

November 25, 2019

Ref: 38026.39

Mr. Bo Chen, P.E.
Virginia Department of Transportation
4975 Alliance Drive
Fairfax, VA 22030

Re: Foundations for Mast Arm Poles
Proj # CRCP-2019-0001
Intersection Tall Cedars Parkway (Route 2200) and Stone Springs Blvd (Route 2625), Loudoun County, VA

This is to certify that the traffic pole foundations from the above referenced intersection were designed in accordance with:

- VDOT 2016 Road and Bridge Specifications
- The 2013 AASHTO Specification (LTS-6), Using:
 - 80 mph wind velocity with Appendix C
 - 25-year recurrence
 - Fatigue Category II (no fatigue loads for mast arms smaller than 50')
 - Natural Wind Gusts (11.2 MPH)
 - No Galloping Loads
 - No truck-induced Gust
 - Maximum Standard Loading (MP-3)

The following identifies this submittal's documents:

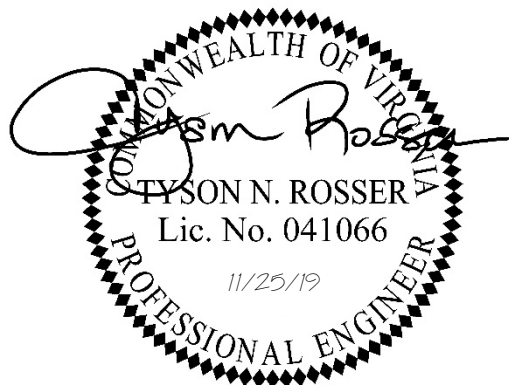
VHB Construction Drawings:	Sheets 1 through 3
Calculations Dated:	10/4/2019 and 11/15/2019 Consisting of 77 pages
Appendix Information:	ECS Mid-Atlantic, LLC Geotechnical Engineering
(separate document)	Report, Project No. 01:28336

In accordance with the Virginia Department of Transportation Road and Bridge Specifications, I am a registered Professional Engineer holding a valid license in the Commonwealth of Virginia.

Sincerely,



Tyson Rosser, P.E.
Director of Transportation Engineering
TRosser@VHB.com





Computations

Project: Tall Cedars @ Stone Springs
 Location: Loudoun County, VA
 Calculated by: KBP
 Checked by: KCD
 Title: Drilled Shafts

Project #: 38026.39
 Sheet: 1 of 2
 Date: 10/4/19
 Date: 10/9/19

Ref:

- (1) ATS Sales Mast Arm Pole submittal 5/1/2018 (approved regional mast arm/pole loading)
- (2) VDOT Instructional & Information Memorandum S&B-90.2
- (3) ECS Mid-Atlantic Geotechnical Report 9/13/2019

Arm Length	POLE A		Load Factors	
	60 feet		1.3	2.25
	Service Load (1)		Structure	Geotech
Axial	5.1		6.6	11.5 k
Shear	5.3		6.9	11.9 k
Moment	128.0		166.3	287.9 k-ft
Torsion	134.6		175.0	303 k-ft

(1) Page 125 of 165

TORSION

Boring	B-5			
Depth	Density (γ)	Friction Angle	$f_{max}^{(4)}$	Torsion Capacity ⁽²⁾
feet	pcf	degrees	psf	ft-lbs
2	115	27	138	0
7.5	118	31	665	91923
12.5	135	35	1460	183469
			TOTAL	275.4 k-ft
			F.S.	2.05 OK

- (3) Soil parameters Table 5.1.1
- (2) Disregard top 2' feet, page 5 of 10 requires disregarding top 1.5'
- (2) Factor of Safety for Torsion of 1.3, page 5 of 10
- (4) f_{max} = Cumulative ($\beta * \gamma * \text{half layer depth}$)

BEARING

Beta	1.2	confirm value
Shaft Dia.	4	feet
Tip Area	12.6	feet ²
Tip Resist (all.) ⁽³⁾	10	ksf
Total Axial Cap (all.) ⁽⁶⁾	126	k
Total Length ⁽⁵⁾	13.5	ft
Total Axial	30.61	k
F.S. ⁽²⁾	4.12	OK

- (2) Factor of Safety for Bearing of 1.75, page 5 of 10
- (3) Drilled Shaft Parameters Table 5.1.3.2.1
- (5) Total Length includes 1' extension above Finish Grade
- (6) excludes skin friction

Arm Length	POLE D		Load Factors	
	60 feet		1.3	2.25
	Service Load ⁽¹⁾		Structure	Geotech
Axial	5.1		6.6	11.5 k
Shear	5.3		6.9	11.9 k
Moment	128.0		166.3	287.9 k-ft
Torsion	134.6		175.0	303 k-ft

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TORSION

Boring	B-3			
Depth	Density (γ)	Friction Angle	$f_{max}^{(4)}$	Torsion Capacity ⁽²⁾
feet	pcf	degrees	psf	ft-lbs
2	115	27	138	0
11.5	118	31	949	226584
12.5	135	35	1702	42776
			TOTAL	269.4 k-ft
			F.S. ⁽²⁾	2.00 OK

- (3) Soil parameters Table 5.1.1
- (2) Disregard top 2' feet, page 5 of 10 requires disregarding top 1.5'
- (2) Factor of Safety for Torsion of 1.3, page 5 of 10
- (4) f_{max} = Cumulative ($\beta * \gamma * \text{half layer depth}$)

BEARING

Beta	1.2	confirm value
Shaft Dia.	4	feet
Tip Area	12.6	feet ²
Tip Resist (all.) ⁽²⁾	10	ksf
Tip Resist (all.)	126	k
Total Length ⁽⁵⁾	13.5	ft
Total Axial	30.61	k
F.S. ⁽²⁾	4.12	OK

- (2) Factor of Safety for Bearing of 1.75, page 5 of 10
- (3) Drilled Shaft Parameters Table 5.1.3.2.1
- (5) Total Length includes 1' extension above Finish Grade
- (6) excludes skin friction



Computations

Project: Tall Cedars @ Stone Springs
Location: Loudoun County, VA
Calculated by: KBP
Checked by: KCD
Title: Drilled Shafts

Project #: 38026.39
Sheet: 2 of 2
Date: 10/4/19
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- (3) ECS Mid-Atlantic Geotechnical Report 9/13/2019

Arm Length	POLE C 60 feet	Load Factors		
		1.3	2.25	
	Service Load (1)	Structure	Geotech	
Axial	5.1	6.6	11.5	k
Shear	5.3	6.9	11.9	k
Moment	128.0	166.3	287.9	k-ft
Torsion	134.6	175.0	303	k-ft

(1) Page 125 of 165

TORSION

Boring	B-4			
Depth	Density (γ)	Friction Angle	$f_{\max}^{(4)}$	Torsion Capacity ⁽²⁾
feet	pcf	degrees	psf	ft-lbs
1	115	27	69	0
2	118	31	209	0
7	118	31	634	79671
12.5	135	35	1437	198637
			TOTAL	278.3
			F.S. ⁽²⁾	2.07

k-ft

OK

- (3) Soil parameters Table 5.1.1
- (2) Disregard top 2' feet, page 5 of 10 required disregarding to 1.5'
- (2) Factor of Safety for Torsion of 1.3, page 5 of 10
- (4) f_{\max} = Cumulative ($\beta * \gamma * \text{half layer depth}$)

BEARING

Beta	1.2	confirm value
Shaft Dia.	4	feet
Tip Area	12.6	feet ²
Tip Resist (all.) ⁽²⁾	10	ksf
Tip Resist (all.)	126	k
Total Length ⁽⁵⁾	13.5	ft
Total Axial	30.61	k
F.S. ⁽²⁾	4.12	OK

- (2) Factor of Safety for Bearing of 1.75, page 5 of 10
- (3) Drilled Shaft Parameters Table 5.1.3.2.1
- (5) Total Length includes 1' extension above Finish Grade
- (6) excludes skin friction

Pole A.l p10o

LPile for Windows, Version 2018-10.002

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:
\Users\KDurso\Desktop\Working\

Name of input data file:
Pole A.l p10

Name of output report file:
Pole A.l p10

Name of plot output file:
Pole A.l p10

Name of runtime message file:
Pole A.l p10

Date and Time of Analysis

Pole A.l p10o

Date: October 9, 2019

Time: 11: 51: 25

Problem Title

Project Name: Tall Cedars and Stone Springs

Job Number: 38026.39

Client: Loudoun County

Engineer: KBP

Description: Pole A

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- | | | |
|--|---|---------------|
| - Maximum number of iterations allowed | = | 500 |
| - Deflection tolerance for convergence | = | 1.0000E-05 in |
| - Maximum allowable deflection | = | 100.0000 in |
| - Number of pile increments | = | 100 |

Loading Type and Number of Cycles of Loading:

- Static loading specified

Pole A.1p10o

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	13.500 ft
Depth of ground surface below top of pile	=	1.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	48.0000
2	13.500	48.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile
Length of section = 13.500000 ft

	Pole A. Ip10o	
Shaft Diameter	=	48.000000 in
Shear capacity of section	=	0.0000 lbs

Ground Slope and Pile Batter Angles

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

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	1.000000 ft
Distance from top of pile to bottom of layer	=	3.000000 ft
Effective unit weight at top of layer	=	115.000000 pcf
Effective unit weight at bottom of layer	=	115.000000 pcf
Friction angle at top of layer	=	27.000000 deg.
Friction angle at bottom of layer	=	27.000000 deg.
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	3.000000 ft
Distance from top of pile to bottom of layer	=	8.500000 ft
Effective unit weight at top of layer	=	118.000000 pcf
Effective unit weight at bottom of layer	=	118.000000 pcf
Friction angle at top of layer	=	31.000000 deg.
Friction angle at bottom of layer	=	31.000000 deg.
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Pole A. Ip10o

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	8.500000 ft
Distance from top of pile to bottom of layer	=	16.000000 ft
Effective unit weight at top of layer	=	135.000000 pcf
Effective unit weight at bottom of layer	=	135.000000 pcf
Friction angle at top of layer	=	35.000000 deg.
Friction angle at bottom of layer	=	35.000000 deg.
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 2.500 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci
1	Sand (Reese, et al.)	1.0000 3.0000	115.0000 115.0000	27.0000 27.0000	default default
2	Sand (Reese, et al.)	3.0000 8.5000	118.0000 118.0000	31.0000 31.0000	default default
3	Sand (Reese, et al.)	8.5000 16.0000	135.0000 135.0000	35.0000 35.0000	default default

Static Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Compute	Load Top y	Condition	Condition	Axial Thrust
-----------------	---------------	-----------	-----------	--------------

		Pole A. Ip10o			
No.	Type	1	2	Force, lbs	
vs. Pile Length					
1	1	V = 6900. lbs	M = 1995600. in-lbs	6600.	
No					
2	1	V = 11900. lbs	M = 3456000. in-lbs	11500.	
No					

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	13.500000 ft
Shaft Diameter	=	48.000000 in
Concrete Cover Thickness	=	4.000000 in
Number of Reinforcing Bars	=	23 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1810. sq. in.
Total Area of Reinforcing Steel	=	18.170000 sq. in.
Area Ratio of Steel Reinforcement	=	1.00 percent
Edge-to-Edge Bar Spacing	=	4.310499 in
Maximum Concrete Aggregate Size	=	1.000000 in
Ratio of Bar Spacing to Aggregate Size	=	4.31
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Pole A. Ip10o

Nom. Axial Structural Capacity = $0.85 F_c A_c + F_y A_s$	=	5658.238 kips
Tensile Load for Cracking of Concrete	=	-709.624 kips
Nominal Axial Tensile Capacity	=	-1090.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
-----	-----	-----	-----	-----
1	1.000000	0.790000	19.500000	0.000000
2	1.000000	0.790000	18.776887	5.261037
3	1.000000	0.790000	16.661178	10.131887
4	1.000000	0.790000	13.309786	14.251301
5	1.000000	0.790000	8.971268	17.313762
6	1.000000	0.790000	3.967392	19.092140
7	1.000000	0.790000	-1.330727	19.454541
8	1.000000	0.790000	-6.530152	18.374088
9	1.000000	0.790000	-11.245266	15.930913
10	1.000000	0.790000	-15.126370	12.306215
11	1.000000	0.790000	-17.885620	7.768821
12	1.000000	0.790000	-19.318376	2.655250
13	1.000000	0.790000	-19.318376	-2.655250
14	1.000000	0.790000	-17.885620	-7.768821
15	1.000000	0.790000	-15.126370	-12.306215
16	1.000000	0.790000	-11.245266	-15.930913
17	1.000000	0.790000	-6.530152	-18.374088
18	1.000000	0.790000	-1.330727	-19.454541
19	1.000000	0.790000	3.967392	-19.092140
20	1.000000	0.790000	8.971268	-17.313762
21	1.000000	0.790000	13.309786	-14.251301
22	1.000000	0.790000	16.661178	-10.131887
23	1.000000	0.790000	18.776887	-5.261037

NOTE: The positions of the above rebars were computed by LPILE

Minimum spacing between any two bars not equal to zero = 4.310 inches
between bars 10 and 11.

Ratio of bar spacing to maximum aggregate size = 4.31

Concrete Properties:

Compressive Strength of Concrete	=	3000. psi
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Pole A. Ip10o

Modulus of Elasticity of Concrete	=	3122019. psi
Modulus of Rupture of Concrete	=	-410.791918 psi
Compression Strain at Peak Stress	=	0.001634
Tensile Strain at Fracture of Concrete	=	-0.0001160
Maximum Coarse Aggregate Size	=	1.000000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force kips
-----	-----
1	6.600
2	11.500

Definitions of Run Messages and Notes:

- C = concrete in section has cracked in tension.
- Y = stress in reinforcing steel has reached yield stress.
- T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
- Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
 Position of neutral axis is measured from edge of compression side of pile.
 Compressive stresses and strains are positive in sign.
 Tensile stresses and strains are negative in sign.

