 | -1.0787E-06 | 8891.5303 | -.6441150 |
| 393.120 | -8.31E-07 | 1040.3563 | -37.0928 | -6.8981E-07 | 8888.9118 | .1024207 |
| 400.140 | -4.46E-06 | 783.1782 | -34.8029 | -3.8705E-07 | 8886.3391 | .5499596 |
| 407.160 | -6.26E-06 | 552.7555 | -30.1614 | -1.6525E-07 | 8884.0341 | .7724143 |
| 414.180 | -6.78E-06 | 360.1528 | -24.5158 | -1.3680E-08 | 8882.1074 | .8360078 |
| 421.200 | -6.46E-06 | 208.5894 | -18.7872 | 8.0748E-08 | 8880.5913 | .7960939 |
| 428.220 | -5.65E-06 | 96.1655 | -13.5491 | 1.3135E-07 | 8879.4667 | .6962318 |
| 435.240 | -4.61E-06 | 18.0096 | -9.1091 | 1.5030E-07 | 8878.6848 | .5687318 |
| 442.260 | -3.54E-06 | -32.1270 | -5.5823 | 1.4796E-07 | 8878.8261 | .4360559 |
| 449.280 | -2.54E-06 | -60.7604 | -2.9545 | 1.3254E-07 | 8879.1125 | .3126133 |
| 456.300 | -1.68E-06 | -73.9611 | -1.1319 | 1.1017E-07 | 8879.2445 | .2066330 |
| 463.320 | -9.89E-07 | -76.9461 | .0212846 | 8.5114E-08 | 8879.2744 | .1219091 |
| 470.340 | -4.81E-07 | -73.8893 | 1.1767 | 6.0071E-08 | 8879.2438 | .2072647 |
| 477.360 | -1.45E-07 | -60.5857 | 2.1241 | 3.7744E-08 | 8879.1107 | .0626533 |
| 484.380 | 4.90E-08 | -44.1677 | 2.2700 | 2.0352E-08 | 8878.9465 | -.0210985 |
| 491.400 | 1.40E-07 | -28.7698 | 1.9836 | 8.2424E-09 | 8878.7925 | -.0604829 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 498.420 | 1.65E-07 | -16.3398 | 1.5222 | 7.5290E-10 | 8878.6681 | -.0709674 |
| 505.440 | 1.51E-07 | -7.3999 | 1.0448 | -3.1886E-09 | 8878.5787 | -.0650382 |
| 512.460 | 1.20E-07 | -1.6619 | .6351694 | -4.6931E-09 | 8878.5213 | -.0516756 |
| 519.480 | 8.50E-08 | 1.5304 | .3251693 | -4.7149E-09 | 8878.5200 | -.0366436 |
| 526.500 | 5.37E-08 | 2.9161 | .1152979 | -3.9767E-09 | 8878.5338 | -.0231489 |
| 533.520 | 2.92E-08 | 3.1598 | -.0101225 | -2.9679E-09 | 8878.5363 | -.0125834 |
| 540.540 | 1.20E-08 | 2.7819 | -.0725146 | -1.9814E-09 | 8878.5325 | -.0051921 |
| 547.560 | 1.38E-09 | 2.1469 | -.0928278 | -1.1631E-09 | 8878.5261 | -.0005952 |
| 554.580 | -4.28E-09 | 1.4817 | -.0884405 | -5.6065E-10 | 8878.5195 | .0018451 |
| 561.600 | -6.49E-09 | .9067257 | -.0721468 | -1.6411E-10 | 8878.5137 | .0027970 |
| 568.620 | -6.59E-09 | .4691909 | -.0523681 | 6.4332E-11 | 8878.5094 | .0028380 |
| 575.640 | -5.59E-09 | .1713066 | -.0339555 | 1.7067E-10 | 8878.5064 | .0024077 |
| 582.660 | -4.19E-09 | -.0079991 | -.0191674 | 1.9779E-10 | 8878.5048 | .0018054 |
| 589.680 | -2.81E-09 | -.0983311 | -.0085796 | 1.8013E-10 | 8878.5057 | .0012111 |
| 596.700 | -1.66E-09 | -.1289374 | -.0018172 | 1.4240E-10 | 8878.5060 | .0007155 |
| 603.720 | -8.11E-10 | -.1242249 | .0019211 | 1.0037E-10 | 8878.5059 | .0003495 |
| 610.740 | -2.51E-10 | -.1022333 | .0035279 | 6.2769E-11 | 8878.5057 | .0001083 |
| 617.760 | 7.02E-11 | -.0748605 | .0038018 | 3.3366E-11 | 8878.5054 | -3.0259E-05 |
| 624.780 | 2.17E-10 | -.0489457 | .0033670 | 1.2811E-11 | 8878.5052 | -9.3598E-05 |
| 631.800 | 2.50E-10 | -.0276217 | .0026602 | 9.8681E-14 | 8878.5049 | -.0001078 |
| 638.820 | 2.19E-10 | -.0115965 | .0019513 | -6.4126E-12 | 8878.5048 | -9.4195E-05 |
| 645.840 | 1.60E-10 | -.0002081 | .0011818 | -8.3725E-12 | 8878.5047 | -.0001250 |
| 652.860 | 1.01E-10 | .0050183 | .0004659 | -7.5739E-12 | 8878.5047 | -7.8932E-05 |
| 659.880 | 5.37E-11 | .0063527 | 4.1509E-05 | -5.6860E-12 | 8878.5047 | -4.1964E-05 |
| 666.900 | 2.12E-11 | .0056162 | -.0001639 | -3.6989E-12 | 8878.5047 | -1.6564E-05 |
| 673.920 | 1.78E-12 | .0040611 | -.0002269 | -2.0922E-12 | 8878.5047 | -1.3918E-06 |
| 680.940 | -8.17E-12 | .0024355 | -.0002094 | -1.0136E-12 | 8878.5047 | 6.3846E-06 |
| 687.960 | -1.24E-11 | .0011235 | -.0001529 | -4.2266E-13 | 8878.5047 | 9.7256E-06 |
| 694.980 | -1.41E-11 | .0002903 | -8.0055E-05 | -1.8795E-13 | 8878.5047 | 1.1021E-05 |
| 702.000 | -1.51E-11 | 0.0000 | 0.0000 | -1.3976E-13 | 8878.5047 | 1.1787E-05 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2: Free

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00492841 |
| Maximum bending moment | = | 750868.30069 lbs-in |
| Maximum shear force | = | 15438.19030 lbs |
| Depth of maximum bending moment | = | 105.30000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 14 |
| Number of zero deflection points | = | 7 |

---

Summary of Pile Response(s)

---

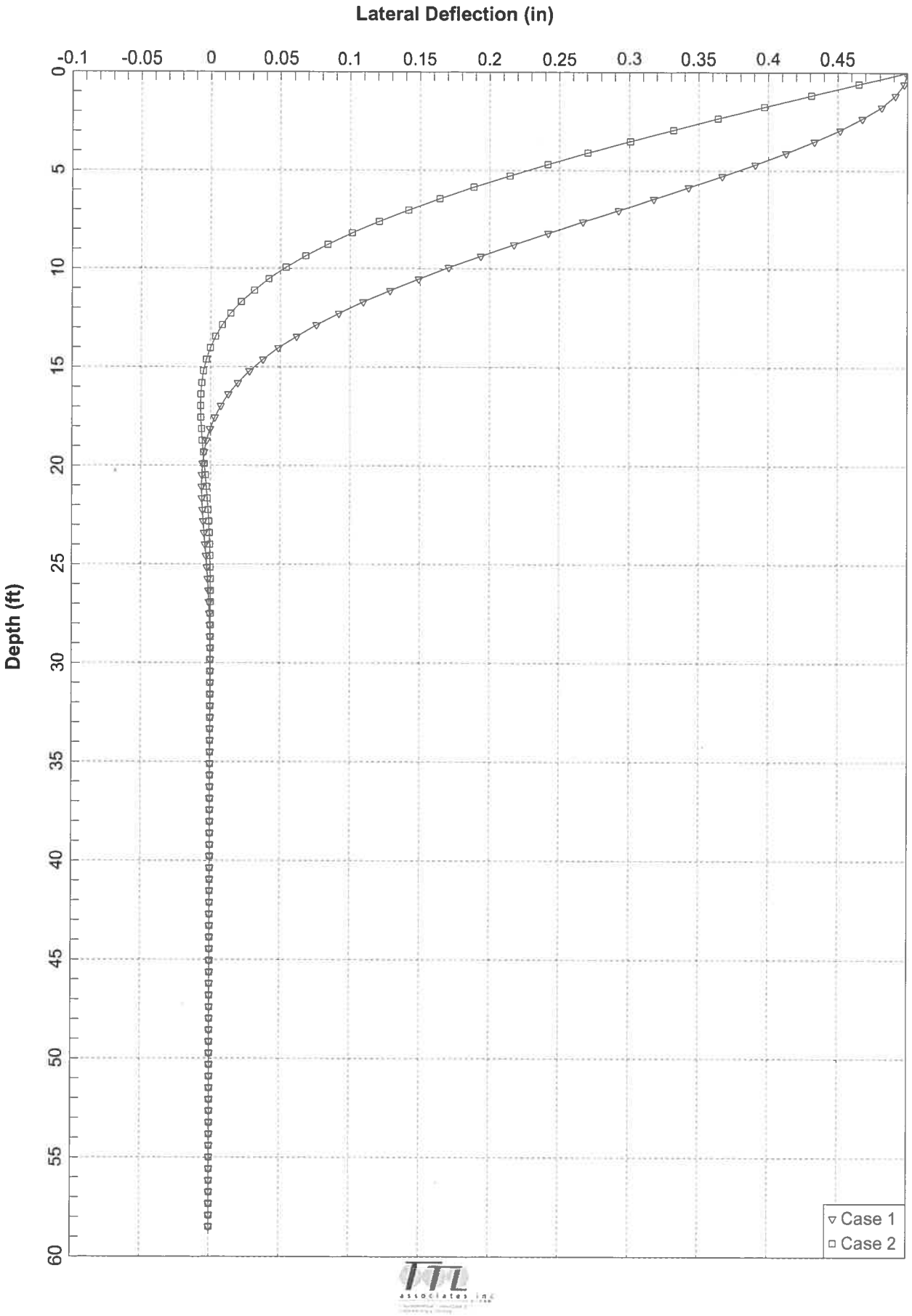
Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

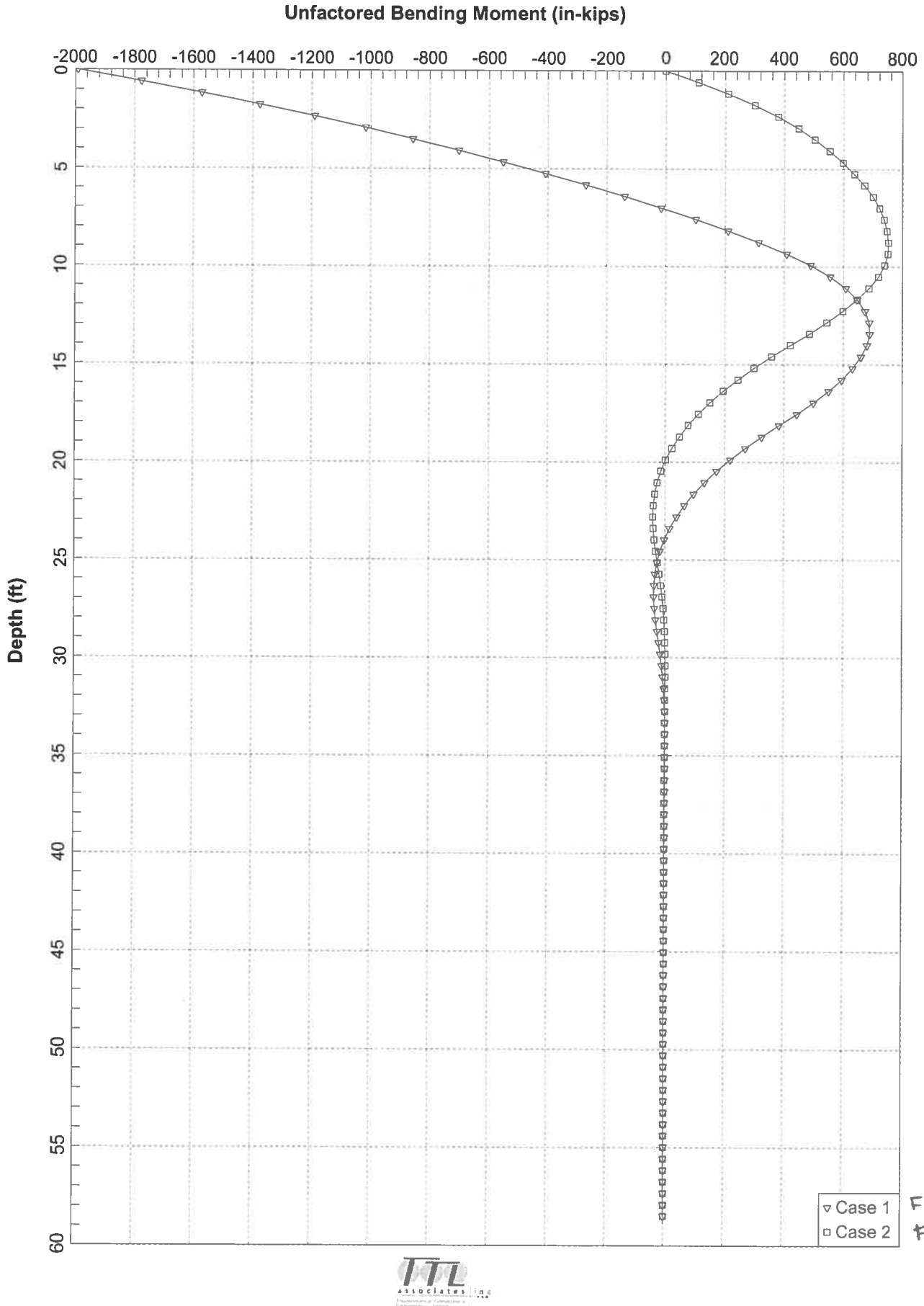
HP14x73.lpo

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs | |
|---|---|---|---|---|---|---|---|
| 5 | y= .500000 | S= 0.000 | 190000. | .5000000 | -1991824. | 31241.1621 | Fixed |
| 4 | y= .500000 | M= 0.000 | 190000. | .5000000 | 750868. | 15438.1903 | Free |