Axial Thrust Force = 6.600 kips

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in ²	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
-----	-----	-----	-----	-----	-----
6.25000E-07	651.0955233	1041752837.	25.4914107	0.00001593	-0.00001407
0.0576872	0.4576818				
0.00000125	1299.	1038823076.	24.7484545	0.00003094	-0.00002906
0.1114682	0.8884315				
0.00000188	1942.	1035883589.	24.5008170	0.00004594	-0.00004406
0.1647532	1.3191819				

Pol e A. l p10o					
0. 00000250	2582.	1032941666.	24. 3770086	0. 00006094	-0. 00005906
0. 2175423	1. 7499331				
0. 00000313	3219.	1029998770.	24. 3027318	0. 00007595	-0. 00007405
0. 2698354	2. 1806851				
0. 00000375	3851.	1027055386.	24. 2532210	0. 00009095	-0. 00008905
0. 3216325	2. 6114378				
0. 00000438	4480.	1024111724.	24. 2178622	0. 0001060	-0. 0001040
0. 3729337	3. 0421913				
0. 00000500	4480.	896097758.	12. 7659625	0. 00006383	-0. 0001762
0. 2256272	-5. 0741354 C				
0. 00000563	4480.	796531341.	12. 6943377	0. 00007141	-0. 0001986
0. 2517944	-5. 7200861 C				
0. 00000625	4480.	716878207.	12. 6364937	0. 00007898	-0. 0002210
0. 2778256	-6. 3661355 C				
0. 00000688	4480.	651707461.	12. 5900196	0. 00008656	-0. 0002434
0. 3037534	-7. 0120148 C				
0. 00000750	4480.	597398505.	12. 5520762	0. 00009414	-0. 0002659
0. 3295775	-7. 6577234 C				
0. 00000813	4480.	551444774.	12. 5206977	0. 0001017	-0. 0002883
0. 3552978	-8. 3032606 C				
0. 00000875	4480.	512055862.	12. 4944800	0. 0001093	-0. 0003107
0. 3809139	-8. 9486257 C				
0. 00000938	4480.	477918804.	12. 4723936	0. 0001169	-0. 0003331
0. 4064257	-9. 5938180 C				
0. 00001000	4480.	448048879.	12. 4536663	0. 0001245	-0. 0003555
0. 4318330	-10. 2388370 C				
0. 00001063	4480.	421693063.	12. 4377076	0. 0001322	-0. 0003778
0. 4571356	-10. 8836815 C				
0. 00001125	4480.	398265670.	12. 4240582	0. 0001398	-0. 0004002
0. 4823332	-11. 5283511 C				
0. 00001188	4480.	377304319.	12. 4123556	0. 0001474	-0. 0004226
0. 5074255	-12. 1728451 C				
0. 00001250	4480.	358439103.	12. 4023097	0. 0001550	-0. 0004450
0. 5324125	-12. 8171628 C				
0. 00001313	4480.	341370575.	12. 3936859	0. 0001627	-0. 0004673
0. 5572939	-13. 4613033 C				
0. 00001375	4480.	325853730.	12. 3862920	0. 0001703	-0. 0004897
0. 5820694	-14. 1052661 C				
0. 00001438	4480.	311686177.	12. 3799694	0. 0001780	-0. 0005120
0. 6067388	-14. 7490503 C				
0. 00001500	4480.	298699253.	12. 3745859	0. 0001856	-0. 0005344
0. 6313019	-15. 3926551 C				
0. 00001563	4480.	286751283.	12. 3700304	0. 0001933	-0. 0005567
0. 6557584	-16. 0360799 C				
0. 00001625	4480.	275722387.	12. 3662091	0. 0002010	-0. 0005790
0. 6801082	-16. 6793239 C				
0. 00001688	4480.	265510447.	12. 3630418	0. 0002086	-0. 0006014
0. 7043510	-17. 3223864 C				
0. 00001750	4480.	256027931.	12. 3604601	0. 0002163	-0. 0006237

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0. 7284865	-17. 9652664 C				
0. 00001813	4480.	247199382.	12. 3584049	0. 0002240	-0. 0006460
0. 7525146	-18. 6079634 C				
0. 00001875	4480.	238959402.	12. 3568248	0. 0002317	-0. 0006683
0. 7764349	-19. 2504765 C				
0. 00001938	4480.	231251034.	12. 3556754	0. 0002394	-0. 0006906
0. 8002473	-19. 8928048 C				
0. 00002000	4480.	224024440.	12. 3549176	0. 0002471	-0. 0007129
0. 8239516	-20. 5349477 C				
0. 00002063	4566.	221384894.	12. 3545172	0. 0002548	-0. 0007352
0. 8475473	-21. 1769043 C				
0. 00002125	4700.	221197975.	12. 3544439	0. 0002625	-0. 0007575
0. 8710345	-21. 8186739 C				
0. 00002188	4835.	221017314.	12. 3546710	0. 0002703	-0. 0007797
0. 8944127	-22. 4602555 C				
0. 00002250	4969.	220842375.	12. 3551748	0. 0002780	-0. 0008020
0. 9176818	-23. 1016484 C				
0. 00002313	5103.	220672677.	12. 3559339	0. 0002857	-0. 0008243
0. 9408414	-23. 7428518 C				
0. 00002375	5237.	220507791.	12. 3569294	0. 0002935	-0. 0008465
0. 9638914	-24. 3838648 C				
0. 00002438	5371.	220347332.	12. 3581444	0. 0003012	-0. 0008688
0. 9868315	-25. 0246866 C				
0. 00002563	5638.	220038340.	12. 3611730	0. 0003168	-0. 0009132
1. 0323811	-26. 3057533 C				
0. 00002688	5906.	219743308.	12. 3649144	0. 0003323	-0. 0009577
1. 0774880	-27. 5860449 C				
0. 00002813	6172.	219460264.	12. 3692819	0. 0003479	-0. 0010021
1. 1221502	-28. 8655545 C				
0. 00002938	6439.	219187573.	12. 3742039	0. 0003635	-0. 0010465
1. 1663656	-30. 1442751 C				
0. 00003063	6705.	218923864.	12. 3796207	0. 0003791	-0. 0010909
1. 2101322	-31. 4221995 C				
0. 00003188	6970.	218667980.	12. 3854819	0. 0003948	-0. 0011352
1. 2534478	-32. 6993203 C				
0. 00003313	7235.	218418936.	12. 3917449	0. 0004105	-0. 0011795
1. 2963102	-33. 9756303 C				
0. 00003438	7500.	218175891.	12. 3983734	0. 0004262	-0. 0012238
1. 3387172	-35. 2511218 C				
0. 00003563	7764.	217938118.	12. 4053363	0. 0004419	-0. 0012681
1. 3806667	-36. 5257872 C				
0. 00003688	8028.	217704989.	12. 4126071	0. 0004577	-0. 0013123
1. 4221563	-37. 7996187 C				
0. 00003813	8291.	217475957.	12. 4201625	0. 0004735	-0. 0013565
1. 4631838	-39. 0726083 C				
0. 00003938	8554.	217250542.	12. 4279824	0. 0004894	-0. 0014006
1. 5037469	-40. 3447481 C				
0. 00004063	8817.	217028322.	12. 4360496	0. 0005052	-0. 0014448
1. 5438432	-41. 6160297 C				

Pol e A. l p10o					
0. 00004188	9079.	216808925.	12. 4443486	0. 0005211	-0. 0014889
1. 5834703	-42. 8864449 C				
0. 00004313	9341.	216592019.	12. 4528661	0. 0005370	-0. 0015330
1. 6226259	-44. 1559852 C				
0. 00004438	9602.	216377309.	12. 4615904	0. 0005530	-0. 0015770
1. 6613074	-45. 4246418 C				
0. 00004563	9863.	216164531.	12. 4705111	0. 0005690	-0. 0016210
1. 6995125	-46. 6924061 C				
0. 00004688	10123.	215953448.	12. 4796191	0. 0005850	-0. 0016650
1. 7372385	-47. 9592690 C				
0. 00004813	10383.	215743865.	12. 4889063	0. 0006010	-0. 0017090
1. 7744830	-49. 2252200 C				
0. 00004938	10642.	215535551.	12. 4983656	0. 0006171	-0. 0017529
1. 8112433	-50. 4902526 C				
0. 00005063	10901.	215328348.	12. 5079908	0. 0006332	-0. 0017968
1. 8475168	-51. 7543559 C				
0. 00005188	11159.	215122096.	12. 5177761	0. 0006494	-0. 0018406
1. 8833008	-53. 0175204 C				
0. 00005313	11417.	214916649.	12. 5277167	0. 0006655	-0. 0018845
1. 9185925	-54. 2797363 C				
0. 00005438	11675.	214711872.	12. 5378082	0. 0006817	-0. 0019283
1. 9533894	-55. 5409935 C				
0. 00005563	11932.	214507640.	12. 5480468	0. 0006980	-0. 0019720
1. 9876885	-56. 8012819 C				
0. 00005688	12189.	214303841.	12. 5584290	0. 0007143	-0. 0020157
2. 0214870	-58. 0605911 C				
0. 00005813	12445.	214100367.	12. 5689518	0. 0007306	-0. 0020594
2. 0547820	-59. 3189105 C				
0. 00005938	12700.	213897122.	12. 5796127	0. 0007469	-0. 0021031
2. 0875706	-60. 0000000 CY				
0. 00006063	12955.	213694012.	12. 5904092	0. 0007633	-0. 0021467
2. 1198499	-60. 0000000 CY				
0. 00006188	13210.	213490954.	12. 6013396	0. 0007797	-0. 0021903
2. 1516167	-60. 0000000 CY				
0. 00006313	13464.	213287866.	12. 6124020	0. 0007962	-0. 0022338
2. 1828680	-60. 0000000 CY				
0. 00006438	13717.	213084673.	12. 6235950	0. 0008126	-0. 0022774
2. 2136007	-60. 0000000 CY				
0. 00006563	13970.	212881304.	12. 6349175	0. 0008292	-0. 0023208
2. 2438116	-60. 0000000 CY				
0. 00006688	14219.	212624354.	12. 6452719	0. 0008457	-0. 0023643
2. 2733649	-60. 0000000 CY				
0. 00006813	14446.	212055062.	12. 6492083	0. 0008617	-0. 0024083
2. 3016003	-60. 0000000 CY				
0. 00006938	14646.	211113648.	12. 6452649	0. 0008773	-0. 0024527
2. 3283437	-60. 0000000 CY				
0. 00007063	14825.	209916158.	12. 6357116	0. 0008924	-0. 0024976
2. 3538730	-60. 0000000 CY				
0. 00007188	14994.	208606850.	12. 6235689	0. 0009073	-0. 0025427

Pol e A. l p10o

2. 3785567	-60. 0000000 CY				
0. 00007313	15148.	207154446.	12. 6080401	0. 0009220	-0. 0025880
2. 4023040	-60. 0000000 CY				
0. 00007438	15294.	205630951.	12. 5907005	0. 0009364	-0. 0026336
2. 4253098	-60. 0000000 CY				
0. 00007938	15805.	199120154.	12. 5090385	0. 0009929	-0. 0028171
2. 5107289	-60. 0000000 CY				
0. 00008438	16221.	192253443.	12. 4137386	0. 0010474	-0. 0030026
2. 5866012	-60. 0000000 CY				
0. 00008938	16573.	185433484.	12. 3139159	0. 0011006	-0. 0031894
2. 6543949	-60. 0000000 CY				
0. 00009438	16884.	178907933.	12. 2152828	0. 0011528	-0. 0033772
2. 7151193	-60. 0000000 CY				
0. 00009938	17140.	172473912.	12. 1082681	0. 0012033	-0. 0035667
2. 7681275	-60. 0000000 CY				
0. 0001044	17381.	166527274.	12. 0107068	0. 0012536	-0. 0037564
2. 8156078	-60. 0000000 CY				
0. 0001094	17578.	160715274.	11. 9100961	0. 0013027	-0. 0039473
2. 8566053	-60. 0000000 CY				
0. 0001144	17765.	155323527.	11. 8181341	0. 0013517	-0. 0041383
2. 8924431	-60. 0000000 CY				
0. 0001194	17938.	150262328.	11. 7302122	0. 0014003	-0. 0043297
2. 9228794	-60. 0000000 CY				
0. 0001244	18075.	145329912.	11. 6362106	0. 0014473	-0. 0045227
2. 9474731	-60. 0000000 CY				
0. 0001294	18210.	140757342.	11. 5512945	0. 0014944	-0. 0047156
2. 9674489	-60. 0000000 CY				
0. 0001344	18341.	136488305.	11. 4736015	0. 0015418	-0. 0049082
2. 9827019	-60. 0000000 CY				
0. 0001394	18451.	132384479.	11. 3964076	0. 0015884	-0. 0051016
2. 9930486	-60. 0000000 CY				
0. 0001444	18547.	128465950.	11. 3215019	0. 0016345	-0. 0052955
2. 9987258	-60. 0000000 CY				
0. 0001494	18640.	124788418.	11. 2511563	0. 0016806	-0. 0054894
2. 9976668	-60. 0000000 CY				
0. 0001544	18731.	121331656.	11. 1843681	0. 0017266	-0. 0056834
2. 9996308	-60. 0000000 CY				
0. 0001594	18815.	118056844.	11. 1219679	0. 0017726	-0. 0058774
2. 9969314	-60. 0000000 CY				
0. 0001644	18886.	114897381.	11. 0594999	0. 0018179	-0. 0060721
2. 9998128	-60. 0000000 CY				
0. 0001694	18947.	111861558.	10. 9982472	0. 0018628	-0. 0062672
2. 9965645	-60. 0000000 CY				
0. 0001744	19006.	108992520.	10. 9419106	0. 0019080	-0. 0064620
2. 9996147	-60. 0000000 CY				
0. 0001794	19063.	106276369.	10. 8902146	0. 0019534	-0. 0066566
2. 9961524	-60. 0000000 CY				
0. 0001844	19120.	103701273.	10. 8426953	0. 0019991	-0. 0068509
2. 9987989	-60. 0000000 CY				

Pole A. I p10o					
0.0001894	19174.	101250460.	10.7980739	0.0020449	-0.0070451
2.9995271	-60.0000000 CY				
0.0001944	19224.	98902347.	10.7522450	0.0020900	-0.0072400
2.9963805	-60.0000000 CY				
0.0001994	19264.	96622815.	10.7046572	0.0021342	-0.0074358
2.9992593	60.0000000 CY				
0.0002044	19301.	94439732.	10.6590448	0.0021784	-0.0076316
2.9988921	60.0000000 CY				
0.0002094	19335.	92345027.	10.6153958	0.0022226	-0.0078274
2.9953649	60.0000000 CY				
0.0002144	19368.	90345894.	10.5745054	0.0022669	-0.0080231
2.9985833	60.0000000 CY				
0.0002194	19401.	88435751.	10.5362001	0.0023114	-0.0082186
2.9999506	60.0000000 CY				
0.0002244	19433.	86607391.	10.5006210	0.0023561	-0.0084139
2.9953330	60.0000000 CY				
0.0002294	19464.	84856721.	10.4672851	0.0024009	-0.0086091
2.9961691	60.0000000 CY				
0.0002344	19495.	83178533.	10.4358768	0.0024459	-0.0088041
2.9988916	60.0000000 CY				
0.0002394	19526.	81568693.	10.4063474	0.0024910	-0.0089990
2.9999793	60.0000000 CY				
0.0002444	19552.	80008467.	10.3768892	0.0025359	-0.0091941
2.9953173	60.0000000 CY				
0.0002494	19576.	78499406.	10.3476038	0.0025804	-0.0093896
2.9944005	60.0000000 CY				
0.0002544	19599.	77045795.	10.3193940	0.0026250	-0.0095850
2.9975783	60.0000000 CY				
0.0002594	19616.	75627313.	10.2865293	0.0026681	-0.0097819
2.9993664	60.0000000 CY				
0.0002644	19633.	74261724.	10.2553065	0.0027112	-0.0099788
2.9999990	60.0000000 CY				
0.0002694	19650.	72945197.	10.2259769	0.0027546	-0.0101754
2.9954274	60.0000000 CY				
0.0002744	19666.	71676089.	10.1980380	0.0027981	-0.0103719
2.9915646	60.0000000 CY				
0.0003044	19762.	64925605.	10.0562040	0.0030609	-0.0115491
2.9918268	60.0000000 CYT				
0.0003344	19842.	59341086.	9.9420068	0.0033244	-0.0127256
2.9988472	60.0000000 CYT				
0.0003644	19892.	54593273.	9.8358315	0.0035839	-0.0139061
2.9958199	60.0000000 CYT				
0.0003944	19932.	50540603.	9.7380557	0.0038404	-0.0150896
2.9937816	60.0000000 CYT				

Axial Thrust Force = 11.500 kips

Bending Bending Bending Depth to Max Comp Max Tens

Pole A. Ip10o						
Max Conc Curvature Stress rad/in. ksi	Max Steel Moment Stress in-kip ksi	Run Msg	Stiffness kip-in ²	N Axis in	Strain in/in	Strain in/in

6. 25000E-07	651. 0589923	1041694388.	26. 5986370	0. 00001662	-0. 00001338	
0. 0602038	0. 4777503					
0. 00000125	1298.	1038793553.	25. 3040642	0. 00003163	-0. 00002837	
0. 1139707	0. 9085723					
0. 00000188	1942.	1035863752.	24. 8725691	0. 00004664	-0. 00004336	
0. 1672416	1. 3393960					
0. 00000250	2582.	1032926677.	24. 6568404	0. 00006164	-0. 00005836	
0. 2200164	1. 7702209					
0. 00000313	3219.	1029986690.	24. 5274176	0. 00007665	-0. 00007335	
0. 2722951	2. 2010472					
0. 00000375	3851.	1027045244.	24. 4411478	0. 00009165	-0. 00008835	
0. 3240777	2. 6318748					
0. 00000438	4480.	1024102966.	24. 3795369	0. 0001067	-0. 0001033	
0. 3753643	3. 0627037					
0. 00000500	4480.	896090095.	13. 2707213	0. 00006635	-0. 0001736	
0. 2345345	-5. 0009454 C					
0. 00000563	4480.	796524529.	13. 1470386	0. 00007395	-0. 0001960	
0. 2607390	-5. 6462393 C					
0. 00000625	4480.	716872076.	13. 0467870	0. 00008154	-0. 0002185	
0. 2867902	-6. 2917698 C					
0. 00000688	4480.	651701887.	12. 9655909	0. 00008914	-0. 0002409	
0. 3127368	-6. 9371353 C					
0. 00000750	4480.	597393397.	12. 8986892	0. 00009674	-0. 0002633	
0. 3385784	-7. 5823351 C					
0. 00000813	4480.	551440058.	12. 8427860	0. 0001043	-0. 0002857	
0. 3643150	-8. 2273685 C					
0. 00000875	4480.	512051483.	12. 7955270	0. 0001120	-0. 0003080	
0. 3899462	-8. 8722350 C					
0. 00000938	4480.	477914717.	12. 7551857	0. 0001196	-0. 0003304	
0. 4154719	-9. 5169339 C					
0. 00001000	4480.	448045047.	12. 7204674	0. 0001272	-0. 0003528	
0. 4408919	-10. 1614644 C					
0. 00001063	4480.	421689456.	12. 6891747	0. 0001348	-0. 0003752	
0. 4661625	-10. 8061980 C					
0. 00001125	4480.	398262264.	12. 6618798	0. 0001424	-0. 0003976	
0. 4913275	-11. 4507617 C					
0. 00001188	4480.	377301093.	12. 6379695	0. 0001501	-0. 0004199	
0. 5163872	-12. 0951492 C					
0. 00001250	4480.	358436038.	12. 6169381	0. 0001577	-0. 0004423	
0. 5413414	-12. 7393599 C					
0. 00001313	4480.	341367655.	12. 5983763	0. 0001654	-0. 0004646	
0. 5661899	-13. 3833930 C					

Pol e A. l p10o					
0. 00001375	4480.	325850944.	12. 5819492	0. 0001730	-0. 0004870
0. 5909323	-14. 0272480 C				
0. 00001438	4480.	311683511.	12. 5673802	0. 0001807	-0. 0005093
0. 6155686	-14. 6709236 C				
0. 00001500	4480.	298696698.	12. 5544386	0. 0001883	-0. 0005317
0. 6400985	-15. 3144194 C				
0. 00001563	4480.	286748830.	12. 5429309	0. 0001960	-0. 0005540
0. 6645217	-15. 9577346 C				
0. 00001625	4480.	275720029.	12. 5326932	0. 0002037	-0. 0005763
0. 6888380	-16. 6008685 C				
0. 00001688	4480.	265508176.	12. 5235860	0. 0002113	-0. 0005987
0. 7130473	-17. 2438202 C				
0. 00001750	4480.	256025741.	12. 5154897	0. 0002190	-0. 0006210
0. 7371492	-17. 8865891 C				
0. 00001813	4480.	247197268.	12. 5083011	0. 0002267	-0. 0006433
0. 7611435	-18. 5291743 C				
0. 00001875	4480.	238957359.	12. 5019310	0. 0002344	-0. 0006656
0. 7850300	-19. 1715750 C				
0. 00001938	4480.	231249057.	12. 4963016	0. 0002421	-0. 0006879
0. 8088084	-19. 8137905 C				
0. 00002000	4489.	224435450.	12. 4913448	0. 0002498	-0. 0007102
0. 8324785	-20. 4558200 C				
0. 00002063	4623.	224152648.	12. 4870008	0. 0002575	-0. 0007325
0. 8560401	-21. 0976627 C				
0. 00002125	4757.	223881936.	12. 4832168	0. 0002653	-0. 0007547
0. 8794929	-21. 7393177 C				
0. 00002188	4892.	223622260.	12. 4799461	0. 0002730	-0. 0007770
0. 9028367	-22. 3807842 C				
0. 00002250	5026.	223372686.	12. 4771472	0. 0002807	-0. 0007993
0. 9260712	-23. 0220614 C				
0. 00002313	5160.	223132377.	12. 4747831	0. 0002885	-0. 0008215
0. 9491963	-23. 6631485 C				
0. 00002375	5294.	222900588.	12. 4728207	0. 0002962	-0. 0008438
0. 9722115	-24. 3040447 C				
0. 00002438	5428.	222676647.	12. 4712302	0. 0003040	-0. 0008660
0. 9951167	-24. 9447491 C				
0. 00002563	5695.	222249954.	12. 4690609	0. 0003195	-0. 0009105
1. 0405961	-26. 2255791 C				
0. 00002688	5962.	221848135.	12. 4680909	0. 0003351	-0. 0009549
1. 0856324	-27. 5056316 C				
0. 00002813	6229.	221467763.	12. 4681689	0. 0003507	-0. 0009993
1. 1302235	-28. 7848997 C				
0. 00002938	6495.	221105994.	12. 4691694	0. 0003663	-0. 0010437
1. 1743673	-30. 0633762 C				
0. 00003063	6761.	220760447.	12. 4709876	0. 0003819	-0. 0010881
1. 2180618	-31. 3410540 C				
0. 00003188	7026.	220429112.	12. 4735353	0. 0003976	-0. 0011324
1. 2613047	-32. 6179258 C				
0. 00003313	7291.	220110281.	12. 4767375	0. 0004133	-0. 0011767

Pol e A. l p10o

1. 3040940	-33. 8939840 C				
0. 00003438	7556.	219802494.	12. 4805306	0. 0004290	-0. 0012210
1. 3464274	-35. 1692211 C				
0. 00003563	7820.	219504493.	12. 4848598	0. 0004448	-0. 0012652
1. 3883026	-36. 4436293 C				
0. 00003688	8084.	219215191.	12. 4896778	0. 0004606	-0. 0013094
1. 4297175	-37. 7172009 C				
0. 00003813	8347.	218933641.	12. 4949439	0. 0004764	-0. 0013536
1. 4706697	-38. 9899279 C				
0. 00003938	8610.	218659014.	12. 5006224	0. 0004922	-0. 0013978
1. 5111569	-40. 2618021 C				
0. 00004063	8872.	218390583.	12. 5066823	0. 0005081	-0. 0014419
1. 5511767	-41. 5328152 C				
0. 00004188	9134.	218127705.	12. 5130963	0. 0005240	-0. 0014860
1. 5907268	-42. 8029590 C				
0. 00004313	9396.	217869813.	12. 5198406	0. 0005399	-0. 0015301
1. 6298047	-44. 0722248 C				
0. 00004438	9657.	217616399.	12. 5268939	0. 0005559	-0. 0015741
1. 6684081	-45. 3406040 C				
0. 00004563	9917.	217367012.	12. 5342375	0. 0005719	-0. 0016181
1. 7065342	-46. 6080876 C				
0. 00004688	10178.	217121246.	12. 5418549	0. 0005879	-0. 0016621
1. 7441808	-47. 8746667 C				
0. 00004813	10437.	216878737.	12. 5497313	0. 0006040	-0. 0017060
1. 7813451	-49. 1403321 C				
0. 00004938	10697.	216639155.	12. 5578535	0. 0006200	-0. 0017500
1. 8180246	-50. 4050745 C				
0. 00005063	10955.	216402203.	12. 5662098	0. 0006362	-0. 0017938
1. 8542166	-51. 6688843 C				
0. 00005188	11214.	216167610.	12. 5747898	0. 0006523	-0. 0018377
1. 8899185	-52. 9317519 C				
0. 00005313	11472.	215935148.	12. 5835840	0. 0006685	-0. 0018815
1. 9251276	-54. 1936657 C				
0. 00005438	11729.	215704557.	12. 5925841	0. 0006847	-0. 0019253
1. 9598410	-55. 4546188 C				
0. 00005563	11986.	215475647.	12. 6017825	0. 0007010	-0. 0019690
1. 9940559	-56. 7145994 C				
0. 00005688	12242.	215248228.	12. 6111725	0. 0007173	-0. 0020127
2. 0277695	-57. 9735971 C				
0. 00005813	12498.	215022127.	12. 6207481	0. 0007336	-0. 0020564
2. 0609789	-59. 2316013 C				
0. 00005938	12754.	214797181.	12. 6305038	0. 0007499	-0. 0021001
2. 0936811	-60. 0000000 CY				
0. 00006063	13009.	214573242.	12. 6404348	0. 0007663	-0. 0021437
2. 1258731	-60. 0000000 CY				
0. 00006188	13263.	214350170.	12. 6505368	0. 0007828	-0. 0021872
2. 1575520	-60. 0000000 CY				
0. 00006313	13517.	214127836.	12. 6608058	0. 0007992	-0. 0022308
2. 1887146	-60. 0000000 CY				

Pol e A. l p10o					
0. 00006438	13770.	213906120.	12. 6712385	0. 0008157	-0. 0022743
2. 2193578	-60. 0000000 CY				
0. 00006563	14023.	213684909.	12. 6818318	0. 0008322	-0. 0023178
2. 2494783	-60. 0000000 CY				
0. 00006688	14272.	213418113.	12. 6916359	0. 0008488	-0. 0023612
2. 2789589	-60. 0000000 CY				
0. 00006813	14501.	212862742.	12. 6955278	0. 0008649	-0. 0024051
2. 3071813	-60. 0000000 CY				
0. 00006938	14703.	211937333.	12. 6916004	0. 0008805	-0. 0024495
2. 3339186	-60. 0000000 CY				
0. 00007063	14884.	210750011.	12. 6819553	0. 0008957	-0. 0024943
2. 3594281	-60. 0000000 CY				
0. 00007188	15054.	209440913.	12. 6695206	0. 0009106	-0. 0025394
2. 3840656	-60. 0000000 CY				
0. 00007313	15209.	207986760.	12. 6536664	0. 0009253	-0. 0025847
2. 4077614	-60. 0000000 CY				
0. 00007438	15355.	206449811.	12. 6357381	0. 0009398	-0. 0026302
2. 4306821	-60. 0000000 CY				
0. 00007938	15868.	199917472.	12. 5525805	0. 0009964	-0. 0028136
2. 5158420	-60. 0000000 CY				
0. 00008438	16286.	193017047.	12. 4555975	0. 0010509	-0. 0029991
2. 5914026	-60. 0000000 CY				
0. 00008938	16639.	186174287.	12. 3545010	0. 0011042	-0. 0031858
2. 6589021	-60. 0000000 CY				
0. 00009438	16952.	179621787.	12. 2558389	0. 0011566	-0. 0033734
2. 7194349	-60. 0000000 CY				
0. 00009938	17208.	173160402.	12. 1483625	0. 0012072	-0. 0035628
2. 7721781	-60. 0000000 CY				
0. 0001044	17450.	167189986.	12. 0496996	0. 0012577	-0. 0037523
2. 8192952	-60. 0000000 CY				
0. 0001094	17648.	161352273.	11. 9479215	0. 0013068	-0. 0039432
2. 8599083	-60. 0000000 CY				
0. 0001144	17835.	155930192.	11. 8546364	0. 0013559	-0. 0041341
2. 8953271	-60. 0000000 CY				
0. 0001194	18008.	150853163.	11. 7676757	0. 0014048	-0. 0043252
2. 9254905	-60. 0000000 CY				
0. 0001244	18147.	145904520.	11. 6733956	0. 0014519	-0. 0045181
2. 9496968	-60. 0000000 CY				
0. 0001294	18282.	141307583.	11. 5873754	0. 0014991	-0. 0047109
2. 9692103	-60. 0000000 CY				
0. 0001344	18412.	137019157.	11. 5088456	0. 0015465	-0. 0049035
2. 9839976	-60. 0000000 CY				
0. 0001394	18523.	132902242.	11. 4311519	0. 0015932	-0. 0050968
2. 9938784	-60. 0000000 CY				
0. 0001444	18620.	128966343.	11. 3554915	0. 0016394	-0. 0052906
2. 9990702	-60. 0000000 CY				
0. 0001494	18713.	125274044.	11. 2863999	0. 0016859	-0. 0054841
2. 9965741	-60. 0000000 CY				
0. 0001544	18803.	121800749.	11. 2192973	0. 0017320	-0. 0056780