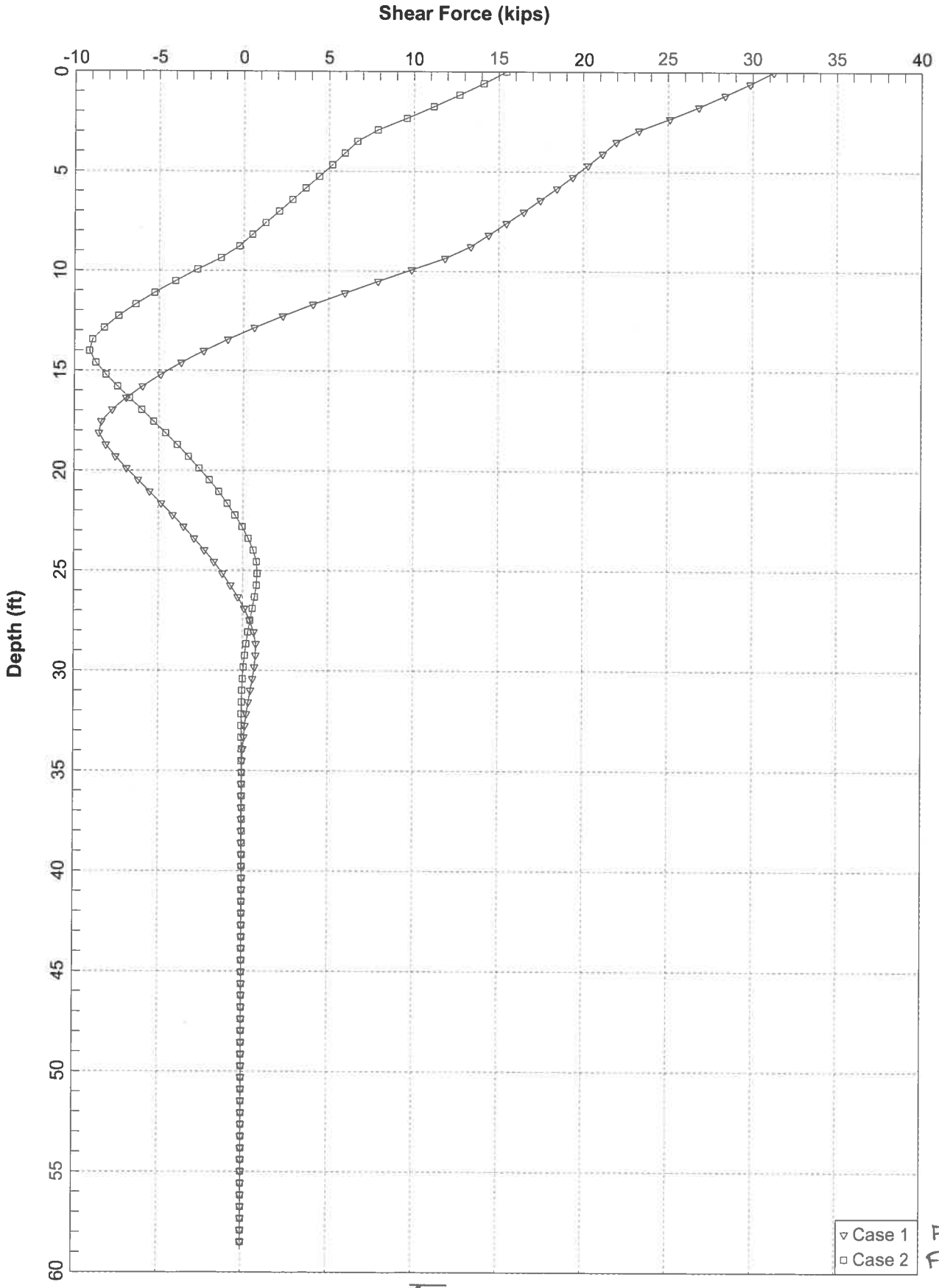
The analysis ended normally.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Case 1
Case 2
Fixed
Free

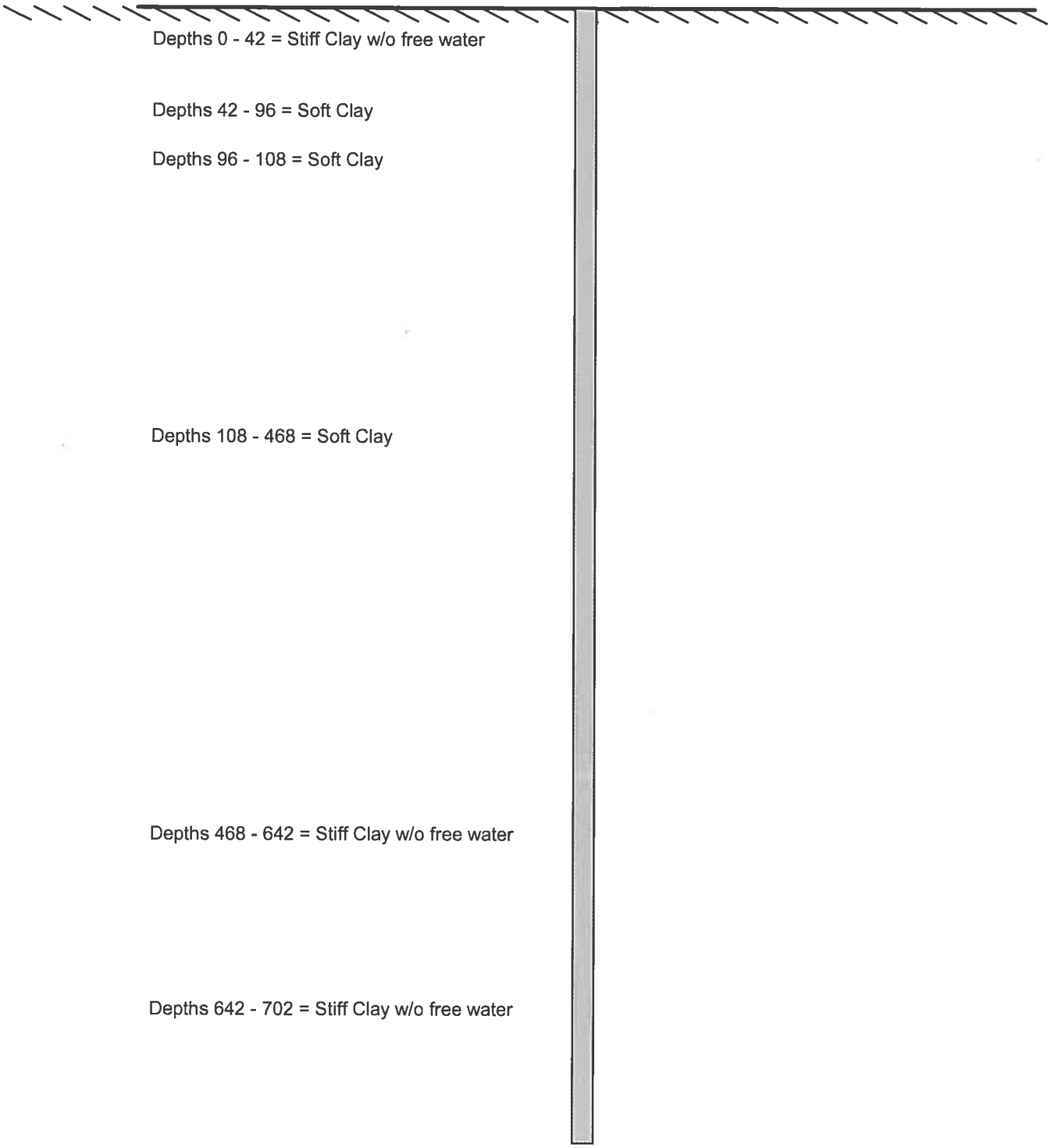
14837.01
Oregon Energy Project
HP14x73 H-Piles



14837.01
Oregon Energy Project
HP14x73 H-Piles




TTL associates inc


Depths 0 - 42 = Stiff Clay w/o free water
Depths 42 - 96 = Soft Clay
Depths 96 - 108 = Soft Clay
Depths 108 - 468 = Soft Clay
Depths 468 - 642 = Stiff Clay w/o free water
Depths 642 - 702 = Stiff Clay w/o free water
Depths 702 - 871.2 = Stiff Clay w/o free water

14inACP.lpo

LPILE Plus for Windows, Version 5.0 (5.0.24)

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



This program is licensed to:

Kate Chulski
TTL Associates

Path to file locations: C:\Program Files\Ensoft\LpileP5\14837.01 - Oregon Energy\
Name of input data file: 14inACP.lpd
Name of output file: 14inACP.lpo
Name of plot output file: 14inACP.lpp
Name of runtime file: 14inACP.lpr

## Time and Date of Analysis

Date: March 3, 2017 Time: 13:59:24

## Problem Title

14837.01 Proposed Oregon Energy Project

## Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant 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 additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100

14inACP.lpo

- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

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

---

## Pile Structural Properties and Geometry

---

Pile Length = 762.00 in
Depth of ground surface below top of pile = .00 in
Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|
| 1 | 0.0000 | 14.00000000 | 1885.7400 | 153.9000 | 3605000. |
| 2 | 762.0000 | 14.00000000 | 1885.7400 | 153.9000 | 3605000. |

---

## Soil and Rock Layering Information

---

The soil profile is modelled using 7 layers

Layer 1 is stiff clay without free water
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 42.000 in

Layer 2 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 42.000 in
Distance from top of pile to bottom of layer = 96.000 in

Layer 3 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 108.000 in

Layer 4 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 108.000 in
Distance from top of pile to bottom of layer = 468.000 in

Layer 5 is stiff clay without free water
Distance from top of pile to top of layer = 468.000 in
Distance from top of pile to bottom of layer = 642.000 in

Layer 6 is stiff clay without free water
Distance from top of pile to top of layer = 642.000 in
Distance from top of pile to bottom of layer = 702.000 in

Layer 7 is stiff clay without free water
Distance from top of pile to top of layer = 702.000 in
Distance from top of pile to bottom of layer = 871.200 in

14inACP.lpo
(Depth of lowest layer extends 109.20 in below pile tip)

## Effective Unit Weight of Soil vs. Depth

Distribution of effective unit weight of soil with depth
is defined using 14 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07234 |
| 2 | 42.00 | .07234 |
| 3 | 42.00 | .07523 |
| 4 | 96.00 | .07523 |
| 5 | 96.00 | .03912 |
| 6 | 108.00 | .03912 |
| 7 | 108.00 | .03912 |
| 8 | 468.00 | .03912 |
| 9 | 468.00 | .03912 |
| 10 | 642.00 | .03912 |
| 11 | 642.00 | .04201 |
| 12 | 702.00 | .04201 |
| 13 | 702.00 | .04201 |
| 14 | 871.20 | .04201 |

## Shear Strength of Soils

Distribution of shear strength parameters with depth
defined using 14 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | E50 or k_rm | RQD % |
|---|---|---|---|---|---|
| 1 | .000 | 6.94440 | .00 | .00700 | .0 |
| 2 | 42.000 | 6.94440 | .00 | .00700 | .0 |
| 3 | 42.000 | 3.47220 | .00 | .02000 | .0 |
| 4 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 5 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 6 | 108.000 | 3.47220 | .00 | .02000 | .0 |
| 7 | 108.000 | 5.90278 | .00 | .01000 | .0 |
| 8 | 468.000 | 5.90278 | .00 | .01000 | .0 |
| 9 | 468.000 | 10.41670 | .00 | .00700 | .0 |
| 10 | 642.000 | 10.41670 | .00 | .00700 | .0 |
| 11 | 642.000 | 17.36110 | .00 | .00500 | .0 |
| 12 | 702.000 | 17.36110 | .00 | .00500 | .0 |
| 13 | 702.000 | 31.25000 | .00 | .00500 | .0 |
| 14 | 871.200 | 31.25000 | .00 | .00500 | .0 |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

14inACP.lpo

---

Loading Type

---

Static loading criteria was used for computation of p-y curves

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Deflection at pile head = .500 in
Slope at pile head = .000 in/in
Axial load at pile head = 110000.000 lbs

Load Case Number 2

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = .500 in
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 110000.000 lbs

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Specified deflection at pile head = .500000 in
Specified slope at pile head = 0.000E+00 in/in
Specified axial load at pile head = 110000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | -1041888. | 22021.5940 | 0.0000 | 4582.3119 | -174.3031 |
| 7.620 | .495550 | -879235. | 20541.0829 | -.0010767 | 3978.5315 | -194.2921 |
| 15.240 | .483591 | -727037. | 18987.9215 | -.0019769 | 3413.5622 | -213.3632 |
| 22.860 | .465422 | -586545. | 17293.4064 | -.0027131 | 2892.0454 | -231.3914 |
| 30.480 | .442243 | -458937. | 15465.9281 | -.0032991 | 2418.3568 | -248.2617 |
| 38.100 | .415144 | -345313. | 13514.7293 | -.0037498 | 1996.5777 | -263.8640 |
| 45.720 | .385096 | -246686. | 12085.3610 | -.0040816 | 1630.4674 | -111.2983 |
| 53.340 | .352940 | -154290. | 11217.1880 | -.0043063 | 1287.4858 | -116.5687 |
| 60.960 | .319467 | -68517.3704 | 10312.2693 | -.0044312 | 969.0912 | -120.9428 |
| 68.580 | .285409 | 10297.3094 | 9377.6540 | -.0044638 | 752.9742 | -124.3631 |
| 76.200 | .251439 | 81881.2471 | 8420.8217 | -.0044122 | 1018.6988 | -126.7740 |
| 83.820 | .218167 | 146027. | 7449.6696 | -.0042844 | 1256.8131 | -128.1216 |
| 91.440 | .186144 | 202597. | 6472.5018 | -.0040891 | 1466.8029 | -128.3529 |
| 99.060 | .155850 | 251523. | 5499.8085 | -.0038345 | 1648.4210 | -126.9472 |
| 106.680 | .127705 | 292842. | 4544.7330 | -.0035295 | 1801.7998 | -123.7288 |
| 114.300 | .102061 | 326702. | 3195.7117 | -.0031822 | 1927.4889 | -230.3450 |
| 121.920 | .079208 | 346879. | 1480.6261 | -.0028047 | 2002.3902 | -219.8087 |

14inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 129.540 | .059317 | 353968. | -140.9874 | -.0024119 | 2028.7044 | -205.8117 |
| 137.160 | .042450 | 348774. | -1626.5468 | -.0020181 | 2009.4235 | -184.0989 |
| 144.780 | .028562 | 332563. | -2942.6284 | -.0016362 | 1949.2458 | -161.3293 |
| 152.400 | .017514 | 306671. | -4079.5548 | -.0012780 | 1853.1353 | -137.0766 |
| 160.020 | .009086 | 272533. | -5021.5701 | -.0009533 | 1726.4100 | -110.1716 |
| 167.640 | .002985 | 231741. | -5731.2868 | -.0006707 | 1574.9879 | -76.1058 |
| 175.260 | -.001136 | 186312. | -5812.3455 | -.0004364 | 1406.3538 | 54.8305 |
| 182.880 | -.003666 | 143892. | -5293.8240 | -.0002514 | 1248.8880 | 81.2643 |
| 190.500 | -.004967 | 106056. | -4641.4741 | -.0001113 | 1108.4360 | 89.9561 |
| 198.120 | -.005362 | 73342.7146 | -3947.1082 | -1.0734E-05 | 987.0032 | 92.2922 |
| 205.740 | -.005130 | 45919.7378 | -3248.9601 | 5.6107E-05 | 885.2071 | 90.9488 |
| 213.360 | -.004507 | 23734.5047 | -2570.5815 | 9.5145E-05 | 802.8540 | 87.1034 |
| 220.980 | -.003680 | 6584.5758 | -1928.5314 | .0001121 | 739.1922 | 81.4137 |
| 228.600 | -.002798 | -5844.3001 | -1335.2701 | .0001126 | 736.4443 | 74.2979 |
| 236.220 | -.001965 | -13953.6220 | -800.5943 | .0001015 | 766.5467 | 66.0370 |
| 243.840 | -.001251 | -18215.4377 | -332.5573 | 8.3427E-05 | 782.3668 | 56.8074 |
| 251.460 | -.000694 | -19161.6518 | 61.6082 | 6.2479E-05 | 785.8792 | 46.6481 |
| 259.080 | -.000299 | -17381.2679 | 373.5581 | 4.1998E-05 | 779.2703 | 35.2285 |
| 266.700 | -5.34E-05 | -13539.0330 | 532.8854 | 2.4669E-05 | 765.0077 | 6.5897 |
| 274.320 | 7.67E-05 | -9301.4499 | 521.9580 | 1.1868E-05 | 749.2775 | -9.4578 |
| 281.940 | .000127 | -5604.2895 | 426.0678 | 3.5142E-06 | 735.5534 | -15.7102 |
| 289.560 | .000130 | -2814.0677 | 305.0199 | -1.2039E-06 | 725.1959 | -16.0609 |
| 297.180 | .000109 | -953.7680 | 192.5904 | -3.3156E-06 | 718.2903 | -13.4482 |
| 304.800 | 7.97E-05 | 126.5689 | 103.8968 | -3.7792E-06 | 715.2197 | -9.8310 |
| 312.420 | 5.15E-05 | 635.9546 | 42.2579 | -3.3518E-06 | 717.1105 | -6.3472 |
| 320.040 | 2.87E-05 | 776.1977 | 4.6142 | -2.5604E-06 | 717.6311 | -3.5330 |
| 327.660 | 1.25E-05 | 710.5675 | -14.7000 | -1.7271E-06 | 717.3875 | -1.5363 |
| 335.280 | 2.33E-06 | 555.0655 | -21.6499 | -1.0178E-06 | 716.8103 | -.2878367 |
| 342.900 | -3.05E-06 | 382.3288 | -21.3136 | -4.9243E-07 | 716.1691 | .3761014 |
| 350.520 | -5.17E-06 | 231.0710 | -17.4521 | -1.4865E-07 | 715.6076 | .6374192 |
| 358.140 | -5.32E-06 | 116.6075 | -12.5265 | 4.6212E-08 | 715.1827 | .6554022 |
| 365.760 | -4.47E-06 | 40.0900 | -7.9317 | 1.3403E-07 | 714.8987 | .5505889 |
| 373.380 | -3.27E-06 | -4.4956 | -4.2964 | 1.5398E-07 | 714.7665 | .4035578 |
| 381.000 | -2.12E-06 | -25.6446 | -1.7634 | 1.3709E-07 | 714.8450 | .2612609 |
| 388.620 | -1.18E-06 | -31.5995 | -.2118465 | 1.0501E-07 | 714.8671 | .1459696 |
| 396.240 | -5.19E-07 | -29.0491 | .5879662 | 7.1017E-08 | 714.8577 | .0639550 |
| 403.860 | -1.02E-07 | -22.7580 | .8793783 | 4.1981E-08 | 714.8343 | .0125311 |
| 411.480 | 1.21E-07 | -15.7178 | .8702506 | 2.0418E-08 | 714.8082 | -.0149269 |
| 419.100 | 2.10E-07 | -9.5296 | .7149560 | 6.2676E-09 | 714.7852 | -.0258329 |
| 426.720 | 2.17E-07 | -4.8324 | .5147921 | -1.7815E-09 | 714.7678 | -.0267036 |
| 434.340 | 1.82E-07 | -1.6811 | .3273821 | -5.4320E-09 | 714.7561 | -.0224854 |
| 441.960 | 1.34E-07 | .1660437 | .1788595 | -6.2812E-09 | 714.7505 | -.0164969 |
| 449.580 | 8.66E-08 | 1.0552 | .0753033 | -5.5967E-09 | 714.7538 | -.0106832 |
| 457.200 | 4.85E-08 | 1.3230 | .0118135 | -4.2639E-09 | 714.7547 | -.0059808 |
| 464.820 | 2.17E-08 | 1.2424 | -.0211518 | -2.8261E-09 | 714.7544 | -.0026716 |
| 472.440 | 5.44E-09 | 1.0054 | -.0402617 | -1.5663E-09 | 714.7536 | -.0023442 |
| 480.060 | -2.20E-09 | .6314227 | -.0455786 | -6.4888E-10 | 714.7522 | .0009486 |
| 487.680 | -4.45E-09 | .3119017 | -.0346593 | -1.2020E-10 | 714.7510 | .0019173 |
| 495.300 | -4.03E-09 | .1034163 | -.0207325 | 1.1257E-10 | 714.7502 | .0017380 |
| 502.920 | -2.73E-09 | -.0042499 | -.0096224 | 1.6815E-10 | 714.7499 | .0011780 |
| 510.540 | -1.47E-09 | -.0435105 | -.0027197 | 1.4138E-10 | 714.7500 | .0006337 |
| 518.160 | -5.79E-10 | -.0459345 | .0006454 | 9.1251E-11 | 714.7500 | .0002495 |
| 525.780 | -7.99E-11 | -.0338271 | .0017272 | 4.6549E-11 | 714.7500 | 3.4415E-05 |
| 533.400 | 1.30E-10 | -.0196896 | .0016443 | 1.6555E-11 | 714.7499 | -5.6184E-05 |
| 541.020 | 1.72E-10 | -.0087959 | .0011471 | 5.9067E-13 | 714.7499 | -7.4311E-05 |
| 548.640 | 1.39E-10 | -.0022087 | .0006351 | -5.5769E-12 | 714.7498 | -6.0063E-05 |
| 556.260 | 8.75E-11 | .0008930 | .0002627 | -6.3143E-12 | 714.7498 | -3.7686E-05 |
| 563.880 | 4.31E-11 | .0018056 | 4.8287E-05 | -4.8019E-12 | 714.7498 | -1.8595E-05 |
| 571.500 | 1.43E-11 | .0016369 | -4.5988E-05 | -2.8725E-12 | 714.7498 | -6.1496E-06 |
| 579.120 | -6.27E-13 | .0011096 | -6.8388E-05 | -1.3332E-12 | 714.7498 | 2.7041E-07 |
| 586.740 | -6.05E-12 | .0005969 | -5.7428E-05 | -3.7684E-13 | 714.7498 | 2.6064E-06 |
| 594.360 | -6.37E-12 | .0002350 | -3.7038E-05 | 8.9408E-14 | 714.7498 | 2.7453E-06 |
| 601.980 | -4.69E-12 | 3.2298E-05 | -1.8885E-05 | 2.3922E-13 | 714.7498 | 2.0192E-06 |

14inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 609.600 | -2.72E-12 | -5.3202E-05 | -6.7184E-06 | 2.2751E-13 | 714.7498 | 1.1742E-06 |
| 617.220 | -1.22E-12 | -7.0472E-05 | -2.4421E-07 | 1.5819E-13 | 714.7498 | 5.2505E-07 |
| 624.840 | -3.14E-13 | -5.7189E-05 | 2.2717E-06 | 8.6645E-14 | 714.7498 | 1.3529E-07 |
| 632.460 | 1.02E-13 | -3.5996E-05 | 2.6195E-06 | 3.4420E-14 | 714.7498 | -4.3984E-08 |
| 640.080 | 2.11E-13 | -1.7324E-05 | 2.1062E-06 | 4.5360E-15 | 714.7498 | -9.0762E-08 |
| 647.700 | 1.71E-13 | -3.9061E-06 | 1.2508E-06 | -7.3626E-15 | 714.7498 | -1.3375E-07 |
| 655.320 | 9.84E-14 | 1.7499E-06 | 4.4827E-07 | -8.5710E-15 | 714.7498 | -7.6885E-08 |
| 662.940 | 4.06E-14 | 2.9400E-06 | 3.4570E-08 | -5.9425E-15 | 714.7498 | -3.1699E-08 |
| 670.560 | 7.85E-15 | 2.2867E-06 | -1.0956E-07 | -3.0132E-15 | 714.7498 | -6.1316E-09 |
| 678.180 | -5.35E-15 | 1.2753E-06 | -1.1701E-07 | -1.0169E-15 | 714.7498 | 4.1768E-09 |
| 685.800 | -7.65E-15 | 5.0518E-07 | -7.8332E-08 | -1.8986E-17 | 714.7498 | 5.9753E-09 |
| 693.420 | -5.64E-15 | 8.1542E-08 | -3.8791E-08 | 3.0984E-16 | 714.7498 | 4.4029E-09 |
| 701.040 | -2.93E-15 | -8.6521E-08 | -1.3306E-08 | 3.0705E-16 | 714.7498 | 2.2863E-09 |
| 708.660 | -9.56E-16 | -1.2175E-07 | 5.2799E-10 | 1.9033E-16 | 714.7498 | 1.3446E-09 |
| 716.280 | -2.59E-17 | -7.8793E-08 | 5.7896E-09 | 7.7930E-17 | 714.7498 | 3.6363E-11 |
| 723.900 | 2.31E-16 | -3.3649E-08 | 4.6879E-09 | 1.4912E-17 | 714.7498 | -3.2551E-10 |
| 731.520 | 2.01E-16 | -7.3741E-09 | 2.3687E-09 | -8.0799E-18 | 714.7498 | -2.8321E-10 |
| 739.140 | 1.08E-16 | 2.4634E-09 | 7.0921E-10 | -1.0832E-17 | 714.7498 | -1.5235E-10 |
| 746.760 | 3.63E-17 | 3.4525E-09 | -6.5799E-11 | -7.5165E-18 | 714.7498 | -5.1069E-11 |
| 754.380 | -6.22E-18 | 1.4732E-09 | -2.2707E-10 | -4.7559E-18 | 714.7498 | 8.7412E-12 |
| 762.000 | -3.62E-17 | 0.0000 | 0.0000 | -3.9303E-18 | 714.7498 | 5.0856E-11 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1: Fixed

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00009116 |
| Maximum bending moment | = | -1041888. lbs-in |
| Maximum shear force | = | 22021.59404 lbs |
| Depth of maximum bending moment | = | 0.00000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 17 |
| Number of zero deflection points | = | 11 |

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Specified deflection at pile head = .500000 in
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 110000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | 0.0000 | 11521.5740 | -.0063842 | 714.7498 | -174.3031 |
| 7.620 | .451352 | 88085.2175 | 10134.3140 | -.0063348 | 1041.7284 | -189.8072 |
| 15.240 | .403457 | 165067. | 8634.2305 | -.0061929 | 1327.4888 | -203.9155 |
| 22.860 | .356972 | 230053. | 7032.2808 | -.0059715 | 1568.7218 | -216.5437 |
| 30.480 | .312452 | 282249. | 5340.0529 | -.0056844 | 1762.4788 | -227.6106 |
| 38.100 | .270342 | 320964. | 3569.7545 | -.0053463 | 1906.1924 | -237.0347 |
| 45.720 | .230974 | 345615. | 2309.0377 | -.0049727 | 1997.6964 | -93.8621 |
| 53.340 | .194558 | 364490. | 1587.2615 | -.0045747 | 2067.7640 | -95.5805 |

14inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 60.960 | .161255 | 377474. | 856.2060 | -.0041589 | 2115.9591 | -96.2976 |
| 68.580 | .131176 | 384511. | 123.6436 | -.0037318 | 2142.0818 | -95.9760 |
| 76.200 | .104382 | 385614. | -602.3528 | -.0033002 | 2146.1768 | -94.5742 |
| 83.820 | .080881 | 380864. | -1313.3640 | -.0028707 | 2128.5425 | -92.0429 |
| 91.440 | .060633 | 370411. | -2000.5385 | -.0024496 | 2089.7411 | -88.3179 |
| 99.060 | .043549 | 354482. | -2653.2607 | -.0020433 | 2030.6118 | -83.0003 |
| 106.680 | .029493 | 333401. | -3258.7474 | -.0016578 | 1952.3565 | -75.9201 |
| 114.300 | .018284 | 307598. | -4042.8373 | -.0012986 | 1856.5746 | -129.8777 |
| 121.920 | .009702 | 273965. | -4953.7532 | -.0009726 | 1731.7261 | -109.2078 |
| 129.540 | .003461 | 233733. | -5674.3242 | -.0006881 | 1582.3836 | -79.9185 |
| 137.160 | -.000784 | 188641. | -5794.3964 | -.0004514 | 1415.0004 | 48.4034 |
| 144.780 | -.003418 | 146183. | -5307.4826 | -.0002637 | 1257.3921 | 79.3954 |
| 152.400 | -.004803 | 108198. | -4666.0301 | -.0001211 | 1116.3868 | 88.9648 |
| 160.020 | -.005264 | 75275.9598 | -3977.5579 | -1.8317E-05 | 994.1795 | 91.7365 |
| 167.640 | -.005082 | 47610.2726 | -3282.5825 | 5.0555E-05 | 891.4825 | 90.6717 |
| 175.260 | -.004494 | 25164.6521 | -2605.5479 | 9.1342E-05 | 808.1628 | 87.0277 |
| 182.880 | -.003690 | 7748.5971 | -1963.4771 | .0001098 | 743.5132 | 81.4949 |
| 190.500 | -.002820 | -4942.7875 | -1369.1062 | .0001114 | 733.0978 | 74.5080 |
| 198.120 | -.001993 | -13303.2664 | -832.4037 | .0001011 | 764.1325 | 66.3588 |
| 205.740 | -.001279 | -17798.1619 | -361.5165 | 8.3704E-05 | 780.8179 | 57.2336 |
| 213.360 | -.000717 | -18953.0980 | 36.3281 | 6.3106E-05 | 785.1051 | 47.1875 |
| 220.980 | -.000317 | -17350.3139 | 353.0478 | 4.2760E-05 | 779.1554 | 35.9411 |
| 228.600 | -6.57E-05 | -13644.3323 | 520.8251 | 2.5389E-05 | 765.3986 | 8.0950 |
| 236.220 | 6.95E-05 | -9455.5011 | 519.0019 | 1.2443E-05 | 749.8493 | -8.5735 |
| 243.840 | .000124 | -5755.6031 | 428.1020 | 3.9177E-06 | 736.1150 | -15.2847 |
| 251.460 | .000129 | -2937.7948 | 309.1556 | -9.5452E-07 | 725.6551 | -15.9348 |
| 259.080 | .000109 | -1042.4712 | 197.0426 | -3.1853E-06 | 718.6196 | -13.4912 |
| 266.700 | 8.07E-05 | 70.4739 | 107.7325 | -3.7300E-06 | 715.0114 | -9.9498 |
| 274.320 | 5.26E-05 | 605.6248 | 45.1252 | -3.3511E-06 | 716.9980 | -6.4826 |
| 281.940 | 2.96E-05 | 763.7994 | 6.5080 | -2.5836E-06 | 717.5851 | -3.6532 |
| 289.560 | 1.32E-05 | 709.1385 | -13.6134 | -1.7581E-06 | 717.3822 | -1.6281 |
| 297.180 | 2.84E-06 | 559.2791 | -21.1488 | -1.0472E-06 | 716.8259 | -.3497380 |
| 304.800 | -2.75E-06 | 388.5869 | -21.1873 | -5.1597E-07 | 716.1923 | .3396189 |
| 312.420 | -5.03E-06 | 237.2494 | -17.5321 | -1.6522E-07 | 715.6305 | .6197652 |
| 320.040 | -5.27E-06 | 121.6753 | -12.6940 | 3.5936E-08 | 715.2015 | .6500705 |
| 327.660 | -4.48E-06 | 43.7328 | -8.1132 | 1.2864E-07 | 714.9122 | .5522426 |
| 335.280 | -3.31E-06 | -2.1851 | -4.4533 | 1.5192E-07 | 714.7579 | .4083609 |
| 342.900 | -2.16E-06 | -24.3897 | -1.8810 | 1.3703E-07 | 714.8404 | .2667803 |
| 350.520 | -1.22E-06 | -31.0810 | -.2896841 | 1.0594E-07 | 714.8652 | .1508839 |
| 358.140 | -5.49E-07 | -28.9821 | .5431891 | 7.2280E-08 | 714.8574 | .0677180 |
| 365.760 | -1.22E-07 | -22.9240 | .8586208 | 4.3189E-08 | 714.8349 | .0150725 |
| 373.380 | 1.09E-07 | -15.9691 | .8648692 | 2.1391E-08 | 714.8091 | -.0134324 |
| 381.000 | 2.04E-07 | -9.7792 | .7179818 | 6.9603E-09 | 714.7861 | -.0251207 |
| 388.620 | 2.15E-07 | -5.0388 | .5212665 | -1.3445E-09 | 714.7685 | -.0265106 |
| 396.240 | 1.83E-07 | -1.8329 | .3341762 | -5.1957E-09 | 714.7566 | -.0225944 |
| 403.860 | 1.36E-07 | .0627892 | .1842814 | -6.1878E-09 | 714.7501 | -.0167480 |
| 411.480 | 8.90E-08 | .9859380 | .0786841 | -5.6000E-09 | 714.7535 | -.0109678 |
| 419.100 | 5.05E-08 | 1.2713 | .0131766 | -4.3349E-09 | 714.7546 | -.0062258 |
| 426.720 | 2.29E-08 | 1.1940 | -.0212977 | -2.9532E-09 | 714.7543 | -.0028226 |
| 434.340 | 5.49E-09 | .9516966 | -.0346303 | -1.7506E-09 | 714.7534 | -.0006768 |
| 441.960 | -3.79E-09 | .6691860 | -.0354302 | -8.4222E-10 | 714.7523 | .0004668 |
| 449.580 | -7.35E-09 | .4131528 | -.0302007 | -2.3562E-10 | 714.7514 | .0009057 |
| 457.200 | -7.38E-09 | .2093223 | -.0232845 | 1.1325E-10 | 714.7506 | .0009096 |
| 464.820 | -5.62E-09 | .0581079 | -.0171789 | 2.6313E-10 | 714.7501 | .0006929 |
| 472.440 | -3.37E-09 | -.0529256 | -.0090104 | 2.6603E-10 | 714.7500 | .0014510 |
| 480.060 | -1.57E-09 | -.0796562 | -.0009108 | 1.9173E-10 | 714.7501 | .0006749 |
| 487.680 | -4.45E-10 | -.0671269 | .0023915 | 1.0946E-10 | 714.7501 | .0001919 |
| 495.300 | 1.02E-10 | -.0433932 | .0029548 | 4.7520E-11 | 714.7500 | -4.4024E-05 |
| 502.920 | 2.79E-10 | -.0221749 | .0023291 | 1.0773E-11 | 714.7499 | -.0001202 |
| 510.540 | 2.66E-10 | -.0079156 | .0014338 | -6.0917E-12 | 714.7499 | -.0001148 |
| 518.160 | 1.86E-10 | -.0003130 | .0006910 | -1.0703E-11 | 714.7498 | -8.0201E-05 |
| 525.780 | 1.03E-10 | .0026330 | .0002160 | -9.4032E-12 | 714.7498 | -4.4478E-05 |
| 533.400 | 4.28E-11 | .0029940 | -2.3776E-05 | -6.2495E-12 | 714.7498 | -1.8446E-05 |

14inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 541.020 | 7.97E-12 | .0022812 | -.0001071 | -3.2930E-12 | 714.7498 | -3.4345E-06 |
| 548.640 | -7.38E-12 | .0013667 | -.0001081 | -1.2486E-12 | 714.7498 | 3.1808E-06 |
| 556.260 | -1.11E-11 | .0006357 | -7.7831E-05 | -1.2634E-13 | 714.7498 | 4.7656E-06 |
| 563.880 | -9.31E-12 | .0001808 | -4.4394E-05 | 3.3125E-13 | 714.7498 | 4.0106E-06 |
| 571.500 | -6.01E-12 | -4.1429E-05 | -1.9245E-05 | 4.0935E-13 | 714.7498 | 2.5902E-06 |
| 579.120 | -3.07E-12 | -.0001132 | -4.3389E-06 | 3.2268E-13 | 714.7498 | 1.3222E-06 |
| 586.740 | -1.09E-12 | -.0001081 | 2.4933E-06 | 1.9865E-13 | 714.7498 | 4.7098E-07 |
| 594.360 | -4.08E-14 | -7.5539E-05 | 4.3547E-06 | 9.5737E-14 | 714.7498 | 1.7585E-08 |
| 601.980 | 3.66E-13 | -4.1890E-05 | 3.8206E-06 | 2.9924E-14 | 714.7498 | -1.5777E-07 |
| 609.600 | 4.15E-13 | -1.7363E-05 | 2.5377E-06 | -3.2849E-15 | 714.7498 | -1.7894E-07 |
| 617.220 | 3.16E-13 | -3.2101E-06 | 1.3370E-06 | -1.4815E-14 | 714.7498 | -1.3620E-07 |
| 624.840 | 1.89E-13 | 3.0379E-06 | 5.0708E-07 | -1.4912E-14 | 714.7498 | -8.1640E-08 |
| 632.460 | 8.88E-14 | 4.5427E-06 | 5.0236E-08 | -1.0663E-14 | 714.7498 | -3.8265E-08 |
| 640.080 | 2.69E-14 | 3.8214E-06 | -1.3979E-07 | -5.9755E-15 | 714.7498 | -1.1610E-08 |
| 647.700 | -2.27E-15 | 2.4223E-06 | -1.7727E-07 | -2.4762E-15 | 714.7498 | 1.7742E-09 |
| 655.320 | -1.08E-14 | 1.1240E-06 | -1.3838E-07 | -4.8863E-16 | 714.7498 | 8.4333E-09 |
| 662.940 | -9.72E-15 | 3.1432E-07 | -7.7320E-08 | 3.1750E-16 | 714.7498 | 7.5919E-09 |
| 670.560 | -5.96E-15 | -5.4862E-08 | -3.0667E-08 | 4.6291E-16 | 714.7498 | 4.6531E-09 |
| 678.180 | -2.66E-15 | -1.5382E-07 | -5.0122E-09 | 3.4596E-16 | 714.7498 | 2.0804E-09 |
| 685.800 | -6.84E-16 | -1.3183E-07 | 4.9486E-09 | 1.8587E-16 | 714.7498 | 5.3403E-10 |
| 693.420 | 1.70E-16 | -7.8711E-08 | 6.4779E-09 | 6.7870E-17 | 714.7498 | -1.3262E-10 |
| 701.040 | 3.51E-16 | -3.3219E-08 | 4.9285E-09 | 5.1388E-18 | 714.7498 | -2.7405E-10 |
| 708.660 | 2.48E-16 | -3.6091E-09 | 2.5552E-09 | -1.5502E-17 | 714.7498 | -3.4885E-10 |
| 716.280 | 1.15E-16 | 5.7485E-09 | 6.1243E-10 | -1.4303E-17 | 714.7498 | -1.6107E-10 |
| 723.900 | 3.01E-17 | 5.7484E-09 | -1.6252E-10 | -7.8591E-18 | 714.7498 | -4.2331E-11 |
| 731.520 | -5.24E-18 | 3.2849E-09 | -2.9575E-10 | -2.7964E-18 | 714.7498 | 7.3622E-12 |
| 739.140 | -1.25E-17 | 1.2458E-09 | -2.0065E-10 | -2.5720E-19 | 714.7498 | 1.7600E-11 |
| 746.760 | -9.16E-18 | 2.2747E-10 | -8.4539E-11 | 5.6849E-19 | 714.7498 | 1.2874E-11 |
| 754.380 | -3.85E-18 | -4.3540E-11 | -1.4852E-11 | 6.7157E-19 | 714.7498 | 5.4165E-12 |
| 762.000 | 1.08E-18 | 0.0000 | 0.0000 | 6.4717E-19 | 714.7498 | -1.5184E-12 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2: Free

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00638419 |
| Maximum bending moment | = | 385614.16046 lbs-in |
| Maximum shear force | = | 11521.57396 lbs |
| Depth of maximum bending moment | = | 76.20000000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 16 |
| Number of zero deflection points | = | 12 |

---

Summary of Pile Response(s)

---

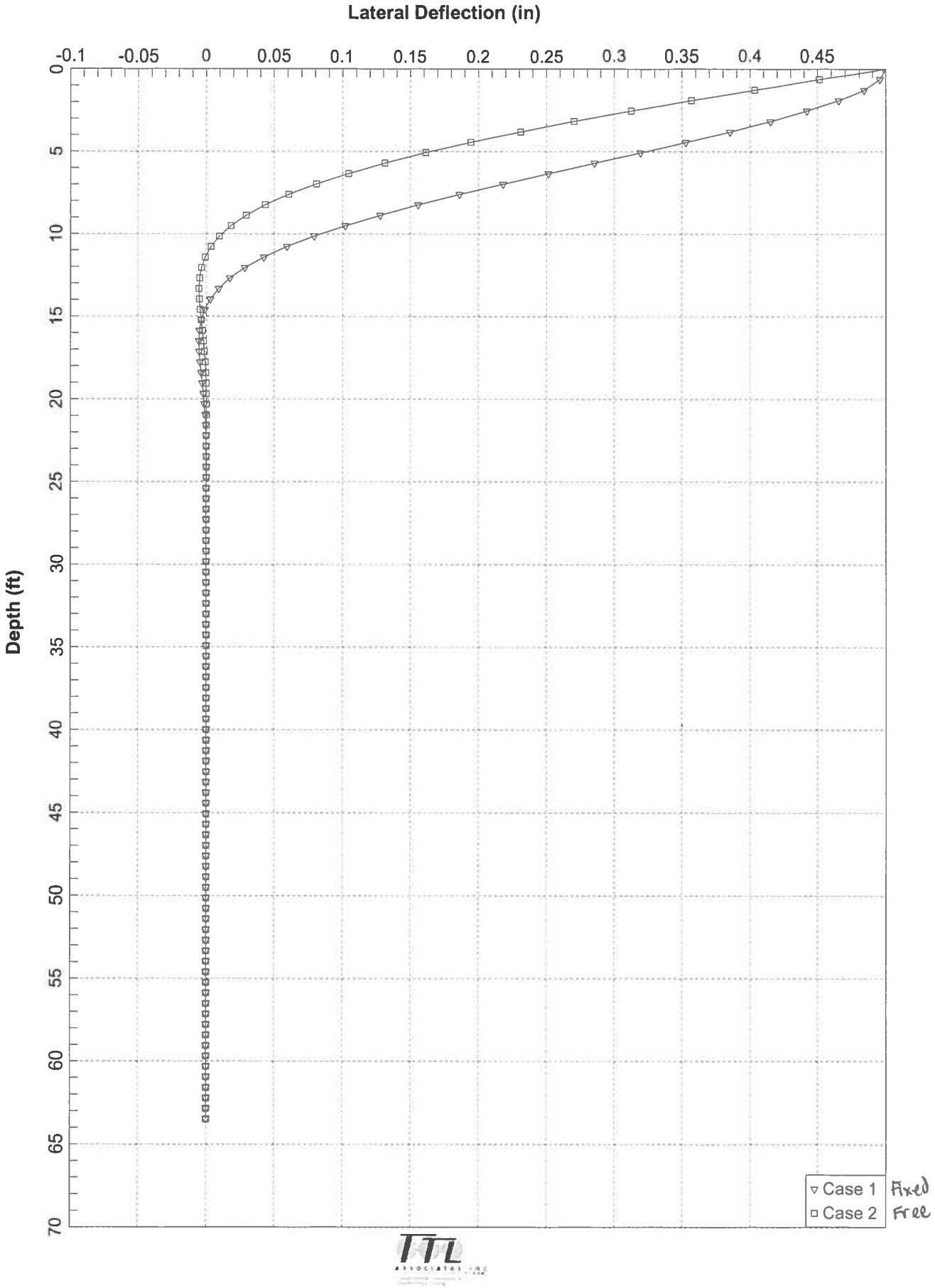
Definition of Symbols for Pile-Head Loading Conditions:

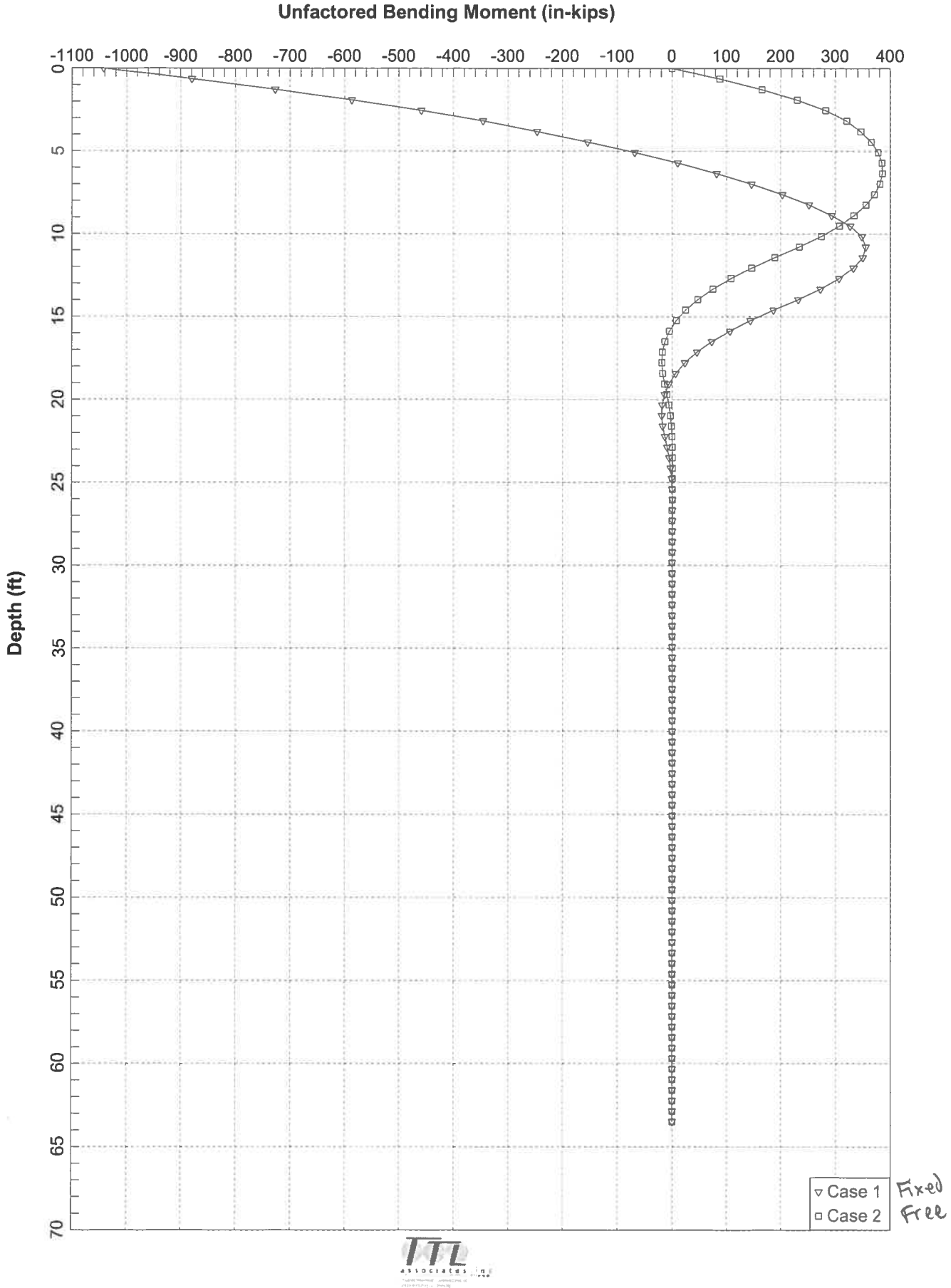
Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

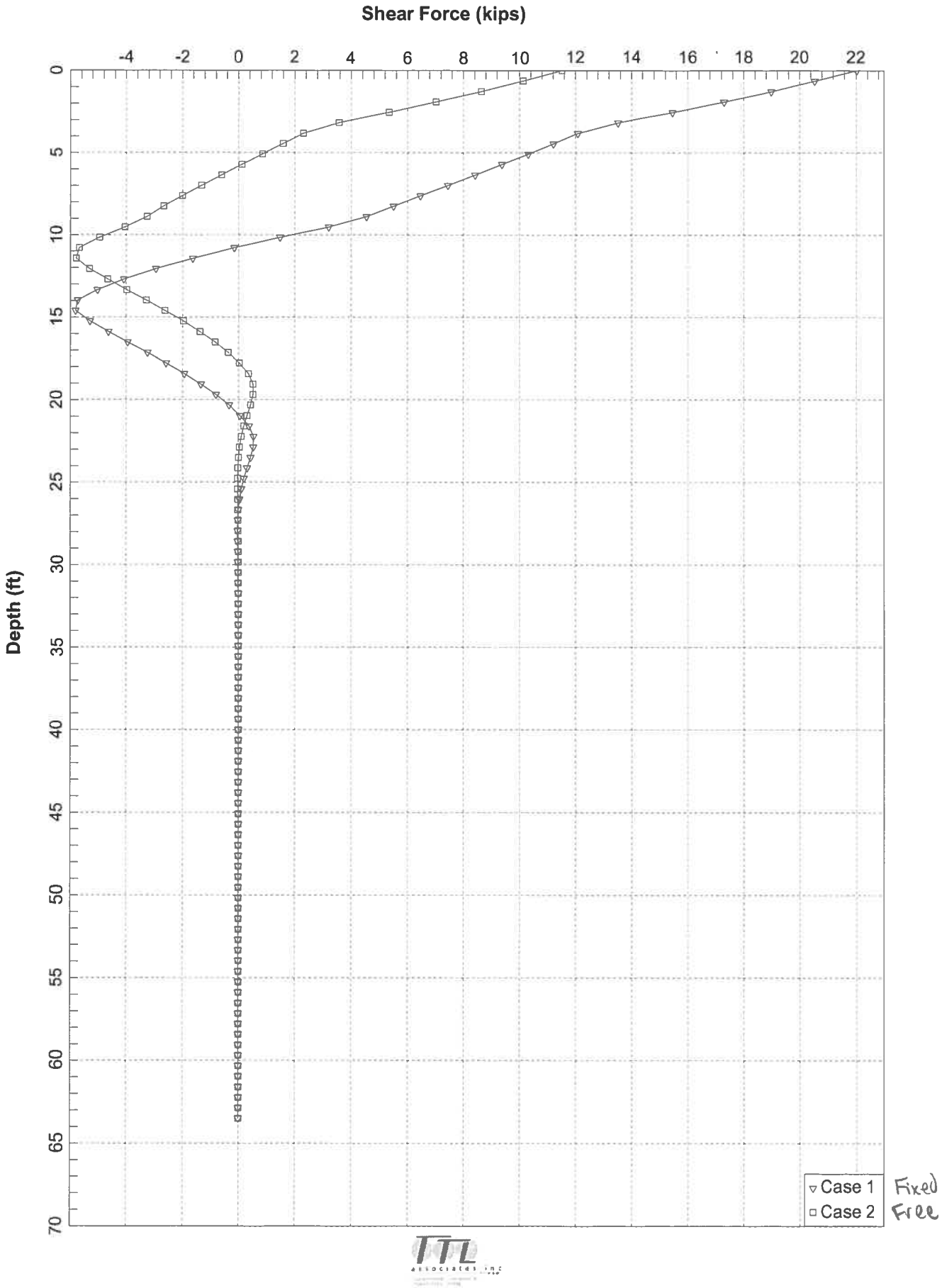
14inACP.lpo

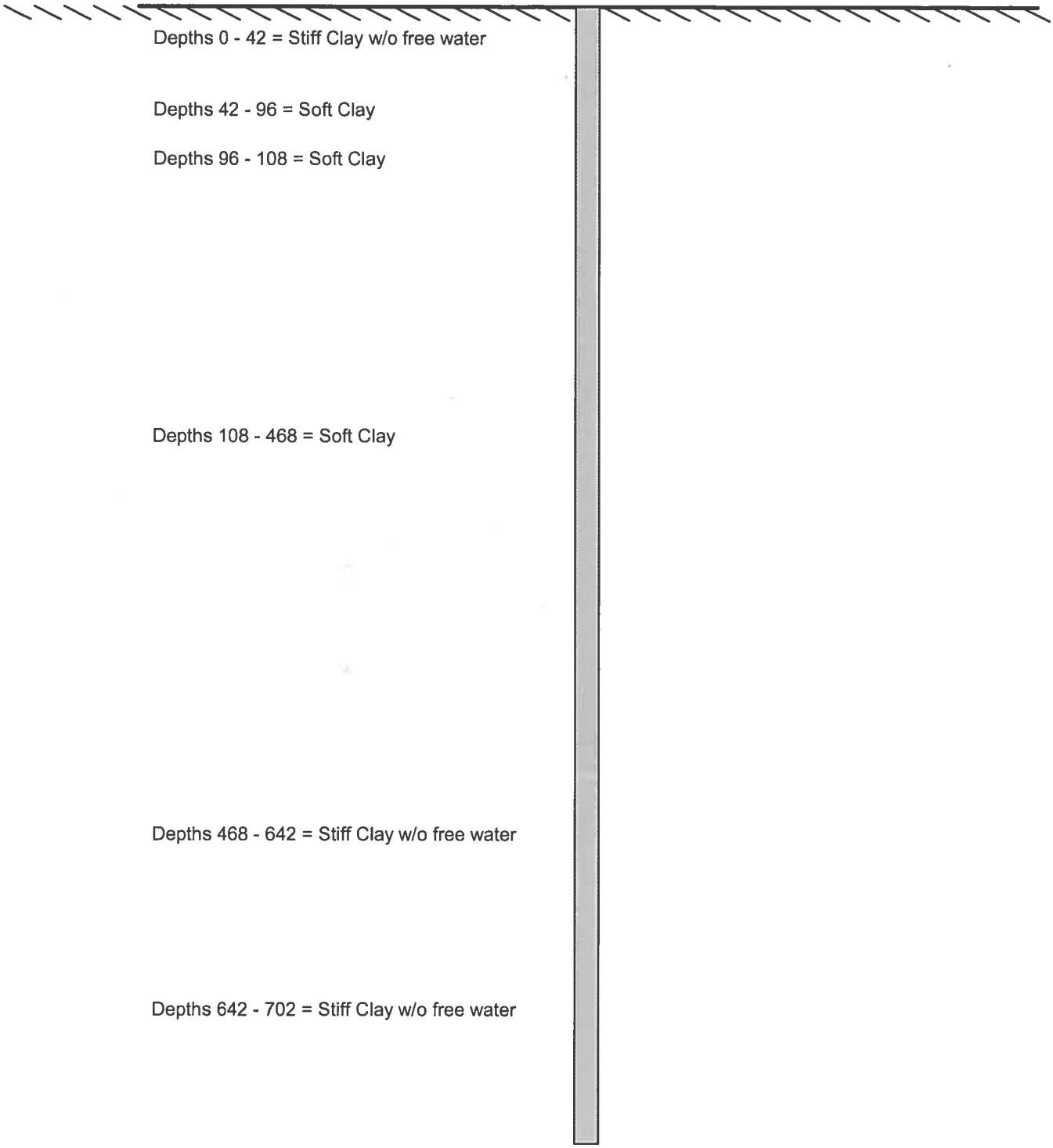
| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs | |
|---|---|---|---|---|---|---|---|
| 5 | y= .500000 | S= 0.000 | 110000. | .5000000 | -1041888. | 22021.5940 | Fixed |
| 4 | y= .500000 | M= 0.000 | 110000. | .5000000 | 385614. | 11521.5740 | Free |

The analysis ended normally.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Case 1
Case 2
Fixed
Free


Unfactored Bending Moment (in-kips)
-1100 -1000 -900 -800 -700 -600 -500 -400 -300 -200 -100 0 100 200 300 400
Depth (ft)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70
Case 1
Case 2
Fixed
Free


Shear Force (kips)
-4
-2
0
2
4
6
8
10
12
14
16
18
20
22
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Case 1
Case 2
Fixed
Free


Depths 0 - 42 = Stiff Clay w/o free water
Depths 42 - 96 = Soft Clay
Depths 96 - 108 = Soft Clay
Depths 108 - 468 = Soft Clay
Depths 468 - 642 = Stiff Clay w/o free water
Depths 642 - 702 = Stiff Clay w/o free water
Depths 702 - 871.2 = Stiff Clay w/o free water

16inACP.lpo

LPILE Plus for Windows, Version 5.0 (5.0.24)

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



This program is licensed to:

Kate Chulski
TTL Associates

Path to file locations: C:\Program Files\Ensoft\LpileP5\14837.01 - Oregon Energy\
Name of input data file: 16inACP.lpd
Name of output file: 16inACP.lpo
Name of plot output file: 16inACP.lpp
Name of runtime file: 16inACP.lpr

## Time and Date of Analysis

Date: March 3, 2017 Time: 14: 5: 9

## Problem Title

14837.01 Proposed Oregon Energy Project

## Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 1:
- Computation of Lateral Pile Response Using User-specified Constant 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 additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100

16inACP.lpo

- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 1.0000E+02 in

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

---

## Pile Structural Properties and Geometry

---

Pile Length = 762.00 in
Depth of ground surface below top of pile = .00 in
Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

| Point | Depth X in | Pile Diameter in | Moment of Inertia in**4 | Pile Area Sq.in | Modulus of Elasticity lbs/Sq.in |
|---|---|---|---|---|---|
| 1 | 0.0000 | 16.00000000 | 3216.9900 | 201.1000 | 3605000. |
| 2 | 762.0000 | 16.00000000 | 3216.9900 | 201.1000 | 3605000. |

---

## Soil and Rock Layering Information

---

The soil profile is modelled using 7 layers

Layer 1 is stiff clay without free water
Distance from top of pile to top of layer = .000 in
Distance from top of pile to bottom of layer = 42.000 in

Layer 2 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 42.000 in
Distance from top of pile to bottom of layer = 96.000 in

Layer 3 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 96.000 in
Distance from top of pile to bottom of layer = 108.000 in

Layer 4 is soft clay, p-y criteria by Matlock, 1970
Distance from top of pile to top of layer = 108.000 in
Distance from top of pile to bottom of layer = 468.000 in

Layer 5 is stiff clay without free water
Distance from top of pile to top of layer = 468.000 in
Distance from top of pile to bottom of layer = 642.000 in

Layer 6 is stiff clay without free water
Distance from top of pile to top of layer = 642.000 in
Distance from top of pile to bottom of layer = 702.000 in

Layer 7 is stiff clay without free water
Distance from top of pile to top of layer = 702.000 in
Distance from top of pile to bottom of layer = 871.200 in