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2. 9998178	-60. 0000000 CY				
0. 0001594	18888.	118515086.	11. 1566108	0. 0017781	-0. 0058719
2. 9975457	-60. 0000000 CY				
0. 0001644	18960.	115345813.	11. 0938393	0. 0018235	-0. 0060665
2. 9999408	-60. 0000000 CY				
0. 0001694	19020.	112295065.	11. 0319187	0. 0018685	-0. 0062615
2. 9972368	-60. 0000000 CY				
0. 0001744	19079.	109412291.	10. 9748973	0. 0019137	-0. 0064563
2. 9998169	-60. 0000000 CY				
0. 0001794	19136.	106682809.	10. 9226182	0. 0019592	-0. 0066508
2. 9957113	-60. 0000000 CY				
0. 0001844	19193.	104095550.	10. 8744820	0. 0020050	-0. 0068450
2. 9991910	-60. 0000000 CY				
0. 0001894	19247.	101634752.	10. 8296867	0. 0020509	-0. 0070391
2. 9982836	-60. 0000000 CY				
0. 0001944	19297.	99279445.	10. 7860430	0. 0020965	-0. 0072335
2. 9971701	-60. 0000000 CY				
0. 0001994	19338.	96995099.	10. 7384771	0. 0021410	-0. 0074290
2. 9995974	60. 0000000 CY				
0. 0002044	19375.	94803665.	10. 6926287	0. 0021853	-0. 0076247
2. 9974664	60. 0000000 CY				
0. 0002094	19409.	92699548.	10. 6484061	0. 0022295	-0. 0078205
2. 9963091	60. 0000000 CY				
0. 0002144	19442.	90691428.	10. 6069759	0. 0022739	-0. 0080161
2. 9990844	60. 0000000 CY				
0. 0002194	19475.	88772667.	10. 5681686	0. 0023184	-0. 0082116
2. 9999203	60. 0000000 CY				
0. 0002244	19506.	86935790.	10. 5321847	0. 0023632	-0. 0084068
2. 9938620	60. 0000000 CY				
0. 0002294	19538.	85177374.	10. 4983664	0. 0024081	-0. 0086019
2. 9970477	60. 0000000 CY				
0. 0002344	19568.	83491863.	10. 4665167	0. 0024531	-0. 0087969
2. 9993406	60. 0000000 CY				
0. 0002394	19599.	81874727.	10. 4366012	0. 0024983	-0. 0089917
2. 9993866	60. 0000000 CY				
0. 0002444	19626.	80311051.	10. 4072932	0. 0025433	-0. 0091867
2. 9937740	60. 0000000 CY				
0. 0002494	19650.	78795487.	10. 3775665	0. 0025879	-0. 0093821
2. 9955234	60. 0000000 CY				
0. 0002544	19673.	77338481.	10. 3494511	0. 0026326	-0. 0095774
2. 9983104	60. 0000000 CY				
0. 0002594	19691.	75917675.	10. 3197523	0. 0026767	-0. 0097733
2. 9997429	60. 0000000 CY				
0. 0002644	19708.	74545860.	10. 2882261	0. 0027199	-0. 0099701
2. 9983920	60. 0000000 CY				
0. 0002694	19725.	73223712.	10. 2584638	0. 0027634	-0. 0101666
2. 9936096	60. 0000000 CY				
0. 0002744	19741.	71949225.	10. 2300951	0. 0028069	-0. 0103631
2. 9931907	60. 0000000 CY				

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0.0003044	19836.	65169905.	10.0861359	0.0030700	-0.0115400
2.9899344	60.0000000 CYT				
0.0003344	19917.	59563879.	9.9706359	0.0033339	-0.0127161
2.9968588	60.0000000 CYT				
0.0003644	19968.	54799332.	9.8642474	0.0035943	-0.0138957
2.9971189	60.0000000 CYT				
0.0003944	20007.	50732017.	9.7687822	0.0038526	-0.0150774
2.9912646	60.0000000 CYT				

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

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

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	6.600	19739.589	0.00300000
2	11.500	19810.819	0.00300000

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

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

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

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in ²
1	0.65	19740.	4.290000	12831.	213793128.
2	0.65	19811.	7.475000	12877.	214688734.
1	0.70	19740.	4.620000	13818.	213003982.
2	0.70	19811.	8.050000	13868.	213820942.
1	0.75	19740.	4.950000	14805.	210053969.
2	0.75	19811.	8.625000	14858.	210921193.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	1.0000	0.00	N. A.	No	0.00	6586.
2	3.0000	1.7903	Yes	No	6586.	118875.
3	8.5000	6.3846	Yes	No	125460.	N. A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

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

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 6900.0 lbs
 Applied moment at pile head = 1995600.0 in-lbs
 Axial thrust load on pile head = 6600.0 lbs

Depth Res.	Soil X	Deflect. Spr. y	Bending Distrib. Moment Load	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
feet	Es*h	inches	in-lbs	lbs	radians	psi *	in-lb^2	
lb/inch	lb/inch	lb/inch	lb/inch					
0.00	0.00	0.3360	1995600.	6900.	-0.00282	0.00	1.04E+12	
0.00	0.00	0.00	0.00					
0.1350	0.00	0.3314	2006808.	6900.	-0.00282	0.00	1.04E+12	
0.00	0.00	0.00	0.00					

			Pol e A. l p10o			
0. 2700	0. 3268	2018016.	6900.	-0. 00281	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 4050	0. 3223	2029224.	6900.	-0. 00281	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 5400	0. 3177	2040432.	6900.	-0. 00281	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 6750	0. 3132	2051640.	6900.	-0. 00281	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 8100	0. 3086	2062848.	6900.	-0. 00280	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 9450	0. 3041	2074056.	6900.	-0. 00280	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
1. 0800	0. 2996	2085264.	6898.	-0. 00280	0. 00	1. 04E+12
-2. 8670	15. 5047	0. 00				
1. 2150	0. 2950	2096465.	6889.	-0. 00279	0. 00	1. 04E+12
-7. 5887	41. 6690	0. 00				
1. 3500	0. 2905	2107645.	6873.	-0. 00279	0. 00	1. 03E+12
-12. 1644	67. 8333	0. 00				
1. 4850	0. 2860	2118793.	6850.	-0. 00279	0. 00	1. 03E+12
-16. 5944	93. 9975	0. 00				
1. 6200	0. 2815	2129898.	6820.	-0. 00278	0. 00	1. 03E+12
-20. 8789	120. 1618	0. 00				
1. 7550	0. 2770	2140948.	6782.	-0. 00278	0. 00	1. 03E+12
-25. 0181	146. 3260	0. 00				
1. 8900	0. 2725	2151933.	6739.	-0. 00278	0. 00	1. 03E+12
-29. 0125	172. 4903	0. 00				
2. 0250	0. 2680	2162841.	6689.	-0. 00277	0. 00	1. 03E+12
-32. 8622	198. 6545	0. 00				
2. 1600	0. 2635	2173663.	6632.	-0. 00277	0. 00	1. 03E+12
-36. 5674	224. 8188	0. 00				
2. 2950	0. 2590	2184389.	6570.	-0. 00277	0. 00	1. 03E+12
-40. 1286	250. 9831	0. 00				
2. 4300	0. 2545	2195009.	6502.	-0. 00276	0. 00	1. 03E+12
-43. 5458	277. 1473	0. 00				
2. 5650	0. 2501	2205515.	6429.	-0. 00276	0. 00	1. 03E+12
-46. 8195	303. 3116	0. 00				
2. 7000	0. 2456	2215899.	6351.	-0. 00276	0. 00	1. 03E+12
-49. 9499	329. 4758	0. 00				
2. 8350	0. 2411	2226151.	6267.	-0. 00275	0. 00	1. 03E+12
-52. 9372	355. 6401	0. 00				
2. 9700	0. 2367	2236264.	6179.	-0. 00275	0. 00	1. 03E+12
-55. 7818	381. 8043	0. 00				
3. 1050	0. 2322	2246231.	5843.	-0. 00274	0. 00	1. 03E+12
-359. 2244	2506.	0. 00				
3. 2400	0. 2278	2255255.	5240.	-0. 00274	0. 00	1. 03E+12
-385. 2047	2740.	0. 00				
3. 3750	0. 2234	2263268.	4595.	-0. 00274	0. 00	1. 03E+12
-411. 7002	2986.	0. 00				
3. 5100	0. 2189	2270200.	3914.	-0. 00273	0. 00	1. 03E+12

Pol e A. Ip10o						
-428.5564	3171.	0.00				
3.6450	0.2145	2276008.	3209.	-0.00273	0.00	1.03E+12
-442.4748	3342.	0.00				
3.7800	0.2101	2280654.	2481.	-0.00273	0.00	1.03E+12
-455.4735	3512.	0.00				
3.9150	0.2057	2284106.	1734.	-0.00272	0.00	1.03E+12
-467.5545	3683.	0.00				
4.0500	0.2012	2286330.	967.1311	-0.00272	0.00	1.03E+12
-478.7196	3854.	0.00				
4.1850	0.1968	2287297.	183.3020	-0.00272	0.00	1.03E+12
-488.9707	4024.	0.00				
4.3200	0.1924	2286982.	-616.3949	-0.00271	0.00	1.03E+12
-498.3095	4195.	0.00				
4.4550	0.1881	2285358.	-1430.	-0.00271	0.00	1.03E+12
-506.7379	4365.	0.00				
4.5900	0.1837	2282405.	-2257.	-0.00271	0.00	1.03E+12
-514.2577	4536.	0.00				
4.7250	0.1793	2278102.	-3096.	-0.00270	0.00	1.03E+12
-520.8708	4706.	0.00				
4.8600	0.1749	2272432.	-3944.	-0.00270	0.00	1.03E+12
-526.5789	4877.	0.00				
4.9950	0.1705	2265380.	-4801.	-0.00269	0.00	1.03E+12
-531.3838	5048.	0.00				
5.1300	0.1662	2256933.	-5665.	-0.00269	0.00	1.03E+12
-535.2873	5218.	0.00				
5.2650	0.1618	2247082.	-6535.	-0.00269	0.00	1.03E+12
-538.2911	5389.	0.00				
5.4000	0.1575	2235817.	-7409.	-0.00268	0.00	1.03E+12
-540.3969	5559.	0.00				
5.5350	0.1531	2223135.	-8285.	-0.00268	0.00	1.03E+12
-541.6065	5730.	0.00				
5.6700	0.1488	2209031.	-9163.	-0.00268	0.00	1.03E+12
-541.9216	5900.	0.00				
5.8050	0.1445	2193505.	-10040.	-0.00267	0.00	1.03E+12
-541.3436	6071.	0.00				
5.9400	0.1401	2176558.	-10916.	-0.00267	0.00	1.03E+12
-539.8744	6242.	0.00				
6.0750	0.1358	2158194.	-11789.	-0.00267	0.00	1.03E+12
-537.5154	6412.	0.00				
6.2100	0.1315	2138420.	-12657.	-0.00266	0.00	1.03E+12
-534.2683	6583.	0.00				
6.3450	0.1272	2117243.	-13519.	-0.00266	0.00	1.03E+12
-530.1344	6753.	0.00				
6.4800	0.1229	2094675.	-14374.	-0.00266	0.00	1.04E+12
-525.1154	6924.	0.00				
6.6150	0.1186	2070729.	-15220.	-0.00265	0.00	1.04E+12
-519.2127	7094.	0.00				
6.7500	0.1143	2045420.	-16055.	-0.00265	0.00	1.04E+12
-512.4276	7265.	0.00				

			Pol e A. l p10o			
6. 8850	0. 1100	2018767.	-16879.	-0. 00265	0. 00	1. 04E+12
-504. 7615	7436.	0. 00				
7. 0200	0. 1057	1990788.	-17690.	-0. 00264	0. 00	1. 04E+12
-496. 2158	7606.	0. 00				
7. 1550	0. 1014	1961508.	-18486.	-0. 00264	0. 00	1. 04E+12
-486. 7917	7777.	0. 00				
7. 2900	0. 09713	1930949.	-19266.	-0. 00264	0. 00	1. 04E+12
-476. 4904	7947.	0. 00				
7. 4250	0. 09286	1899141.	-20029.	-0. 00264	0. 00	1. 04E+12
-465. 3131	8118.	0. 00				
7. 5600	0. 08859	1866111.	-20773.	-0. 00263	0. 00	1. 04E+12
-453. 2610	8288.	0. 00				
7. 6950	0. 08433	1831891.	-21497.	-0. 00263	0. 00	1. 04E+12
-440. 3351	8459.	0. 00				
7. 8300	0. 08007	1796516.	-22199.	-0. 00263	0. 00	1. 04E+12
-426. 5365	8630.	0. 00				
7. 9650	0. 07582	1760021.	-22878.	-0. 00262	0. 00	1. 04E+12
-411. 8661	8800.	0. 00				
8. 1000	0. 07157	1722446.	-23533.	-0. 00262	0. 00	1. 04E+12
-396. 3248	8971.	0. 00				
8. 2350	0. 06733	1683830.	-24162.	-0. 00262	0. 00	1. 04E+12
-379. 9136	9141.	0. 00				
8. 3700	0. 06309	1644218.	-24763.	-0. 00262	0. 00	1. 04E+12
-362. 6332	9312.	0. 00				
8. 5050	0. 05885	1603653.	-25669.	-0. 00261	0. 00	1. 04E+12
-755. 4356	20794.	0. 00				
8. 6400	0. 05462	1561106.	-26859.	-0. 00261	0. 00	1. 04E+12
-713. 7333	21168.	0. 00				
8. 7750	0. 05039	1516686.	-27980.	-0. 00261	0. 00	1. 04E+12
-670. 1296	21542.	0. 00				
8. 9100	0. 04617	1470507.	-29029.	-0. 00261	0. 00	1. 04E+12
-624. 6256	21916.	0. 00				
9. 0450	0. 04195	1422689.	-30002.	-0. 00260	0. 00	1. 04E+12
-577. 2224	22290.	0. 00				
9. 1800	0. 03773	1373356.	-30897.	-0. 00260	0. 00	1. 04E+12
-527. 9208	22665.	0. 00				
9. 3150	0. 03352	1322637.	-31711.	-0. 00260	0. 00	1. 04E+12
-476. 7216	23039.	0. 00				
9. 4500	0. 02931	1270667.	-32440.	-0. 00260	0. 00	1. 04E+12
-423. 6252	23413.	0. 00				
9. 5850	0. 02511	1217586.	-33082.	-0. 00260	0. 00	1. 04E+12
-368. 6321	23787.	0. 00				
9. 7200	0. 02090	1163537.	-33633.	-0. 00259	0. 00	1. 04E+12
-311. 7424	24161.	0. 00				
9. 8550	0. 01670	1108670.	-34091.	-0. 00259	0. 00	1. 04E+12
-252. 9563	24535.	0. 00				
9. 9900	0. 01250	1053139.	-34451.	-0. 00259	0. 00	1. 04E+12
-192. 2736	24909.	0. 00				
10. 1250	0. 00831	997103.	-34712.	-0. 00259	0. 00	1. 04E+12

			Pol e A. l p10o				
-129.6941	25283.	0.00					
10.2600	0.00412	940727.	-34870.	-0.00259	0.00	1.04E+12	
-65.2173	25657.	0.00					
10.3950	-7.20E-05	884180.	-34922.	-0.00259	0.00	1.04E+12	
1.1573	26031.	0.00					
10.5300	-0.00426	827636.	-34865.	-0.00258	0.00	1.04E+12	
69.4304	26405.	0.00					
10.6650	-0.00845	771274.	-34695.	-0.00258	0.00	1.04E+12	
139.6027	26779.	0.00					
10.8000	-0.01263	715278.	-34411.	-0.00258	0.00	1.04E+12	
211.6753	27153.	0.00					
10.9350	-0.01681	659838.	-34008.	-0.00258	0.00	1.04E+12	
285.6493	27527.	0.00					
11.0700	-0.02099	605148.	-33484.	-0.00258	0.00	1.04E+12	
361.5257	27901.	0.00					
11.2050	-0.02517	551406.	-32835.	-0.00258	0.00	1.04E+12	
439.3059	28275.	0.00					
11.3400	-0.02935	498817.	-32059.	-0.00258	0.00	1.04E+12	
518.9911	28649.	0.00					
11.4750	-0.03352	447591.	-31152.	-0.00258	0.00	1.04E+12	
600.5828	29023.	0.00					
11.6100	-0.03770	397940.	-30111.	-0.00258	0.00	1.04E+12	
684.0825	29397.	0.00					
11.7450	-0.04187	350085.	-28934.	-0.00258	0.00	1.04E+12	
769.4917	29771.	0.00					
11.8800	-0.04604	304249.	-27617.	-0.00258	0.00	1.04E+12	
856.8119	30145.	0.00					
12.0150	-0.05022	260662.	-26156.	-0.00258	0.00	1.04E+12	
946.0447	30520.	0.00					
12.1500	-0.05439	219557.	-24550.	-0.00257	0.00	1.04E+12	
1037.	30894.	0.00					
12.2850	-0.05856	181175.	-22794.	-0.00257	0.00	1.04E+12	
1130.	31268.	0.00					
12.4200	-0.06273	145759.	-20886.	-0.00257	0.00	1.04E+12	
1225.	31642.	0.00					
12.5550	-0.06690	113558.	-18823.	-0.00257	0.00	1.04E+12	
1322.	32016.	0.00					
12.6900	-0.07107	84827.	-16601.	-0.00257	0.00	1.04E+12	
1421.	32390.	0.00					
12.8250	-0.07524	59826.	-14218.	-0.00257	0.00	1.04E+12	
1522.	32764.	0.00					
12.9600	-0.07941	38817.	-11669.	-0.00257	0.00	1.04E+12	
1624.	33138.	0.00					
13.0950	-0.08358	22072.	-8953.	-0.00257	0.00	1.04E+12	
1729.	33512.	0.00					
13.2300	-0.08775	9864.	-6066.	-0.00257	0.00	1.04E+12	
1835.	33886.	0.00					
13.3650	-0.09192	2473.	-3062.	-0.00257	0.00	1.04E+12	
1874.	33024.	0.00					

Pole A. Ip10o

13.5000	-0.09609	0.00	0.00	-0.00257	0.00	1.04E+12
1906.	16067.	0.00				

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection	=	0.33595829 inches
Computed slope at pile head	=	-0.00282127 radians
Maximum bending moment	=	2287297. inch-lbs
Maximum shear force	=	-34922. lbs
Depth of maximum bending moment	=	4.18500000 feet below pile head
Depth of maximum shear force	=	10.39500000 feet below pile head
Number of iterations	=	6
Number of zero deflection points	=	1

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

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head	=	11900.0 lbs
Applied moment at pile head	=	3456000.0 in-lbs
Axial thrust load on pile head	=	11500.0 lbs

Depth Res.	Soil X	Deflect. Spr.	Bending Distrib.	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
	Es*h	y	Moment					
feet	inches	Lat.	Load					
lb/inch	lb/inch		in-lbs	lbs	radians	psi *	in-lb^2	
			lb/inch					
0.00	0.7465		3456000.	11900.	-0.00630	0.00	1.03E+12	
0.00	0.00		0.00					
0.1350	0.7363		3475395.	11900.	-0.00629	0.00	1.03E+12	
0.00	0.00		0.00					
0.2700	0.7261		3494790.	11900.	-0.00629	0.00	1.03E+12	
0.00	0.00		0.00					

			Pol e A. l p10o			
0. 4050	0. 7159	3514185.	11900.	-0. 00628	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
0. 5400	0. 7057	3533580.	11900.	-0. 00628	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
0. 6750	0. 6956	3552975.	11900.	-0. 00627	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
0. 8100	0. 6854	3572370.	11900.	-0. 00626	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
0. 9450	0. 6753	3591765.	11900.	-0. 00626	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
1. 0800	0. 6651	3611159.	11895.	-0. 00625	0. 00	1. 03E+12
-6. 3660	15. 5047	0. 00				
1. 2150	0. 6550	3630537.	11876.	-0. 00625	0. 00	1. 03E+12
-16. 8481	41. 6690	0. 00				
1. 3500	0. 6449	3649870.	11841.	-0. 00624	0. 00	1. 03E+12
-27. 0036	67. 8333	0. 00				
1. 4850	0. 6348	3669133.	11789.	-0. 00624	0. 00	1. 03E+12
-36. 8328	93. 9975	0. 00				
1. 6200	0. 6247	3688298.	11721.	-0. 00623	0. 00	1. 03E+12
-46. 3364	120. 1618	0. 00				
1. 7550	0. 6146	3707342.	11639.	-0. 00622	0. 00	1. 03E+12
-55. 5146	146. 3260	0. 00				
1. 8900	0. 6045	3726241.	11542.	-0. 00622	0. 00	1. 03E+12
-64. 3680	172. 4903	0. 00				
2. 0250	0. 5945	3744970.	11431.	-0. 00621	0. 00	1. 03E+12
-72. 8970	198. 6545	0. 00				
2. 1600	0. 5844	3763507.	11306.	-0. 00621	0. 00	1. 03E+12
-81. 1021	224. 8188	0. 00				
2. 2950	0. 5744	3781832.	11168.	-0. 00620	0. 00	1. 03E+12
-88. 9838	250. 9831	0. 00				
2. 4300	0. 5643	3799923.	11018.	-0. 00619	0. 00	1. 03E+12
-96. 5425	277. 1473	0. 00				
2. 5650	0. 5543	3817761.	10856.	-0. 00619	0. 00	1. 03E+12
-103. 7788	303. 3116	0. 00				
2. 7000	0. 5443	3835326.	10682.	-0. 00618	0. 00	1. 03E+12
-110. 6930	329. 4758	0. 00				
2. 8350	0. 5343	3852600.	10497.	-0. 00618	0. 00	1. 03E+12
-117. 2858	355. 6401	0. 00				
2. 9700	0. 5243	3869567.	10302.	-0. 00617	0. 00	1. 03E+12
-123. 5575	381. 8043	0. 00				
3. 1050	0. 5143	3886209.	9838.	-0. 00616	0. 00	1. 03E+12
-449. 7051	1417.	0. 00				
3. 2400	0. 5043	3901671.	9082.	-0. 00616	0. 00	1. 03E+12
-482. 8599	1551.	0. 00				
3. 3750	0. 4943	3915866.	8273.	-0. 00615	0. 00	1. 03E+12
-516. 3118	1692.	0. 00				
3. 5100	0. 4844	3928705.	7410.	-0. 00615	0. 00	1. 03E+12
-549. 5352	1838.	0. 00				
3. 6450	0. 4744	3940102.	6493.	-0. 00614	0. 00	1. 03E+12

			Pol e A. Ip10o			
-582.4722	1989.	0.00				
3.7800	0.4645	3949971.	5523.	-0.00613	0.00	1.03E+12
-615.0652	2145.	0.00				
3.9150	0.4545	3958225.	4500.	-0.00613	0.00	1.03E+12
-647.2566	2307.	0.00				
4.0500	0.4446	3964780.	3426.	-0.00612	0.00	1.03E+12
-678.9891	2474.	0.00				
4.1850	0.4347	3969553.	2301.	-0.00611	0.00	1.03E+12
-710.2056	2647.	0.00				
4.3200	0.4248	3972463.	1125.	-0.00611	0.00	1.03E+12
-740.8490	2825.	0.00				
4.4550	0.4149	3973428.	-99.0007	-0.00610	0.00	1.03E+12
-770.8622	3010.	0.00				
4.5900	0.4050	3972369.	-1372.	-0.00610	0.00	1.03E+12
-800.1883	3201.	0.00				
4.7250	0.3952	3969211.	-2691.	-0.00609	0.00	1.03E+12
-828.7702	3398.	0.00				
4.8600	0.3853	3963877.	-4056.	-0.00608	0.00	1.03E+12
-856.5508	3601.	0.00				
4.9950	0.3755	3956296.	-5466.	-0.00608	0.00	1.03E+12
-883.4729	3812.	0.00				
5.1300	0.3656	3946395.	-6918.	-0.00607	0.00	1.03E+12
-909.4792	4030.	0.00				
5.2650	0.3558	3934108.	-8412.	-0.00606	0.00	1.03E+12
-934.9304	4257.	0.00				
5.4000	0.3460	3919367.	-9947.	-0.00606	0.00	1.03E+12
-960.0207	4495.	0.00				
5.5350	0.3362	3902107.	-11521.	-0.00605	0.00	1.03E+12
-984.1186	4743.	0.00				
5.6700	0.3264	3882263.	-13134.	-0.00605	0.00	1.03E+12
-1007.	4999.	0.00				
5.8050	0.3166	3859776.	-14784.	-0.00604	0.00	1.03E+12
-1029.	5266.	0.00				
5.9400	0.3068	3834589.	-16468.	-0.00603	0.00	1.03E+12
-1050.	5544.	0.00				
6.0750	0.2970	3806646.	-18184.	-0.00603	0.00	1.03E+12
-1069.	5833.	0.00				
6.2100	0.2873	3775896.	-19932.	-0.00602	0.00	1.03E+12
-1088.	6134.	0.00				
6.3450	0.2775	3742291.	-21708.	-0.00602	0.00	1.03E+12
-1105.	6449.	0.00				
6.4800	0.2678	3705787.	-23510.	-0.00601	0.00	1.03E+12
-1120.	6777.	0.00				
6.6150	0.2580	3666344.	-25332.	-0.00600	0.00	1.03E+12
-1130.	7094.	0.00				
6.7500	0.2483	3623934.	-27150.	-0.00600	0.00	1.03E+12
-1114.	7265.	0.00				
6.8850	0.2386	3578602.	-28939.	-0.00599	0.00	1.03E+12
-1095.	7436.	0.00				

			Pol e A. l p10o			
7. 0200	0. 2289	3530396.	-30696.	-0. 00599	0. 00	1. 03E+12
-1075.	7606.	0. 00				
7. 1550	0. 2192	3479369.	-32419.	-0. 00598	0. 00	1. 03E+12
-1052.	7777.	0. 00				
7. 2900	0. 2095	3425581.	-34104.	-0. 00598	0. 00	1. 03E+12
-1028.	7947.	0. 00				
7. 4250	0. 1998	3369095.	-35748.	-0. 00597	0. 00	1. 03E+12
-1001.	8118.	0. 00				
7. 5600	0. 1902	3309981.	-37347.	-0. 00597	0. 00	1. 03E+12
-972. 9872	8288.	0. 00				
7. 6950	0. 1805	3248313.	-38899.	-0. 00596	0. 00	1. 03E+12
-942. 5716	8459.	0. 00				
7. 8300	0. 1709	3184171.	-40399.	-0. 00596	0. 00	1. 03E+12
-910. 1661	8630.	0. 00				
7. 9650	0. 1612	3117641.	-41846.	-0. 00595	0. 00	1. 03E+12
-875. 7722	8800.	0. 00				
8. 1000	0. 1516	3048812.	-43235.	-0. 00595	0. 00	1. 03E+12
-839. 3916	8971.	0. 00				
8. 2350	0. 1420	2977781.	-44564.	-0. 00594	0. 00	1. 03E+12
-801. 0259	9141.	0. 00				
8. 3700	0. 1323	2904646.	-45829.	-0. 00594	0. 00	1. 03E+12
-760. 6763	9312.	0. 00				
8. 5050	0. 1227	2829516.	-47574.	-0. 00593	0. 00	1. 03E+12
-1394.	18401.	0. 00				
8. 6400	0. 1131	2750727.	-49828.	-0. 00593	0. 00	1. 03E+12
-1388.	19883.	0. 00				
8. 7750	0. 1035	2668294.	-52068.	-0. 00592	0. 00	1. 03E+12
-1377.	21542.	0. 00				
8. 9100	0. 09393	2582249.	-54212.	-0. 00592	0. 00	1. 03E+12
-1271.	21916.	0. 00				
9. 0450	0. 08434	2492868.	-56181.	-0. 00591	0. 00	1. 03E+12
-1161.	22290.	0. 00				
9. 1800	0. 07477	2400442.	-57968.	-0. 00591	0. 00	1. 03E+12
-1046.	22665.	0. 00				
9. 3150	0. 06519	2305271.	-59567.	-0. 00591	0. 00	1. 03E+12
-927. 1231	23039.	0. 00				
9. 4500	0. 05563	2207666.	-60969.	-0. 00590	0. 00	1. 03E+12
-803. 9135	23413.	0. 00				
9. 5850	0. 04606	2107952.	-62168.	-0. 00590	0. 00	1. 03E+12
-676. 3682	23787.	0. 00				
9. 7200	0. 03651	2006462.	-63157.	-0. 00590	0. 00	1. 04E+12
-544. 4874	24161.	0. 00				
9. 8550	0. 02696	1903543.	-63929.	-0. 00589	0. 00	1. 04E+12
-408. 2708	24535.	0. 00				
9. 9900	0. 01741	1799553.	-64476.	-0. 00589	0. 00	1. 04E+12
-267. 7179	24909.	0. 00				
10. 1250	0. 00787	1694861.	-64792.	-0. 00589	0. 00	1. 04E+12
-122. 8280	25283.	0. 00				
10. 2600	-0. 00167	1589845.	-64871.	-0. 00589	0. 00	1. 04E+12