16inACP.lpo
(Depth of lowest layer extends 109.20 in below pile tip)

## Effective Unit Weight of Soil vs. Depth

Distribution of effective unit weight of soil with depth
is defined using 14 points

| Point No. | Depth X in | Eff. Unit Weight lbs/in**3 |
|---|---|---|
| 1 | .00 | .07234 |
| 2 | 42.00 | .07234 |
| 3 | 42.00 | .07523 |
| 4 | 96.00 | .07523 |
| 5 | 96.00 | .03912 |
| 6 | 108.00 | .03912 |
| 7 | 108.00 | .03912 |
| 8 | 468.00 | .03912 |
| 9 | 468.00 | .03912 |
| 10 | 642.00 | .03912 |
| 11 | 642.00 | .04201 |
| 12 | 702.00 | .04201 |
| 13 | 702.00 | .04201 |
| 14 | 871.20 | .04201 |

## Shear Strength of Soils

Distribution of shear strength parameters with depth
defined using 14 points

| Point No. | Depth X in | Cohesion c lbs/in**2 | Angle of Friction Deg. | E50 or k_rm | RQD % |
|---|---|---|---|---|---|
| 1 | .000 | 6.94440 | .00 | .00700 | .0 |
| 2 | 42.000 | 6.94440 | .00 | .00700 | .0 |
| 3 | 42.000 | 3.47220 | .00 | .02000 | .0 |
| 4 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 5 | 96.000 | 3.47220 | .00 | .02000 | .0 |
| 6 | 108.000 | 3.47220 | .00 | .02000 | .0 |
| 7 | 108.000 | 5.90278 | .00 | .01000 | .0 |
| 8 | 468.000 | 5.90278 | .00 | .01000 | .0 |
| 9 | 468.000 | 10.41670 | .00 | .00700 | .0 |
| 10 | 642.000 | 10.41670 | .00 | .00700 | .0 |
| 11 | 642.000 | 17.36110 | .00 | .00500 | .0 |
| 12 | 702.000 | 17.36110 | .00 | .00500 | .0 |
| 13 | 702.000 | 31.25000 | .00 | .00500 | .0 |
| 14 | 871.200 | 31.25000 | .00 | .00500 | .0 |

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

16inACP.lpo

---

Loading Type

---

Static loading criteria was used for computation of p-y curves

---

Pile-head Loading and Pile-head Fixity Conditions

---

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Deflection at pile head = .500 in
Slope at pile head = .000 in/in
Axial load at pile head = 130000.000 lbs

Load Case Number 2

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Deflection at pile head = .500 in
Bending moment at pile head = .000 in-lbs
Axial load at pile head = 130000.000 lbs

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

---

Pile-head boundary conditions are Displacement and Slope (BC Type 5)
Specified deflection at pile head = .500000 in
Specified slope at pile head = 0.000E+00 in/in
Specified axial load at pile head = 130000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | -1441583. | 27029.9260 | 0.0000 | 4231.3688 | -192.6633 |
| 7.620 | .496391 | -1241320. | 25409.3818 | -.0008814 | 3733.3556 | -212.6682 |
| 15.240 | .486567 | -1052598. | 23715.7411 | -.0016350 | 3264.0412 | -231.8602 |
| 22.860 | .471474 | -876653. | 21879.3433 | -.0022688 | 2826.5024 | -250.1340 |
| 30.480 | .451991 | -714662. | 19907.5722 | -.0027916 | 2423.6626 | -267.3912 |
| 38.100 | .428929 | -567731. | 17808.5348 | -.0032129 | 2058.2759 | -283.5372 |
| 45.720 | .403026 | -436894. | 16274.8343 | -.0035430 | 1732.9113 | -119.0089 |
| 53.340 | .374935 | -312683. | 15345.6277 | -.0037892 | 1424.0239 | -124.8774 |
| 60.960 | .345278 | -195520. | 14374.7023 | -.0039562 | 1132.6619 | -129.9587 |
| 68.580 | .314643 | -85774.6822 | 13368.2497 | -.0040486 | 859.7487 | -134.2021 |
| 76.200 | .283578 | 16233.6425 | 12332.8410 | -.0040714 | 686.8143 | -137.5587 |
| 83.820 | .252594 | 110244. | 11275.4114 | -.0040299 | 920.5993 | -139.9818 |
| 91.440 | .222162 | 196055. | 10203.2472 | -.0039293 | 1133.9933 | -141.4261 |
| 99.060 | .192712 | 273526. | 9126.0675 | -.0037750 | 1326.6487 | -141.2982 |
| 106.680 | .164631 | 342615. | 8056.6611 | -.0035726 | 1498.4588 | -139.3859 |
| 114.300 | .138266 | 403388. | 6528.5533 | -.0033275 | 1649.5878 | -261.6923 |
| 121.920 | .113921 | 448703. | 4562.6190 | -.0030475 | 1762.2770 | -254.3009 |

16inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 129.540 | .091822 | 478960. | 2660.2436 | -.0027428 | 1837.5203 | -245.0102 |
| 137.160 | .072121 | 494679. | 836.1190 | -.0024229 | 1876.6103 | -233.7626 |
| 144.780 | .054896 | 496503. | -889.8180 | -.0020973 | 1881.1456 | -219.2392 |
| 152.400 | .040158 | 485273. | -2477.7770 | -.0017748 | 1853.2203 | -197.5479 |
| 160.020 | .027849 | 462257. | -3896.6722 | -.0014635 | 1795.9848 | -174.8655 |
| 167.640 | .017855 | 428787. | -5137.4336 | -.0011707 | 1712.7514 | -150.7937 |
| 175.260 | .010007 | 386282. | -6185.7206 | -.0009030 | 1607.0503 | -124.3473 |
| 182.880 | .004093 | 336306. | -7011.3501 | -.0006656 | 1482.7689 | -92.3534 |
| 190.500 | -.000136 | 280748. | -7299.1984 | -.0004629 | 1344.6079 | 16.8027 |
| 198.120 | -.002960 | 225983. | -6919.9988 | -.0002964 | 1208.4186 | 82.7248 |
| 205.740 | -.004653 | 175874. | -6238.2047 | -.0001644 | 1083.8086 | 96.2238 |
| 213.360 | -.005465 | 131239. | -5484.7434 | -6.3464E-05 | 972.8080 | 101.5351 |
| 220.980 | -.005620 | 92412.7028 | -4707.4153 | 1.0011E-05 | 876.2562 | 102.4880 |
| 228.600 | -.005313 | 59477.6577 | -3933.7268 | 5.9911E-05 | 794.3534 | 100.5799 |
| 236.220 | -.004707 | 32344.0110 | -3182.4781 | 9.0077E-05 | 726.8775 | 96.5982 |
| 243.840 | -.003940 | 10798.2313 | -2467.6274 | .0001042 | 673.2976 | 91.0266 |
| 251.460 | -.003118 | -5469.1711 | -1800.0479 | .0001060 | 660.0453 | 84.1911 |
| 259.080 | -.002324 | -16844.5078 | -1188.4921 | 9.8670E-05 | 688.3334 | 76.3222 |
| 266.700 | -.001615 | -23777.2764 | -640.2287 | 8.5325E-05 | 705.5738 | 67.5789 |
| 274.320 | -.001024 | -26770.6388 | -161.6126 | 6.8718E-05 | 713.0177 | 58.0421 |
| 281.940 | -.000567 | -26376.3968 | 241.0641 | 5.1258E-05 | 712.0373 | 47.6473 |
| 289.560 | -.000243 | -23198.3744 | 536.7189 | 3.4972E-05 | 704.1342 | 29.9524 |
| 297.180 | -3.45E-05 | -18266.0861 | 667.0568 | 2.1350E-05 | 691.8686 | 4.2570 |
| 304.800 | 8.24E-05 | -13074.7268 | 644.5558 | 1.1053E-05 | 678.9587 | -10.1628 |
| 312.420 | .000134 | -8464.9544 | 542.9260 | 3.9769E-06 | 667.4952 | -16.5117 |
| 320.040 | .000143 | -4808.4143 | 412.8260 | -3.8377E-07 | 658.4021 | -17.6353 |
| 327.660 | .000128 | -2172.7252 | 285.4735 | -2.6773E-06 | 651.8477 | -15.7906 |
| 335.280 | .000102 | -452.4942 | 177.2871 | -3.5397E-06 | 647.5698 | -12.6048 |
| 342.900 | 7.41E-05 | 536.1434 | 94.4411 | -3.5122E-06 | 647.7778 | -9.1396 |
| 350.520 | 4.87E-05 | 993.7471 | 36.7388 | -3.0096E-06 | 648.9158 | -6.0054 |
| 358.140 | 2.83E-05 | 1102.0056 | .5820269 | -2.3211E-06 | 649.1850 | -3.4846 |
| 365.760 | 1.33E-05 | 1007.2158 | -18.9582 | -1.6282E-06 | 648.9493 | -1.6441 |
| 373.380 | 3.45E-06 | 816.3084 | -26.8425 | -1.0291E-06 | 648.4745 | -.4252963 |
| 381.000 | -2.35E-06 | 600.1752 | -27.3596 | -5.6375E-07 | 647.9371 | .2895786 |
| 388.620 | -5.14E-06 | 400.4655 | -23.8408 | -2.3501E-07 | 647.4404 | .6339701 |
| 396.240 | -5.93E-06 | 237.3062 | -18.6397 | -2.5486E-08 | 647.0347 | .7311574 |
| 403.860 | -5.53E-06 | 116.4467 | -13.2561 | 9.0731E-08 | 646.7341 | .6818573 |
| 411.480 | -4.55E-06 | 35.1031 | -8.5221 | 1.4052E-07 | 646.5318 | .5606756 |
| 419.100 | -3.39E-06 | -13.7081 | -4.7940 | 1.4755E-07 | 646.4786 | .4178251 |
| 426.720 | -2.30E-06 | -38.2496 | -2.1222 | 1.3048E-07 | 646.5397 | .2834364 |
| 434.340 | -1.40E-06 | -46.3087 | -.3844605 | 1.0270E-07 | 646.5597 | .1726590 |
| 441.960 | -7.34E-07 | -44.3123 | .6180514 | 7.2928E-08 | 646.5548 | .0904675 |
| 449.580 | -2.89E-07 | -37.0341 | 1.0985 | 4.6203E-08 | 646.5367 | .0356297 |
| 457.200 | -2.96E-08 | -27.6630 | 1.2481 | 2.4949E-08 | 646.5133 | .0036528 |
| 464.820 | 9.12E-08 | -18.0617 | 1.2192 | 9.9268E-09 | 646.4895 | -.0112480 |
| 472.440 | 1.22E-07 | -9.1019 | .9766104 | 1.0029E-09 | 646.4672 | -.0524265 |
| 480.060 | 1.07E-07 | -3.1802 | .6019837 | -3.0321E-09 | 646.4525 | -.0459007 |
| 487.680 | 7.54E-08 | .0783747 | .3032260 | -4.0511E-09 | 646.4447 | -.0325134 |
| 495.300 | 4.48E-08 | 1.4490 | .1058351 | -3.5493E-09 | 646.4482 | -.0192952 |
| 502.920 | 2.14E-08 | 1.6983 | -.0027446 | -2.5154E-09 | 646.4488 | -.0092034 |
| 510.540 | 6.44E-09 | 1.4122 | -.0483853 | -1.4935E-09 | 646.4481 | -.0027758 |
| 518.160 | -1.40E-09 | .9639005 | -.0566564 | -7.1287E-10 | 646.4470 | .0006049 |
| 525.780 | -4.42E-09 | .5501331 | -.0470901 | -2.1547E-10 | 646.4459 | .0019059 |
| 533.400 | -4.69E-09 | .2466750 | -.0321321 | 4.6298E-11 | 646.4452 | .0020200 |
| 541.020 | -3.72E-09 | .0603478 | -.0183327 | 1.4716E-10 | 646.4447 | .0016019 |
| 548.640 | -2.44E-09 | -.0330064 | -.0082155 | 1.5615E-10 | 646.4446 | .0010535 |
| 556.260 | -1.34E-09 | -.0651661 | -.0020054 | 1.2389E-10 | 646.4447 | .0005764 |
| 563.880 | -5.57E-10 | -.0638147 | .0011046 | 8.1520E-11 | 646.4447 | .0002399 |
| 571.500 | -9.52E-11 | -.0484934 | .0021749 | 4.4624E-11 | 646.4447 | 4.1032E-05 |
| 579.120 | 1.23E-10 | -.0307580 | .0021286 | 1.8587E-11 | 646.4446 | -5.3185E-05 |
| 586.740 | 1.88E-10 | -.0160909 | .0016172 | 3.1963E-12 | 646.4446 | -8.1040E-05 |
| 594.360 | 1.72E-10 | -.0061187 | .0010258 | -4.1001E-12 | 646.4446 | -7.4177E-05 |
| 601.980 | 1.26E-10 | -.0004496 | .0005370 | -6.2580E-12 | 646.4446 | -5.4112E-05 |

16inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 609.600 | 7.68E-11 | .0020778 | .0002048 | -5.7231E-12 | 646.4446 | -3.3078E-05 |
| 617.220 | 3.83E-11 | .0026832 | 1.5829E-05 | -4.1590E-12 | 646.4446 | -1.6526E-05 |
| 624.840 | 1.34E-11 | .0023273 | -6.9096E-05 | -2.5129E-12 | 646.4446 | -5.7638E-06 |
| 632.460 | 5.25E-14 | .0016351 | -9.1142E-05 | -1.2112E-12 | 646.4446 | -2.2631E-08 |
| 640.080 | -5.08E-12 | .0009406 | -8.2882E-05 | -3.6498E-13 | 646.4446 | 2.1906E-06 |
| 647.700 | -5.51E-12 | .0003727 | -5.8136E-05 | 6.6502E-14 | 646.4446 | 4.3045E-06 |
| 655.320 | -4.07E-12 | 5.4522E-05 | -2.9621E-05 | 2.0687E-13 | 646.4446 | 3.1796E-06 |
| 662.940 | -2.36E-12 | -7.9105E-05 | -1.0491E-05 | 1.9879E-13 | 646.4446 | 1.8415E-06 |
| 670.560 | -1.04E-12 | -.0001058 | -3.7849E-07 | 1.3806E-13 | 646.4446 | 8.1276E-07 |
| 678.180 | -2.53E-13 | -8.5147E-05 | 3.4714E-06 | 7.5342E-14 | 646.4446 | 1.9771E-07 |
| 685.800 | 1.08E-13 | -5.3002E-05 | 3.9035E-06 | 2.9957E-14 | 646.4446 | -8.4285E-08 |
| 693.420 | 2.03E-13 | -2.5716E-05 | 2.9768E-06 | 4.0957E-15 | 646.4446 | -1.5896E-07 |
| 701.040 | 1.70E-13 | -7.6441E-06 | 1.8642E-06 | -6.8641E-15 | 646.4446 | -1.3305E-07 |
| 708.660 | 9.89E-14 | 2.7077E-06 | 8.2759E-07 | -8.4858E-15 | 646.4446 | -1.3903E-07 |
| 716.280 | 4.10E-14 | 4.9853E-06 | 7.8336E-08 | -5.9584E-15 | 646.4446 | -5.7629E-08 |
| 723.900 | 8.06E-15 | 3.9134E-06 | -1.8440E-07 | -3.0350E-15 | 646.4446 | -1.1330E-08 |
| 731.520 | -5.27E-15 | 2.1811E-06 | -1.9931E-07 | -1.0328E-15 | 646.4446 | 7.4157E-09 |
| 739.140 | -7.68E-15 | 8.7793E-07 | -1.2989E-07 | -2.7874E-17 | 646.4446 | 1.0805E-08 |
| 746.760 | -5.70E-15 | 2.0162E-07 | -5.8192E-08 | 3.2679E-16 | 646.4446 | 8.0130E-09 |
| 754.380 | -2.70E-15 | -9.5630E-09 | -1.3179E-08 | 3.8988E-16 | 646.4446 | 3.8016E-09 |
| 762.000 | 2.44E-16 | 0.0000 | 0.0000 | 3.8674E-16 | 646.4446 | -3.4259E-10 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1: Fixed