Pol e A. l p10o						
26. 4002	25657.	0. 00				
10. 3950	-0. 01120	1484899.	-64703.	-0. 00588	0. 00	1. 04E+12
179. 9678	26031.	0. 00				
10. 5300	-0. 02073	1380426.	-64284.	-0. 00588	0. 00	1. 04E+12
337. 8765	26405.	0. 00				
10. 6650	-0. 03026	1276839.	-63605.	-0. 00588	0. 00	1. 04E+12
500. 1280	26779.	0. 00				
10. 8000	-0. 03978	1174564.	-62660.	-0. 00588	0. 00	1. 04E+12
666. 7244	27153.	0. 00				
10. 9350	-0. 04930	1074039.	-61441.	-0. 00588	0. 00	1. 04E+12
837. 6679	27527.	0. 00				
11. 0700	-0. 05881	975713.	-59942.	-0. 00587	0. 00	1. 04E+12
1013.	27901.	0. 00				
11. 2050	-0. 06833	880045.	-58156.	-0. 00587	0. 00	1. 04E+12
1193.	28275.	0. 00				
11. 3400	-0. 07784	787507.	-56075.	-0. 00587	0. 00	1. 04E+12
1377.	28649.	0. 00				
11. 4750	-0. 08735	698581.	-53692.	-0. 00587	0. 00	1. 04E+12
1565.	29023.	0. 00				
11. 6100	-0. 09686	613763.	-51001.	-0. 00587	0. 00	1. 04E+12
1758.	29397.	0. 00				
11. 7450	-0. 1064	533557.	-48060.	-0. 00587	0. 00	1. 04E+12
1873.	28520.	0. 00				
11. 8800	-0. 1159	458266.	-44970.	-0. 00587	0. 00	1. 04E+12
1943.	27164.	0. 00				
12. 0150	-0. 1254	388074.	-41767.	-0. 00587	0. 00	1. 04E+12
2010.	25977.	0. 00				
12. 1500	-0. 1349	323158.	-38458.	-0. 00587	0. 00	1. 04E+12
2076.	24931.	0. 00				
12. 2850	-0. 1444	263690.	-35043.	-0. 00587	0. 00	1. 04E+12
2140.	24010.	0. 00				
12. 4200	-0. 1539	209838.	-31526.	-0. 00587	0. 00	1. 04E+12
2202.	23185.	0. 00				
12. 5550	-0. 1634	161765.	-27909.	-0. 00586	0. 00	1. 04E+12
2263.	22439.	0. 00				
12. 6900	-0. 1729	119632.	-24194.	-0. 00586	0. 00	1. 04E+12
2322.	21761.	0. 00				
12. 8250	-0. 1824	83594.	-20385.	-0. 00586	0. 00	1. 04E+12
2380.	21141.	0. 00				
12. 9600	-0. 1919	53802.	-16484.	-0. 00586	0. 00	1. 04E+12
2436.	20569.	0. 00				
13. 0950	-0. 2014	30405.	-12492.	-0. 00586	0. 00	1. 04E+12
2491.	20041.	0. 00				
13. 2300	-0. 2109	13546.	-8413.	-0. 00586	0. 00	1. 04E+12
2545.	19549.	0. 00				
13. 3650	-0. 2204	3365.	-4248.	-0. 00586	0. 00	1. 04E+12
2597.	19089.	0. 00				
13. 5000	-0. 2299	0. 00	0. 00	-0. 00586	0. 00	1. 04E+12
2648.	9329.	0. 00				

Pole A. Ip10o

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.74646848 inches
 Computed slope at pile head = -0.00629727 radians
 Maximum bending moment = 3973428. inch-lbs
 Maximum shear force = -64871. lbs
 Depth of maximum bending moment = 4.45500000 feet below pile head
 Depth of maximum shear force = 10.26000000 feet below pile head
 Number of iterations = 16
 Number of zero deflection points = 1

----- Summary of Pile-head Responses for Conventional Analyses -----

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in lbs
1	V, lb	6900.	M, in-lb	1995600.	6600.	0.3360	-0.00282
2	V, lb	11900.	M, in-lb	3456000.	11500.	0.7465	-0.00630

Maximum pile-head deflection = 0.7464684844 inches

Pole A. Ip10o

Maximum pile-head rotation = -0.0062972741 radians = -0.360807 deg.

The analysis ended normally.

Pole D.Ip10o

LPile for Windows, Version 2018-10.002

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

Path to file locations:
\Users\KDurso\Desktop\Working\

Name of input data file:
Pole D.Ip10

Name of output report file:
Pole D.Ip10

Name of plot output file:
Pole D.Ip10

Name of runtime message file:
Pole D.Ip10

Date and Time of Analysis

Pole D.Ip10o

Date: October 9, 2019

Time: 11:56:11

Problem Title

Project Name: Tall Cedars and Stone Springs

Job Number: 38026.39

Client: Loudoun County

Engineer: KBP

Description: Pole A

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- | | | |
|--|---|---------------|
| - Maximum number of iterations allowed | = | 500 |
| - Deflection tolerance for convergence | = | 1.0000E-05 in |
| - Maximum allowable deflection | = | 100.0000 in |
| - Number of pile increments | = | 100 |

Loading Type and Number of Cycles of Loading:

- Static loading specified

Pole D. I p10o

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined	=	1
Total length of pile	=	13.500 ft
Depth of ground surface below top of pile	=	1.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	48.0000
2	13.500	48.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile
Length of section = 13.500000 ft

	Pole D. I p10o		
Shaft Diameter		=	48.000000 in
Shear capacity of section		=	0.0000 lbs

Ground Slope and Pile Batter Angles

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

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	1.000000 ft
Distance from top of pile to bottom of layer	=	3.000000 ft
Effective unit weight at top of layer	=	115.000000 pcf
Effective unit weight at bottom of layer	=	115.000000 pcf
Friction angle at top of layer	=	27.000000 deg.
Friction angle at bottom of layer	=	27.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	3.000000 ft
Distance from top of pile to bottom of layer	=	12.500000 ft
Effective unit weight at top of layer	=	118.000000 pcf
Effective unit weight at bottom of layer	=	118.000000 pcf
Friction angle at top of layer	=	31.000000 deg.
Friction angle at bottom of layer	=	31.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

Layer 3 is sand, p-y criteria by Reese et al., 1974

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Distance from top of pile to top of layer	=	12.500000 ft
Distance from top of pile to bottom of layer	=	18.250000 ft
Effective unit weight at top of layer	=	135.000000 pcf
Effective unit weight at bottom of layer	=	135.000000 pcf
Friction angle at top of layer	=	35.000000 deg.
Friction angle at bottom of layer	=	35.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

(Depth of the lowest soil layer extends 4.750 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci
1	Sand	1.0000	115.0000	27.0000	90.0000
	(Reese, et al.)	3.0000	115.0000	27.0000	90.0000
2	Sand	3.0000	118.0000	31.0000	90.0000
	(Reese, et al.)	12.5000	118.0000	31.0000	90.0000
3	Sand	12.5000	135.0000	35.0000	90.0000
	(Reese, et al.)	18.2500	135.0000	35.0000	90.0000

Static Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Compute No.	Load Top y Type	Condition 1	Condition 2	Axial Thrust Force, lbs
vs. Pile Length				

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1	1	V =	6900. lbs	M =	1995600. in-lbs	6600.
No						
2	1	V =	11900. lbs	M =	3456000. in-lbs	11500.
No						

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	13.500000 ft
Shaft Diameter	=	48.000000 in
Concrete Cover Thickness	=	4.000000 in
Number of Reinforcing Bars	=	23 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	1810. sq. in.
Total Area of Reinforcing Steel	=	18.170000 sq. in.
Area Ratio of Steel Reinforcement	=	1.00 percent
Edge-to-Edge Bar Spacing	=	4.310499 in
Maximum Concrete Aggregate Size	=	1.000000 in
Ratio of Bar Spacing to Aggregate Size	=	4.31
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

$$\text{Nom. Axial Structural Capacity} = 0.85 F_c A_c + F_y A_s = 5658.238 \text{ kips}$$

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Tensile Load for Cracking of Concrete = -709.624 kips
 Nominal Axial Tensile Capacity = -1090.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.000000	0.790000	19.500000	0.000000
2	1.000000	0.790000	18.776887	5.261037
3	1.000000	0.790000	16.661178	10.131887
4	1.000000	0.790000	13.309786	14.251301
5	1.000000	0.790000	8.971268	17.313762
6	1.000000	0.790000	3.967392	19.092140
7	1.000000	0.790000	-1.330727	19.454541
8	1.000000	0.790000	-6.530152	18.374088
9	1.000000	0.790000	-11.245266	15.930913
10	1.000000	0.790000	-15.126370	12.306215
11	1.000000	0.790000	-17.885620	7.768821
12	1.000000	0.790000	-19.318376	2.655250
13	1.000000	0.790000	-19.318376	-2.655250
14	1.000000	0.790000	-17.885620	-7.768821
15	1.000000	0.790000	-15.126370	-12.306215
16	1.000000	0.790000	-11.245266	-15.930913
17	1.000000	0.790000	-6.530152	-18.374088
18	1.000000	0.790000	-1.330727	-19.454541
19	1.000000	0.790000	3.967392	-19.092140
20	1.000000	0.790000	8.971268	-17.313762
21	1.000000	0.790000	13.309786	-14.251301
22	1.000000	0.790000	16.661178	-10.131887
23	1.000000	0.790000	18.776887	-5.261037

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 4.310 inches
 between bars 10 and 11.

Ratio of bar spacing to maximum aggregate size = 4.31

Concrete Properties:

Compressive Strength of Concrete = 3000. psi
 Modulus of Elasticity of Concrete = 3122019. psi
 Modulus of Rupture of Concrete = -410.791918 psi
 Compression Strain at Peak Stress = 0.001634

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Tensile Strain at Fracture of Concrete = -0.0001160
Maximum Coarse Aggregate Size = 1.000000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 2

Number	Axial Thrust Force ki ps
1	6.600
2	11.500

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 6.600 ki ps

Bending Max Conc Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Run Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
6.25000E-07	651.0955233	1041752837.	25.4914107	0.00001593	-0.00001407
0.0576872	0.4576818				
0.00000125	1299.	1038823076.	24.7484545	0.00003094	-0.00002906
0.1114682	0.8884315				
0.00000188	1942.	1035883589.	24.5008170	0.00004594	-0.00004406
0.1647532	1.3191819				
0.00000250	2582.	1032941666.	24.3770086	0.00006094	-0.00005906
0.2175423	1.7499331				
0.00000313	3219.	1029998770.	24.3027318	0.00007595	-0.00007405

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0. 2698354	2. 1806851				
0. 00000375	3851.	1027055386.	24. 2532210	0. 00009095	-0. 00008905
0. 3216325	2. 6114378				
0. 00000438	4480.	1024111724.	24. 2178622	0. 0001060	-0. 0001040
0. 3729337	3. 0421913				
0. 00000500	4480.	896097758.	12. 7659625	0. 00006383	-0. 0001762
0. 2256272	-5. 0741354 C				
0. 00000563	4480.	796531341.	12. 6943377	0. 00007141	-0. 0001986
0. 2517944	-5. 7200861 C				
0. 00000625	4480.	716878207.	12. 6364937	0. 00007898	-0. 0002210
0. 2778256	-6. 3661355 C				
0. 00000688	4480.	651707461.	12. 5900196	0. 00008656	-0. 0002434
0. 3037534	-7. 0120148 C				
0. 00000750	4480.	597398505.	12. 5520762	0. 00009414	-0. 0002659
0. 3295775	-7. 6577234 C				
0. 00000813	4480.	551444774.	12. 5206977	0. 0001017	-0. 0002883
0. 3552978	-8. 3032606 C				
0. 00000875	4480.	512055862.	12. 4944800	0. 0001093	-0. 0003107
0. 3809139	-8. 9486257 C				
0. 00000938	4480.	477918804.	12. 4723936	0. 0001169	-0. 0003331
0. 4064257	-9. 5938180 C				
0. 00001000	4480.	448048879.	12. 4536663	0. 0001245	-0. 0003555
0. 4318330	-10. 2388370 C				
0. 00001063	4480.	421693063.	12. 4377076	0. 0001322	-0. 0003778
0. 4571356	-10. 8836815 C				
0. 00001125	4480.	398265670.	12. 4240582	0. 0001398	-0. 0004002
0. 4823332	-11. 5283511 C				
0. 00001188	4480.	377304319.	12. 4123556	0. 0001474	-0. 0004226
0. 5074255	-12. 1728451 C				
0. 00001250	4480.	358439103.	12. 4023097	0. 0001550	-0. 0004450
0. 5324125	-12. 8171628 C				
0. 00001313	4480.	341370575.	12. 3936859	0. 0001627	-0. 0004673
0. 5572939	-13. 4613033 C				
0. 00001375	4480.	325853730.	12. 3862920	0. 0001703	-0. 0004897
0. 5820694	-14. 1052661 C				
0. 00001438	4480.	311686177.	12. 3799694	0. 0001780	-0. 0005120
0. 6067388	-14. 7490503 C				
0. 00001500	4480.	298699253.	12. 3745859	0. 0001856	-0. 0005344
0. 6313019	-15. 3926551 C				
0. 00001563	4480.	286751283.	12. 3700304	0. 0001933	-0. 0005567
0. 6557584	-16. 0360799 C				
0. 00001625	4480.	275722387.	12. 3662091	0. 0002010	-0. 0005790
0. 6801082	-16. 6793239 C				
0. 00001688	4480.	265510447.	12. 3630418	0. 0002086	-0. 0006014
0. 7043510	-17. 3223864 C				
0. 00001750	4480.	256027931.	12. 3604601	0. 0002163	-0. 0006237
0. 7284865	-17. 9652664 C				
0. 00001813	4480.	247199382.	12. 3584049	0. 0002240	-0. 0006460
0. 7525146	-18. 6079634 C				

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0. 00001875	4480.	238959402.	12. 3568248	0. 0002317	-0. 0006683
0. 7764349	-19. 2504765 C				
0. 00001938	4480.	231251034.	12. 3556754	0. 0002394	-0. 0006906
0. 8002473	-19. 8928048 C				
0. 00002000	4480.	224024440.	12. 3549176	0. 0002471	-0. 0007129
0. 8239516	-20. 5349477 C				
0. 00002063	4566.	221384894.	12. 3545172	0. 0002548	-0. 0007352
0. 8475473	-21. 1769043 C				
0. 00002125	4700.	221197975.	12. 3544439	0. 0002625	-0. 0007575
0. 8710345	-21. 8186739 C				
0. 00002188	4835.	221017314.	12. 3546710	0. 0002703	-0. 0007797
0. 8944127	-22. 4602555 C				
0. 00002250	4969.	220842375.	12. 3551748	0. 0002780	-0. 0008020
0. 9176818	-23. 1016484 C				
0. 00002313	5103.	220672677.	12. 3559339	0. 0002857	-0. 0008243
0. 9408414	-23. 7428518 C				
0. 00002375	5237.	220507791.	12. 3569294	0. 0002935	-0. 0008465
0. 9638914	-24. 3838648 C				
0. 00002438	5371.	220347332.	12. 3581444	0. 0003012	-0. 0008688
0. 9868315	-25. 0246866 C				
0. 00002563	5638.	220038340.	12. 3611730	0. 0003168	-0. 0009132
1. 0323811	-26. 3057533 C				
0. 00002688	5906.	219743308.	12. 3649144	0. 0003323	-0. 0009577
1. 0774880	-27. 5860449 C				
0. 00002813	6172.	219460264.	12. 3692819	0. 0003479	-0. 0010021
1. 1221502	-28. 8655545 C				
0. 00002938	6439.	219187573.	12. 3742039	0. 0003635	-0. 0010465
1. 1663656	-30. 1442751 C				
0. 00003063	6705.	218923864.	12. 3796207	0. 0003791	-0. 0010909
1. 2101322	-31. 4221995 C				
0. 00003188	6970.	218667980.	12. 3854819	0. 0003948	-0. 0011352
1. 2534478	-32. 6993203 C				
0. 00003313	7235.	218418936.	12. 3917449	0. 0004105	-0. 0011795
1. 2963102	-33. 9756303 C				
0. 00003438	7500.	218175891.	12. 3983734	0. 0004262	-0. 0012238
1. 3387172	-35. 2511218 C				
0. 00003563	7764.	217938118.	12. 4053363	0. 0004419	-0. 0012681
1. 3806667	-36. 5257872 C				
0. 00003688	8028.	217704989.	12. 4126071	0. 0004577	-0. 0013123
1. 4221563	-37. 7996187 C				
0. 00003813	8291.	217475957.	12. 4201625	0. 0004735	-0. 0013565
1. 4631838	-39. 0726083 C				
0. 00003938	8554.	217250542.	12. 4279824	0. 0004894	-0. 0014006
1. 5037469	-40. 3447481 C				
0. 00004063	8817.	217028322.	12. 4360496	0. 0005052	-0. 0014448
1. 5438432	-41. 6160297 C				
0. 00004188	9079.	216808925.	12. 4443486	0. 0005211	-0. 0014889
1. 5834703	-42. 8864449 C				
0. 00004313	9341.	216592019.	12. 4528661	0. 0005370	-0. 0015330

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1. 6226259	-44. 1559852 C				
0. 00004438	9602.	216377309.	12. 4615904	0. 0005530	-0. 0015770
1. 6613074	-45. 4246418 C				
0. 00004563	9863.	216164531.	12. 4705111	0. 0005690	-0. 0016210
1. 6995125	-46. 6924061 C				
0. 00004688	10123.	215953448.	12. 4796191	0. 0005850	-0. 0016650
1. 7372385	-47. 9592690 C				
0. 00004813	10383.	215743865.	12. 4889063	0. 0006010	-0. 0017090
1. 7744830	-49. 2252200 C				
0. 00004938	10642.	215535551.	12. 4983656	0. 0006171	-0. 0017529
1. 8112433	-50. 4902526 C				
0. 00005063	10901.	215328348.	12. 5079908	0. 0006332	-0. 0017968
1. 8475168	-51. 7543559 C				
0. 00005188	11159.	215122096.	12. 5177761	0. 0006494	-0. 0018406
1. 8833008	-53. 0175204 C				
0. 00005313	11417.	214916649.	12. 5277167	0. 0006655	-0. 0018845
1. 9185925	-54. 2797363 C				
0. 00005438	11675.	214711872.	12. 5378082	0. 0006817	-0. 0019283
1. 9533894	-55. 5409935 C				
0. 00005563	11932.	214507640.	12. 5480468	0. 0006980	-0. 0019720
1. 9876885	-56. 8012819 C				
0. 00005688	12189.	214303841.	12. 5584290	0. 0007143	-0. 0020157
2. 0214870	-58. 0605911 C				
0. 00005813	12445.	214100367.	12. 5689518	0. 0007306	-0. 0020594
2. 0547820	-59. 3189105 C				
0. 00005938	12700.	213897122.	12. 5796127	0. 0007469	-0. 0021031
2. 0875706	-60. 0000000 CY				
0. 00006063	12955.	213694012.	12. 5904092	0. 0007633	-0. 0021467
2. 1198499	-60. 0000000 CY				
0. 00006188	13210.	213490954.	12. 6013396	0. 0007797	-0. 0021903
2. 1516167	-60. 0000000 CY				
0. 00006313	13464.	213287866.	12. 6124020	0. 0007962	-0. 0022338
2. 1828680	-60. 0000000 CY				
0. 00006438	13717.	213084673.	12. 6235950	0. 0008126	-0. 0022774
2. 2136007	-60. 0000000 CY				
0. 00006563	13970.	212881304.	12. 6349175	0. 0008292	-0. 0023208
2. 2438116	-60. 0000000 CY				
0. 00006688	14219.	212624354.	12. 6452719	0. 0008457	-0. 0023643
2. 2733649	-60. 0000000 CY				
0. 00006813	14446.	212055062.	12. 6492083	0. 0008617	-0. 0024083
2. 3016003	-60. 0000000 CY				
0. 00006938	14646.	211113648.	12. 6452649	0. 0008773	-0. 0024527
2. 3283437	-60. 0000000 CY				
0. 00007063	14825.	209916158.	12. 6357116	0. 0008924	-0. 0024976
2. 3538730	-60. 0000000 CY				
0. 00007188	14994.	208606850.	12. 6235689	0. 0009073	-0. 0025427
2. 3785567	-60. 0000000 CY				
0. 00007313	15148.	207154446.	12. 6080401	0. 0009220	-0. 0025880
2. 4023040	-60. 0000000 CY				

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0. 00007438	15294.	205630951.	12. 5907005	0. 0009364	-0. 0026336
2. 4253098	-60. 0000000 CY				
0. 00007938	15805.	199120154.	12. 5090385	0. 0009929	-0. 0028171
2. 5107289	-60. 0000000 CY				
0. 00008438	16221.	192253443.	12. 4137386	0. 0010474	-0. 0030026
2. 5866012	-60. 0000000 CY				
0. 00008938	16573.	185433484.	12. 3139159	0. 0011006	-0. 0031894
2. 6543949	-60. 0000000 CY				
0. 00009438	16884.	178907933.	12. 2152828	0. 0011528	-0. 0033772
2. 7151193	-60. 0000000 CY				
0. 00009938	17140.	172473912.	12. 1082681	0. 0012033	-0. 0035667
2. 7681275	-60. 0000000 CY				
0. 0001044	17381.	166527274.	12. 0107068	0. 0012536	-0. 0037564
2. 8156078	-60. 0000000 CY				
0. 0001094	17578.	160715274.	11. 9100961	0. 0013027	-0. 0039473
2. 8566053	-60. 0000000 CY				
0. 0001144	17765.	155323527.	11. 8181341	0. 0013517	-0. 0041383
2. 8924431	-60. 0000000 CY				
0. 0001194	17938.	150262328.	11. 7302122	0. 0014003	-0. 0043297
2. 9228794	-60. 0000000 CY				
0. 0001244	18075.	145329912.	11. 6362106	0. 0014473	-0. 0045227
2. 9474731	-60. 0000000 CY				
0. 0001294	18210.	140757342.	11. 5512945	0. 0014944	-0. 0047156
2. 9674489	-60. 0000000 CY				
0. 0001344	18341.	136488305.	11. 4736015	0. 0015418	-0. 0049082
2. 9827019	-60. 0000000 CY				
0. 0001394	18451.	132384479.	11. 3964076	0. 0015884	-0. 0051016
2. 9930486	-60. 0000000 CY				
0. 0001444	18547.	128465950.	11. 3215019	0. 0016345	-0. 0052955
2. 9987258	-60. 0000000 CY				
0. 0001494	18640.	124788418.	11. 2511563	0. 0016806	-0. 0054894
2. 9976668	-60. 0000000 CY				
0. 0001544	18731.	121331656.	11. 1843681	0. 0017266	-0. 0056834
2. 9996308	-60. 0000000 CY				
0. 0001594	18815.	118056844.	11. 1219679	0. 0017726	-0. 0058774
2. 9969314	-60. 0000000 CY				
0. 0001644	18886.	114897381.	11. 0594999	0. 0018179	-0. 0060721
2. 9998128	-60. 0000000 CY				
0. 0001694	18947.	111861558.	10. 9982472	0. 0018628	-0. 0062672
2. 9965645	-60. 0000000 CY				
0. 0001744	19006.	108992520.	10. 9419106	0. 0019080	-0. 0064620
2. 9996147	-60. 0000000 CY				
0. 0001794	19063.	106276369.	10. 8902146	0. 0019534	-0. 0066566
2. 9961524	-60. 0000000 CY				
0. 0001844	19120.	103701273.	10. 8426953	0. 0019991	-0. 0068509
2. 9987989	-60. 0000000 CY				
0. 0001894	19174.	101250460.	10. 7980739	0. 0020449	-0. 0070451
2. 9995271	-60. 0000000 CY				
0. 0001944	19224.	98902347.	10. 7522450	0. 0020900	-0. 0072400

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2. 9963805	-60. 0000000 CY				
0. 0001994	19264.	96622815.	10. 7046572	0. 0021342	-0. 0074358
2. 9992593	60. 0000000 CY				
0. 0002044	19301.	94439732.	10. 6590448	0. 0021784	-0. 0076316
2. 9988921	60. 0000000 CY				
0. 0002094	19335.	92345027.	10. 6153958	0. 0022226	-0. 0078274
2. 9953649	60. 0000000 CY				
0. 0002144	19368.	90345894.	10. 5745054	0. 0022669	-0. 0080231
2. 9985833	60. 0000000 CY				
0. 0002194	19401.	88435751.	10. 5362001	0. 0023114	-0. 0082186
2. 9999506	60. 0000000 CY				
0. 0002244	19433.	86607391.	10. 5006210	0. 0023561	-0. 0084139
2. 9953330	60. 0000000 CY				
0. 0002294	19464.	84856721.	10. 4672851	0. 0024009	-0. 0086091
2. 9961691	60. 0000000 CY				
0. 0002344	19495.	83178533.	10. 4358768	0. 0024459	-0. 0088041
2. 9988916	60. 0000000 CY				
0. 0002394	19526.	81568693.	10. 4063474	0. 0024910	-0. 0089990
2. 9999793	60. 0000000 CY				
0. 0002444	19552.	80008467.	10. 3768892	0. 0025359	-0. 0091941
2. 9953173	60. 0000000 CY				
0. 0002494	19576.	78499406.	10. 3476038	0. 0025804	-0. 0093896
2. 9944005	60. 0000000 CY				
0. 0002544	19599.	77045795.	10. 3193940	0. 0026250	-0. 0095850
2. 9975783	60. 0000000 CY				
0. 0002594	19616.	75627313.	10. 2865293	0. 0026681	-0. 0097819
2. 9993664	60. 0000000 CY				
0. 0002644	19633.	74261724.	10. 2553065	0. 0027112	-0. 0099788
2. 9999990	60. 0000000 CY				
0. 0002694	19650.	72945197.	10. 2259769	0. 0027546	-0. 0101754
2. 9954274	60. 0000000 CY				
0. 0002744	19666.	71676089.	10. 1980380	0. 0027981	-0. 0103719
2. 9915646	60. 0000000 CY				
0. 0003044	19762.	64925605.	10. 0562040	0. 0030609	-0. 0115491
2. 9918268	60. 0000000 CYT				
0. 0003344	19842.	59341086.	9. 9420068	0. 0033244	-0. 0127256
2. 9988472	60. 0000000 CYT				
0. 0003644	19892.	54593273.	9. 8358315	0. 0035839	-0. 0139061
2. 9958199	60. 0000000 CYT				
0. 0003944	19932.	50540603.	9. 7380557	0. 0038404	-0. 0150896
2. 9937816	60. 0000000 CYT				

Axi al Thrust Force = 11. 500 ki ps

Bendi ng Max Conc Curvature Stress	Bendi ng Max Steel Moment Stress	Bendi ng Run Sti ffness Msg	Depth to N Axis	Max Comp Strain	Max Tens Strain
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rad/in. ksi	in-kip ksi	kip-in ²	Pol e D. I p10o in	in/in	in/in
-----	-----	-----	-----	-----	-----
6. 25000E-07	651. 0589923	1041694388.	26. 5986370	0. 00001662	-0. 00001338
0. 0602038	0. 4777503				
0. 00000125	1298.	1038793553.	25. 3040642	0. 00003163	-0. 00002837
0. 1139707	0. 9085723				
0. 00000188	1942.	1035863752.	24. 8725691	0. 00004664	-0. 00004336
0. 1672416	1. 3393960				
0. 00000250	2582.	1032926677.	24. 6568404	0. 00006164	-0. 00005836
0. 2200164	1. 7702209				
0. 00000313	3219.	1029986690.	24. 5274176	0. 00007665	-0. 00007335
0. 2722951	2. 2010472				
0. 00000375	3851.	1027045244.	24. 4411478	0. 00009165	-0. 00008835
0. 3240777	2. 6318748				
0. 00000438	4480.	1024102966.	24. 3795369	0. 0001067	-0. 0001033
0. 3753643	3. 0627037				
0. 00000500	4480.	896090095.	13. 2707213	0. 00006635	-0. 0001736
0. 2345345	-5. 0009454 C				
0. 00000563	4480.	796524529.	13. 1470386	0. 00007395	-0. 0001960
0. 2607390	-5. 6462393 C				
0. 00000625	4480.	716872076.	13. 0467870	0. 00008154	-0. 0002185
0. 2867902	-6. 2917698 C				
0. 00000688	4480.	651701887.	12. 9655909	0. 00008914	-0. 0002409
0. 3127368	-6. 9371353 C				
0. 00000750	4480.	597393397.	12. 8986892	0. 00009674	-0. 0002633
0. 3385784	-7. 5823351 C				
0. 00000813	4480.	551440058.	12. 8427860	0. 0001043	-0. 0002857
0. 3643150	-8. 2273685 C				
0. 00000875	4480.	512051483.	12. 7955270	0. 0001120	-0. 0003080
0. 3899462	-8. 8722350 C				
0. 00000938	4480.	477914717.	12. 7551857	0. 0001196	-0. 0003304
0. 4154719	-9. 5169339 C				
0. 00001000	4480.	448045047.	12. 7204674	0. 0001272	-0. 0003528
0. 4408919	-10. 1614644 C				
0. 00001063	4480.	421689456.	12. 6891747	0. 0001348	-0. 0003752
0. 4661625	-10. 8061980 C				
0. 00001125	4480.	398262264.	12. 6618798	0. 0001424	-0. 0003976
0. 4913275	-11. 4507617 C				
0. 00001188	4480.	377301093.	12. 6379695	0. 0001501	-0. 0004199
0. 5163872	-12. 0951492 C				
0. 00001250	4480.	358436038.	12. 6169381	0. 0001577	-0. 0004423
0. 5413414	-12. 7393599 C				
0. 00001313	4480.	341367655.	12. 5983763	0. 0001654	-0. 0004646
0. 5661899	-13. 3833930 C				
0. 00001375	4480.	325850944.	12. 5819492	0. 0001730	-0. 0004870
0. 5909323	-14. 0272480 C				
0. 00001438	4480.	311683511.	12. 5673802	0. 0001807	-0. 0005093