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00006579 |
| Maximum bending moment | = | -1441583. lbs-in |
| Maximum shear force | = | 27029.92603 lbs |
| Depth of maximum bending moment | = | 0.00000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 14 |
| Number of zero deflection points | = | 10 |

---

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

---

Pile-head boundary conditions are Displacement and Moment (BC Type 4)
Specified deflection at pile head = .500000 in
Specified moment at pile head = .000 in-lbs
Specified axial load at pile head = 130000.000 lbs

| Depth X in | Deflect. y in | Moment M lbs-in | Shear V lbs | Slope S Rad. | Total Stress lbs/in**2 | Soil Res p lbs/in |
|---|---|---|---|---|---|---|
| 0.000 | .500000 | 0.0000 | 13949.5773 | -.0057042 | 646.4446 | -192.6633 |
| 7.620 | .456534 | 106353. | 12422.0423 | -.0056693 | 910.9227 | -208.2645 |
| 15.240 | .413600 | 200544. | 10780.3281 | -.0055685 | 1145.1565 | -222.6316 |
| 22.860 | .371670 | 281677. | 9034.1053 | -.0054100 | 1346.9190 | -235.6946 |
| 30.480 | .331151 | 348942. | 7193.5707 | -.0052029 | 1514.1925 | -247.3853 |
| 38.100 | .292379 | 401615. | 5269.4461 | -.0049563 | 1645.1802 | -257.6342 |
| 45.720 | .255617 | 439068. | 3898.2820 | -.0046801 | 1738.3170 | -102.2514 |
| 53.340 | .221054 | 470297. | 3109.7453 | -.0043814 | 1815.9785 | -104.7137 |

16inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 60.960 | .188845 | 495141. | 2305.8534 | -.0040642 | 1877.7588 | -106.2816 |
| 68.580 | .159116 | 513491. | 1493.5480 | -.0037328 | 1923.3911 | -106.9219 |
| 76.200 | .131957 | 525298. | 680.0328 | -.0033916 | 1952.7534 | -106.5991 |
| 83.820 | .107428 | 530574. | -127.2022 | -.0030447 | 1965.8732 | -105.2736 |
| 91.440 | .085556 | 529391. | -920.3398 | -.0026964 | 1962.9333 | -102.8990 |
| 99.060 | .066335 | 521890. | -1689.6972 | -.0023511 | 1944.2784 | -99.0321 |
| 106.680 | .049726 | 508298. | -2423.3572 | -.0020126 | 1910.4791 | -93.5296 |
| 114.300 | .035662 | 488945. | -3414.4592 | -.0016850 | 1862.3520 | -166.6021 |
| 121.920 | .024046 | 459600. | -4626.2193 | -.0013734 | 1789.3771 | -151.4451 |
| 129.540 | .014732 | 421163. | -5710.6444 | -.0010840 | 1693.7904 | -133.1809 |
| 137.160 | .007526 | 374718. | -6637.6699 | -.0008226 | 1578.2915 | -110.1329 |
| 144.780 | .002196 | 321634. | -7343.6667 | -.0005938 | 1446.2834 | -75.1682 |
| 152.400 | -.001524 | 263977. | -7378.0756 | -.0004014 | 1302.9010 | 66.1370 |
| 160.020 | -.003922 | 209988. | -6779.9896 | -.0002457 | 1168.6410 | 90.8410 |
| 167.640 | -.005268 | 161136. | -6051.8418 | -.0001238 | 1047.1581 | 100.2739 |
| 175.260 | -.005808 | 118003. | -5275.0682 | -3.2067E-05 | 939.8934 | 103.6036 |
| 182.880 | -.005757 | 80807.9336 | -4486.7420 | 3.3247E-05 | 847.3975 | 103.3061 |
| 190.500 | -.005301 | 49558.9315 | -3710.2101 | 7.6076E-05 | 769.6875 | 100.5080 |
| 198.120 | -.004597 | 24113.6088 | -2962.0961 | .0001003 | 706.4102 | 95.8474 |
| 205.740 | -.003773 | 4217.9133 | -2255.0298 | .0001096 | 656.9336 | 89.7343 |
| 213.360 | -.002927 | -10470.1593 | -1598.9986 | .0001075 | 672.4817 | 82.4524 |
| 220.980 | -.002134 | -20363.8701 | -1002.1404 | 9.7403E-05 | 697.0854 | 74.2033 |
| 228.600 | -.001443 | -25935.7546 | -471.3174 | 8.2193E-05 | 710.9415 | 65.1203 |
| 236.220 | -.000881 | -27709.5876 | -12.7174 | 6.4569E-05 | 715.3527 | 55.2472 |
| 243.840 | -.000459 | -26257.4912 | 367.0483 | 4.6839E-05 | 711.7416 | 44.4289 |
| 251.460 | -.000168 | -22208.5693 | 615.0714 | 3.0917E-05 | 701.6728 | 20.6691 |
| 259.080 | 1.23E-05 | -16945.0564 | 688.0199 | 1.8054E-05 | 688.5835 | -1.5225 |
| 266.700 | .000108 | -11758.9153 | 631.7218 | 8.6240E-06 | 675.6866 | -13.2539 |
| 274.320 | .000144 | -7334.7022 | 513.6855 | 2.3512E-06 | 664.6845 | -17.7267 |
| 281.940 | .000143 | -3935.0060 | 378.8171 | -1.3512E-06 | 656.2301 | -17.6718 |
| 289.560 | .000123 | -1558.8531 | 253.6214 | -3.1560E-06 | 650.3211 | -15.1879 |
| 297.180 | 9.52E-05 | -63.5625 | 151.0196 | -3.6890E-06 | 646.6026 | -11.7417 |
| 304.800 | 6.70E-05 | 749.9936 | 74.8271 | -3.4635E-06 | 648.3096 | -8.2563 |
| 312.420 | 4.25E-05 | 1083.6650 | 23.4298 | -2.8611E-06 | 649.1394 | -5.2338 |
| 320.040 | 2.34E-05 | 1112.7320 | -7.4851 | -2.1396E-06 | 649.2117 | -2.8803 |
| 327.660 | 9.84E-06 | 973.8317 | -23.0830 | -1.4541E-06 | 648.8663 | -1.2137 |
| 335.280 | 1.20E-06 | 763.8273 | -28.2715 | -8.8320E-07 | 648.3440 | -.1481518 |
| 342.900 | -3.62E-06 | 544.7234 | -27.1373 | -4.5331E-07 | 647.7992 | .4458494 |
| 350.520 | -5.71E-06 | 351.1529 | -22.7579 | -1.5899E-07 | 647.3178 | .7035971 |
| 358.140 | -6.04E-06 | 198.2078 | -17.2404 | 2.1493E-08 | 646.9375 | .7445809 |
| 365.760 | -5.38E-06 | 88.3673 | -11.8767 | 1.1564E-07 | 646.6643 | .6632125 |
| 373.380 | -4.28E-06 | 16.9783 | -7.3408 | 1.5025E-07 | 646.4868 | .5272958 |
| 381.000 | -3.09E-06 | -23.8046 | -3.8806 | 1.4801E-07 | 646.5038 | .3808984 |
| 388.620 | -2.02E-06 | -42.4553 | -1.4799 | 1.2624E-07 | 646.5501 | .2491954 |
| 396.240 | -1.17E-06 | -46.6091 | .0169830 | 9.6978E-08 | 646.5605 | .1436998 |
| 403.860 | -5.43E-07 | -42.3886 | .8196561 | 6.7740E-08 | 646.5500 | .0669756 |
| 411.480 | -1.33E-07 | -34.2517 | 1.1374 | 4.2562E-08 | 646.5297 | .0164175 |
| 419.100 | 1.05E-07 | -25.1392 | 1.1504 | 2.3050E-08 | 646.5071 | -.0129972 |
| 426.720 | 2.18E-07 | -16.7651 | .9984314 | 9.2838E-09 | 646.4862 | -.0268936 |
| 434.340 | 2.47E-07 | -9.9415 | .7799858 | 5.0996E-10 | 646.4693 | -.0304412 |
| 441.960 | 2.26E-07 | -4.8791 | .5578895 | -4.3590E-09 | 646.4567 | -.0278518 |
| 449.580 | 1.80E-07 | -1.4307 | .3669989 | -6.4319E-09 | 646.4481 | -.0222507 |
| 457.200 | 1.28E-07 | .7267181 | .2221537 | -6.6632E-09 | 646.4464 | -.0157664 |
| 464.820 | 7.89E-08 | 1.9682 | .1250095 | -5.7779E-09 | 646.4494 | -.0097307 |
| 472.440 | 3.98E-08 | 2.6433 | .0225502 | -4.2629E-09 | 646.4511 | -.0171615 |
| 480.060 | 1.40E-08 | 2.3203 | -.0657524 | -2.6322E-09 | 646.4503 | -.0060150 |
| 487.680 | -2.91E-10 | 1.6465 | -.0881923 | -1.3290E-09 | 646.4486 | .0001253 |
| 495.300 | -6.30E-09 | .9788514 | -.0773776 | -4.6654E-10 | 646.4470 | .0027132 |
| 502.920 | -7.40E-09 | .4681486 | -.0548892 | 8.8392E-12 | 646.4457 | .0031892 |
| 510.540 | -6.16E-09 | .1423222 | -.0326220 | 2.0939E-10 | 646.4449 | .0026552 |
| 518.160 | -4.21E-09 | -.0294256 | -.0155942 | 2.4648E-10 | 646.4446 | .0018141 |
| 525.780 | -2.41E-09 | -.0958224 | -.0047340 | 2.0534E-10 | 646.4448 | .0010364 |
| 533.400 | -1.08E-09 | -.1019783 | .0009883 | 1.4035E-10 | 646.4448 | .0004655 |

16inACP.lpo

| | | | | | | |
|---|---|---|---|---|---|---|
| 541.020 | -2.66E-10 | -.0810382 | .0031987 | 8.0229E-11 | 646.4448 | .0001146 |
| 548.640 | 1.42E-10 | -.0533887 | .0034016 | 3.6066E-11 | 646.4447 | -6.1383E-05 |
| 556.260 | 2.84E-10 | -.0292687 | .0027021 | 8.9107E-12 | 646.4446 | -.0001222 |
| 563.880 | 2.78E-10 | -.0122262 | .0017796 | -4.7214E-12 | 646.4446 | -.0001199 |
| 571.500 | 2.12E-10 | -.0021378 | .0009753 | -9.4404E-12 | 646.4446 | -9.1211E-05 |
| 579.120 | 1.34E-10 | .0026558 | .0004072 | -9.2702E-12 | 646.4446 | -5.7905E-05 |
| 586.740 | 7.04E-11 | .0040855 | 7.0978E-05 | -7.0555E-12 | 646.4446 | -3.0329E-05 |
| 594.360 | 2.68E-11 | .0037515 | -8.8654E-05 | -4.4808E-12 | 646.4446 | -1.1569E-05 |
| 601.980 | 2.09E-12 | .0027433 | -.0001362 | -2.3471E-12 | 646.4446 | -9.0221E-07 |
| 609.600 | -8.92E-12 | .0016810 | -.0001250 | -8.9356E-13 | 646.4446 | 3.8454E-06 |
| 617.220 | -1.15E-11 | .0008408 | -9.1383E-05 | -6.5107E-14 | 646.4446 | 4.9662E-06 |
| 624.840 | -9.92E-12 | .0002884 | -5.6182E-05 | 3.0586E-13 | 646.4446 | 4.2730E-06 |
| 632.460 | -6.86E-12 | -1.6039E-05 | -2.8634E-05 | 3.9534E-13 | 646.4446 | 2.9575E-06 |
| 640.080 | -3.89E-12 | -.0001488 | -1.0978E-05 | 3.4120E-13 | 646.4446 | 1.6766E-06 |
| 647.700 | -1.66E-12 | -.0001840 | 3.6021E-07 | 2.3188E-13 | 646.4446 | 1.2993E-06 |
| 655.320 | -3.57E-13 | -.0001437 | 6.3724E-06 | 1.2421E-13 | 646.4446 | 2.7874E-07 |
| 662.940 | 2.30E-13 | -8.7148E-05 | 6.7500E-06 | 4.8362E-14 | 646.4446 | -1.7961E-07 |
| 670.560 | 3.80E-13 | -4.0947E-05 | 4.9339E-06 | 6.2795E-15 | 646.4446 | -2.9707E-07 |
| 678.180 | 3.26E-13 | -1.1968E-05 | 2.8329E-06 | -1.1104E-14 | 646.4446 | -2.5437E-07 |
| 685.800 | 2.11E-13 | 2.2486E-06 | 1.2356E-06 | -1.4297E-14 | 646.4446 | -1.6486E-07 |
| 693.420 | 1.08E-13 | 6.8912E-06 | 2.8691E-07 | -1.1295E-14 | 646.4446 | -8.4144E-08 |
| 701.040 | 3.89E-14 | 6.6435E-06 | -1.4944E-07 | -6.8482E-15 | 646.4446 | -3.0383E-08 |
| 708.660 | 3.34E-15 | 4.6273E-06 | -2.8308E-07 | -3.1455E-15 | 646.4446 | -4.6940E-09 |
| 716.280 | -9.05E-15 | 2.3355E-06 | -2.5250E-07 | -8.5801E-16 | 646.4446 | 1.2722E-08 |
| 723.900 | -9.74E-15 | 7.8094E-07 | -1.5185E-07 | 1.6583E-16 | 646.4446 | 1.3694E-08 |
| 731.520 | -6.52E-15 | 2.0991E-08 | -6.4745E-08 | 4.2928E-16 | 646.4446 | 9.1681E-09 |
| 739.140 | -3.20E-15 | -2.0663E-07 | -1.2692E-08 | 3.6830E-16 | 646.4446 | 4.4941E-09 |
| 746.760 | -9.07E-16 | -1.7317E-07 | 9.2882E-09 | 2.4352E-16 | 646.4446 | 1.2750E-09 |
| 754.380 | 5.15E-16 | -6.5562E-08 | 1.1384E-08 | 1.6509E-16 | 646.4446 | -7.2486E-10 |
| 762.000 | 1.61E-15 | 0.0000 | 0.0000 | 1.4355E-16 | 646.4446 | -2.2631E-09 |

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2: Free

| | | |
|---|---|---|
| Pile-head deflection | = | .50000000 in |
| Computed slope at pile head | = | -.00570423 |
| Maximum bending moment | = | 530573.59440 lbs-in |
| Maximum shear force | = | 13949.57732 lbs |
| Depth of maximum bending moment | = | 83.82000000 in |
| Depth of maximum shear force | = | 0.00000 in |
| Number of iterations | = | 15 |
| Number of zero deflection points | = | 10 |

---

Summary of Pile Response(s)

---

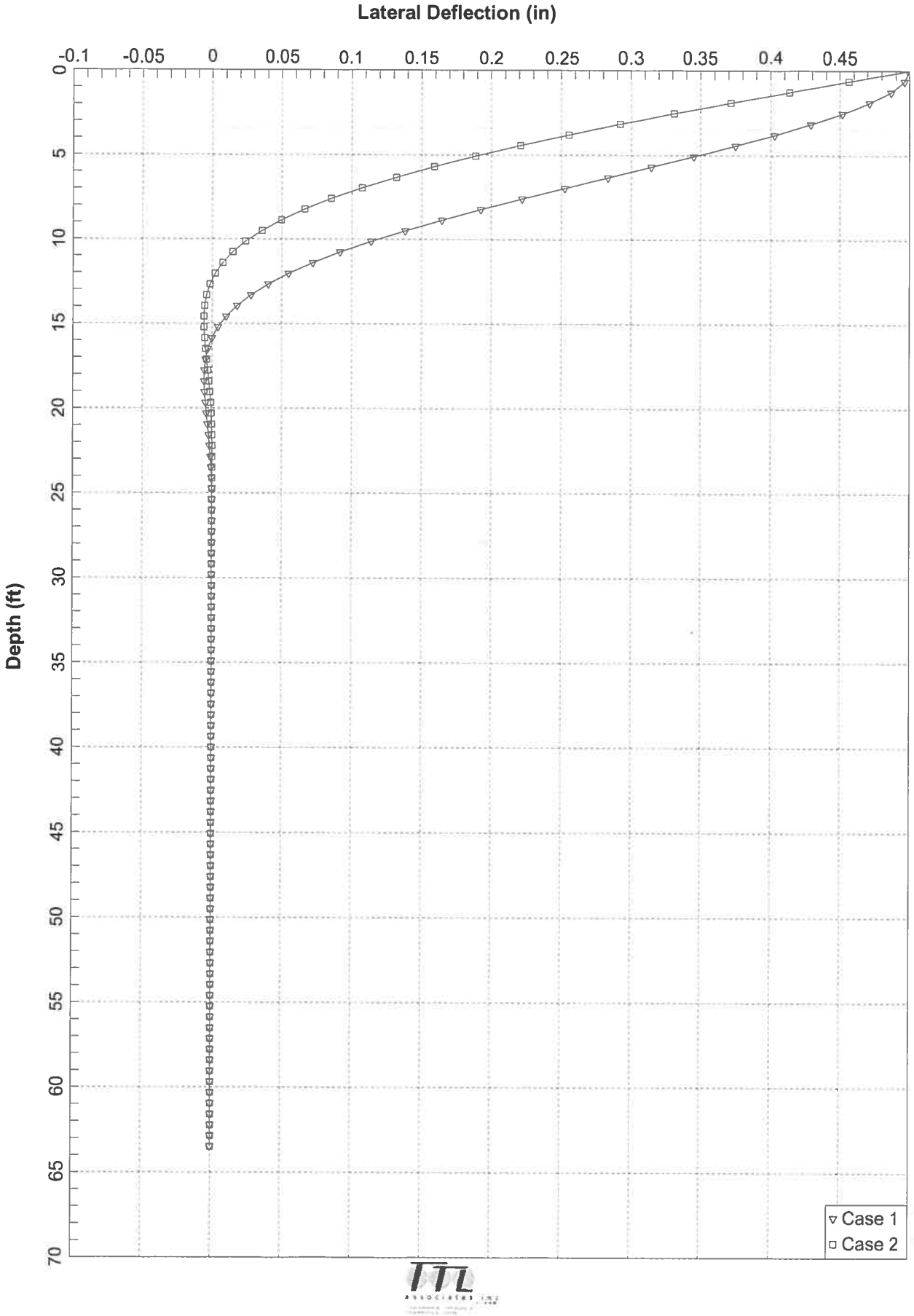
Definition of Symbols for Pile-Head Loading Conditions:

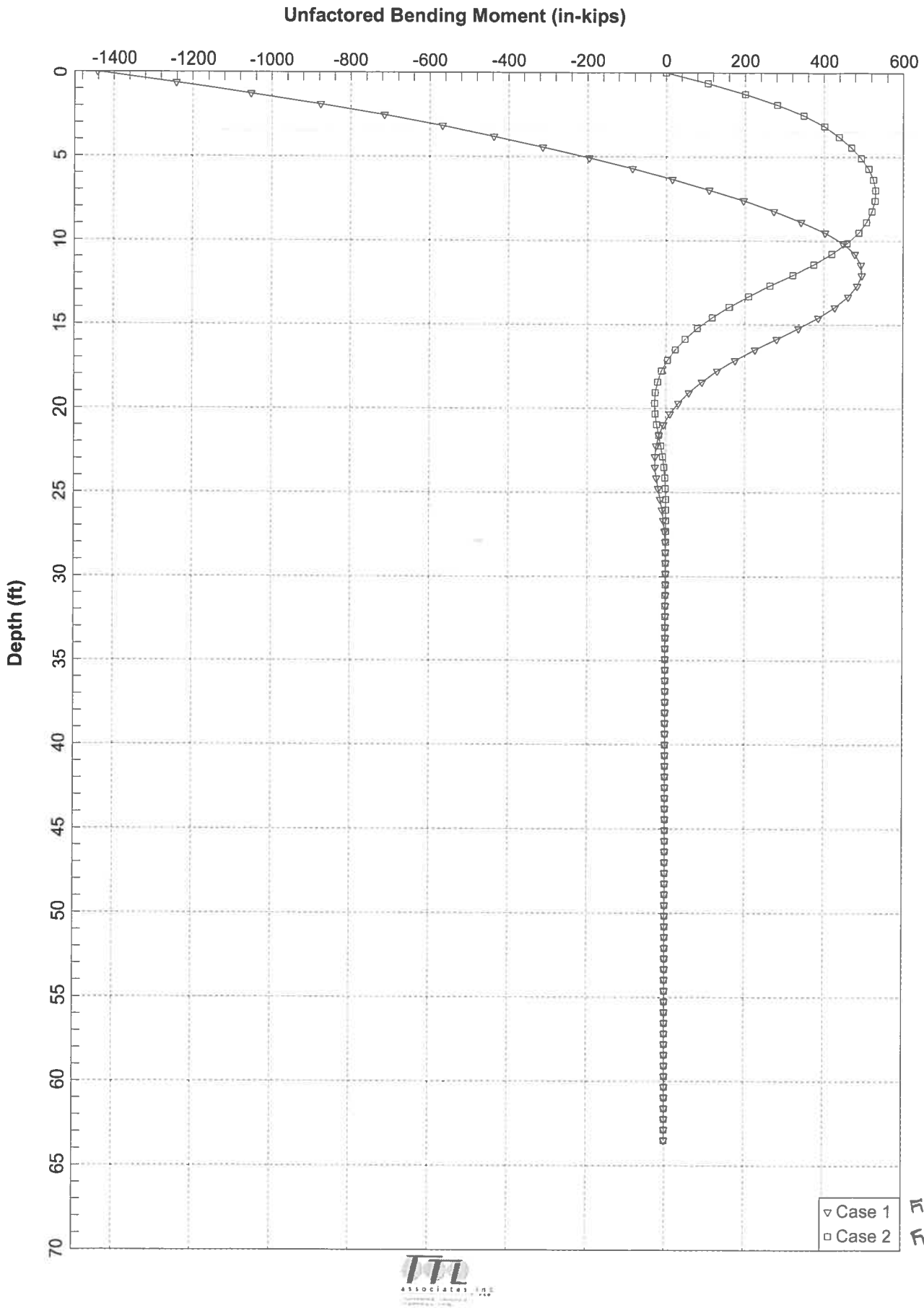
| | |
|---|---|
| Type 1 = Shear and Moment, | y = pile-head displacment in |
| Type 2 = Shear and Slope, | M = Pile-head Moment lbs-in |
| Type 3 = Shear and Rot. Stiffness, | V = Pile-head Shear Force lbs |
| Type 4 = Deflection and Moment, | S = Pile-head Slope, radians |
| Type 5 = Deflection and Slope, | R = Rot. Stiffness of Pile-head in-lbs/rad |

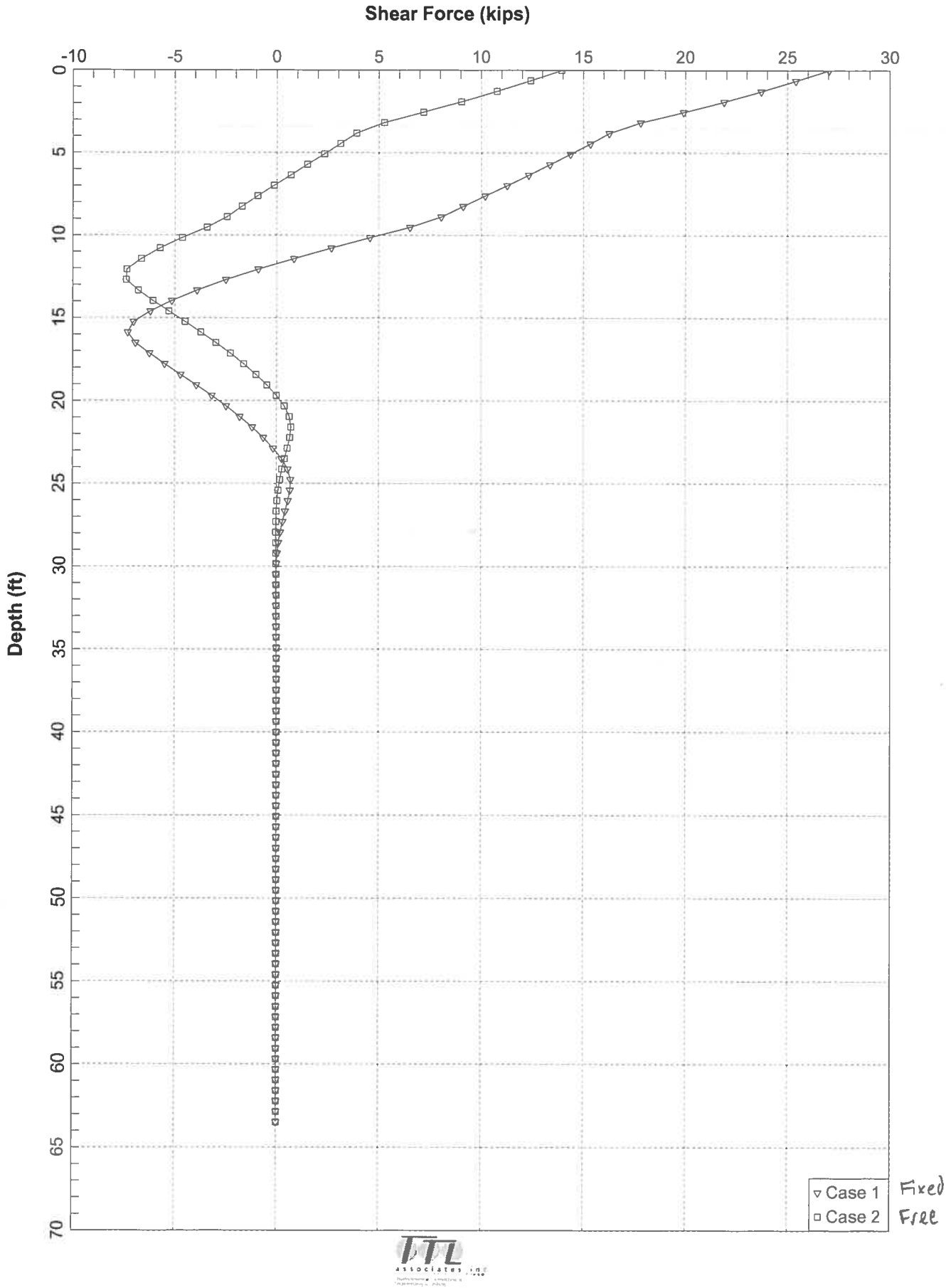
16inACP.lpo

| Load Type | Pile-Head Condition 1 | Pile-Head Condition 2 | Axial Load lbs | Pile-Head Deflection in | Maximum Moment in-lbs | Maximum Shear lbs | |
|---|---|---|---|---|---|---|---|
| 5 | y= .500000 | S= 0.000 | 130000. | .5000000 | -1441583. | 27029.9260 | Fixed |
| 4 | y= .500000 | M= 0.000 | 130000. | .5000000 | 530574. | 13949.5773 | Free |

The analysis ended normally.


Lateral Deflection (in)
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Case 1
Case 2
Fixed
Free


Unfactored Bending Moment (in-kips)
-1400
-1200
-1000
-800
-600
-400
-200
0
200
400
600
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Case 1
Case 2
Fixed
Free


Shear Force (kips)
-10
-5
0
5
10
15
20
25
30
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Case 1
Case 2
Fixed
Free

Summary: Application of Clean Energy Future-Oregon, LLC Part 6: Appendix G Attachment B (Continued) to Attachment C electronically filed by Teresa Orahood on behalf of Sally W. Bloomfield