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0. 6155686	-14. 6709236 C				
0. 00001500	4480.	298696698.	12. 5544386	0. 0001883	-0. 0005317
0. 6400985	-15. 3144194 C				
0. 00001563	4480.	286748830.	12. 5429309	0. 0001960	-0. 0005540
0. 6645217	-15. 9577346 C				
0. 00001625	4480.	275720029.	12. 5326932	0. 0002037	-0. 0005763
0. 6888380	-16. 6008685 C				
0. 00001688	4480.	265508176.	12. 5235860	0. 0002113	-0. 0005987
0. 7130473	-17. 2438202 C				
0. 00001750	4480.	256025741.	12. 5154897	0. 0002190	-0. 0006210
0. 7371492	-17. 8865891 C				
0. 00001813	4480.	247197268.	12. 5083011	0. 0002267	-0. 0006433
0. 7611435	-18. 5291743 C				
0. 00001875	4480.	238957359.	12. 5019310	0. 0002344	-0. 0006656
0. 7850300	-19. 1715750 C				
0. 00001938	4480.	231249057.	12. 4963016	0. 0002421	-0. 0006879
0. 8088084	-19. 8137905 C				
0. 00002000	4489.	224435450.	12. 4913448	0. 0002498	-0. 0007102
0. 8324785	-20. 4558200 C				
0. 00002063	4623.	224152648.	12. 4870008	0. 0002575	-0. 0007325
0. 8560401	-21. 0976627 C				
0. 00002125	4757.	223881936.	12. 4832168	0. 0002653	-0. 0007547
0. 8794929	-21. 7393177 C				
0. 00002188	4892.	223622260.	12. 4799461	0. 0002730	-0. 0007770
0. 9028367	-22. 3807842 C				
0. 00002250	5026.	223372686.	12. 4771472	0. 0002807	-0. 0007993
0. 9260712	-23. 0220614 C				
0. 00002313	5160.	223132377.	12. 4747831	0. 0002885	-0. 0008215
0. 9491963	-23. 6631485 C				
0. 00002375	5294.	222900588.	12. 4728207	0. 0002962	-0. 0008438
0. 9722115	-24. 3040447 C				
0. 00002438	5428.	222676647.	12. 4712302	0. 0003040	-0. 0008660
0. 9951167	-24. 9447491 C				
0. 00002563	5695.	222249954.	12. 4690609	0. 0003195	-0. 0009105
1. 0405961	-26. 2255791 C				
0. 00002688	5962.	221848135.	12. 4680909	0. 0003351	-0. 0009549
1. 0856324	-27. 5056316 C				
0. 00002813	6229.	221467763.	12. 4681689	0. 0003507	-0. 0009993
1. 1302235	-28. 7848997 C				
0. 00002938	6495.	221105994.	12. 4691694	0. 0003663	-0. 0010437
1. 1743673	-30. 0633762 C				
0. 00003063	6761.	220760447.	12. 4709876	0. 0003819	-0. 0010881
1. 2180618	-31. 3410540 C				
0. 00003188	7026.	220429112.	12. 4735353	0. 0003976	-0. 0011324
1. 2613047	-32. 6179258 C				
0. 00003313	7291.	220110281.	12. 4767375	0. 0004133	-0. 0011767
1. 3040940	-33. 8939840 C				
0. 00003438	7556.	219802494.	12. 4805306	0. 0004290	-0. 0012210
1. 3464274	-35. 1692211 C				

Pol e D. l p10o					
0. 00003563	7820.	219504493.	12. 4848598	0. 0004448	-0. 0012652
1. 3883026	-36. 4436293 C				
0. 00003688	8084.	219215191.	12. 4896778	0. 0004606	-0. 0013094
1. 4297175	-37. 7172009 C				
0. 00003813	8347.	218933641.	12. 4949439	0. 0004764	-0. 0013536
1. 4706697	-38. 9899279 C				
0. 00003938	8610.	218659014.	12. 5006224	0. 0004922	-0. 0013978
1. 5111569	-40. 2618021 C				
0. 00004063	8872.	218390583.	12. 5066823	0. 0005081	-0. 0014419
1. 5511767	-41. 5328152 C				
0. 00004188	9134.	218127705.	12. 5130963	0. 0005240	-0. 0014860
1. 5907268	-42. 8029590 C				
0. 00004313	9396.	217869813.	12. 5198406	0. 0005399	-0. 0015301
1. 6298047	-44. 0722248 C				
0. 00004438	9657.	217616399.	12. 5268939	0. 0005559	-0. 0015741
1. 6684081	-45. 3406040 C				
0. 00004563	9917.	217367012.	12. 5342375	0. 0005719	-0. 0016181
1. 7065342	-46. 6080876 C				
0. 00004688	10178.	217121246.	12. 5418549	0. 0005879	-0. 0016621
1. 7441808	-47. 8746667 C				
0. 00004813	10437.	216878737.	12. 5497313	0. 0006040	-0. 0017060
1. 7813451	-49. 1403321 C				
0. 00004938	10697.	216639155.	12. 5578535	0. 0006200	-0. 0017500
1. 8180246	-50. 4050745 C				
0. 00005063	10955.	216402203.	12. 5662098	0. 0006362	-0. 0017938
1. 8542166	-51. 6688843 C				
0. 00005188	11214.	216167610.	12. 5747898	0. 0006523	-0. 0018377
1. 8899185	-52. 9317519 C				
0. 00005313	11472.	215935148.	12. 5835840	0. 0006685	-0. 0018815
1. 9251276	-54. 1936657 C				
0. 00005438	11729.	215704557.	12. 5925841	0. 0006847	-0. 0019253
1. 9598410	-55. 4546188 C				
0. 00005563	11986.	215475647.	12. 6017825	0. 0007010	-0. 0019690
1. 9940559	-56. 7145994 C				
0. 00005688	12242.	215248228.	12. 6111725	0. 0007173	-0. 0020127
2. 0277695	-57. 9735971 C				
0. 00005813	12498.	215022127.	12. 6207481	0. 0007336	-0. 0020564
2. 0609789	-59. 2316013 C				
0. 00005938	12754.	214797181.	12. 6305038	0. 0007499	-0. 0021001
2. 0936811	-60. 0000000 CY				
0. 00006063	13009.	214573242.	12. 6404348	0. 0007663	-0. 0021437
2. 1258731	-60. 0000000 CY				
0. 00006188	13263.	214350170.	12. 6505368	0. 0007828	-0. 0021872
2. 1575520	-60. 0000000 CY				
0. 00006313	13517.	214127836.	12. 6608058	0. 0007992	-0. 0022308
2. 1887146	-60. 0000000 CY				
0. 00006438	13770.	213906120.	12. 6712385	0. 0008157	-0. 0022743
2. 2193578	-60. 0000000 CY				
0. 00006563	14023.	213684909.	12. 6818318	0. 0008322	-0. 0023178

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2. 2494783	-60. 0000000 CY				
0. 00006688	14272.	213418113.	12. 6916359	0. 0008488	-0. 0023612
2. 2789589	-60. 0000000 CY				
0. 00006813	14501.	212862742.	12. 6955278	0. 0008649	-0. 0024051
2. 3071813	-60. 0000000 CY				
0. 00006938	14703.	211937333.	12. 6916004	0. 0008805	-0. 0024495
2. 3339186	-60. 0000000 CY				
0. 00007063	14884.	210750011.	12. 6819553	0. 0008957	-0. 0024943
2. 3594281	-60. 0000000 CY				
0. 00007188	15054.	209440913.	12. 6695206	0. 0009106	-0. 0025394
2. 3840656	-60. 0000000 CY				
0. 00007313	15209.	207986760.	12. 6536664	0. 0009253	-0. 0025847
2. 4077614	-60. 0000000 CY				
0. 00007438	15355.	206449811.	12. 6357381	0. 0009398	-0. 0026302
2. 4306821	-60. 0000000 CY				
0. 00007938	15868.	199917472.	12. 5525805	0. 0009964	-0. 0028136
2. 5158420	-60. 0000000 CY				
0. 00008438	16286.	193017047.	12. 4555975	0. 0010509	-0. 0029991
2. 5914026	-60. 0000000 CY				
0. 00008938	16639.	186174287.	12. 3545010	0. 0011042	-0. 0031858
2. 6589021	-60. 0000000 CY				
0. 00009438	16952.	179621787.	12. 2558389	0. 0011566	-0. 0033734
2. 7194349	-60. 0000000 CY				
0. 00009938	17208.	173160402.	12. 1483625	0. 0012072	-0. 0035628
2. 7721781	-60. 0000000 CY				
0. 0001044	17450.	167189986.	12. 0496996	0. 0012577	-0. 0037523
2. 8192952	-60. 0000000 CY				
0. 0001094	17648.	161352273.	11. 9479215	0. 0013068	-0. 0039432
2. 8599083	-60. 0000000 CY				
0. 0001144	17835.	155930192.	11. 8546364	0. 0013559	-0. 0041341
2. 8953271	-60. 0000000 CY				
0. 0001194	18008.	150853163.	11. 7676757	0. 0014048	-0. 0043252
2. 9254905	-60. 0000000 CY				
0. 0001244	18147.	145904520.	11. 6733956	0. 0014519	-0. 0045181
2. 9496968	-60. 0000000 CY				
0. 0001294	18282.	141307583.	11. 5873754	0. 0014991	-0. 0047109
2. 9692103	-60. 0000000 CY				
0. 0001344	18412.	137019157.	11. 5088456	0. 0015465	-0. 0049035
2. 9839976	-60. 0000000 CY				
0. 0001394	18523.	132902242.	11. 4311519	0. 0015932	-0. 0050968
2. 9938784	-60. 0000000 CY				
0. 0001444	18620.	128966343.	11. 3554915	0. 0016394	-0. 0052906
2. 9990702	-60. 0000000 CY				
0. 0001494	18713.	125274044.	11. 2863999	0. 0016859	-0. 0054841
2. 9965741	-60. 0000000 CY				
0. 0001544	18803.	121800749.	11. 2192973	0. 0017320	-0. 0056780
2. 9998178	-60. 0000000 CY				
0. 0001594	18888.	118515086.	11. 1566108	0. 0017781	-0. 0058719
2. 9975457	-60. 0000000 CY				

Pol e D. l p10o					
0. 0001644	18960.	115345813.	11. 0938393	0. 0018235	-0. 0060665
2. 9999408	-60. 0000000 CY				
0. 0001694	19020.	112295065.	11. 0319187	0. 0018685	-0. 0062615
2. 9972368	-60. 0000000 CY				
0. 0001744	19079.	109412291.	10. 9748973	0. 0019137	-0. 0064563
2. 9998169	-60. 0000000 CY				
0. 0001794	19136.	106682809.	10. 9226182	0. 0019592	-0. 0066508
2. 9957113	-60. 0000000 CY				
0. 0001844	19193.	104095550.	10. 8744820	0. 0020050	-0. 0068450
2. 9991910	-60. 0000000 CY				
0. 0001894	19247.	101634752.	10. 8296867	0. 0020509	-0. 0070391
2. 9982836	-60. 0000000 CY				
0. 0001944	19297.	99279445.	10. 7860430	0. 0020965	-0. 0072335
2. 9971701	-60. 0000000 CY				
0. 0001994	19338.	96995099.	10. 7384771	0. 0021410	-0. 0074290
2. 9995974	60. 0000000 CY				
0. 0002044	19375.	94803665.	10. 6926287	0. 0021853	-0. 0076247
2. 9974664	60. 0000000 CY				
0. 0002094	19409.	92699548.	10. 6484061	0. 0022295	-0. 0078205
2. 9963091	60. 0000000 CY				
0. 0002144	19442.	90691428.	10. 6069759	0. 0022739	-0. 0080161
2. 9990844	60. 0000000 CY				
0. 0002194	19475.	88772667.	10. 5681686	0. 0023184	-0. 0082116
2. 9999203	60. 0000000 CY				
0. 0002244	19506.	86935790.	10. 5321847	0. 0023632	-0. 0084068
2. 9938620	60. 0000000 CY				
0. 0002294	19538.	85177374.	10. 4983664	0. 0024081	-0. 0086019
2. 9970477	60. 0000000 CY				
0. 0002344	19568.	83491863.	10. 4665167	0. 0024531	-0. 0087969
2. 9993406	60. 0000000 CY				
0. 0002394	19599.	81874727.	10. 4366012	0. 0024983	-0. 0089917
2. 9993866	60. 0000000 CY				
0. 0002444	19626.	80311051.	10. 4072932	0. 0025433	-0. 0091867
2. 9937740	60. 0000000 CY				
0. 0002494	19650.	78795487.	10. 3775665	0. 0025879	-0. 0093821
2. 9955234	60. 0000000 CY				
0. 0002544	19673.	77338481.	10. 3494511	0. 0026326	-0. 0095774
2. 9983104	60. 0000000 CY				
0. 0002594	19691.	75917675.	10. 3197523	0. 0026767	-0. 0097733
2. 9997429	60. 0000000 CY				
0. 0002644	19708.	74545860.	10. 2882261	0. 0027199	-0. 0099701
2. 9983920	60. 0000000 CY				
0. 0002694	19725.	73223712.	10. 2584638	0. 0027634	-0. 0101666
2. 9936096	60. 0000000 CY				
0. 0002744	19741.	71949225.	10. 2300951	0. 0028069	-0. 0103631
2. 9931907	60. 0000000 CY				
0. 0003044	19836.	65169905.	10. 0861359	0. 0030700	-0. 0115400
2. 9899344	60. 0000000 CYT				
0. 0003344	19917.	59563879.	9. 9706359	0. 0033339	-0. 0127161

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2. 9968588	60. 0000000 CYT				
0. 0003644	19968.	54799332.	9. 8642474	0. 0035943	-0. 0138957
2. 9971189	60. 0000000 CYT				
0. 0003944	20007.	50732017.	9. 7687822	0. 0038526	-0. 0150774
2. 9912646	60. 0000000 CYT				

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

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

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
----	-----	-----	-----
1	6. 600	19739. 589	0. 00300000
2	11. 500	19810. 819	0. 00300000

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

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

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

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
-----	-----	-----	-----	-----	-----
1	0. 65	19740.	4. 290000	12831.	213793128.
2	0. 65	19811.	7. 475000	12877.	214688734.
1	0. 70	19740.	4. 620000	13818.	213003982.
2	0. 70	19811.	8. 050000	13868.	213820942.
1	0. 75	19740.	4. 950000	14805.	210053969.
2	0. 75	19811.	8. 625000	14858.	210921193.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	1.0000	0.00	N. A.	No	0.00	6586.
2	3.0000	1.7903	Yes	No	6586.	292677.
3	12.5000	9.7474	Yes	No	299263.	N. A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

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

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 6900.0 lbs
Applied moment at pile head = 1995600.0 in-lbs
Axial thrust load on pile head = 6600.0 lbs

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Distrib. Lat. Load inches lb/inch	Bending Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
0.00	0.00	0.2839	1995600.	6900.	-0.00257	0.00	1.04E+12	
0.00	0.00	0.00	0.00					
0.1350	0.00	0.2798	2006805.	6900.	-0.00256	0.00	1.04E+12	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.2756	2018011.	6900.	-0.00256	0.00	1.04E+12	
0.00	0.00	0.00	0.00					
0.4050	0.00	0.2715	2029216.	6900.	-0.00256	0.00	1.04E+12	

			Pol e D. I p10o			
0. 00	0. 00	0. 00				
0. 5400	0. 2673	2040422.	6900.	-0. 00256	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 6750	0. 2632	2051627.	6900.	-0. 00255	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 8100	0. 2591	2062832.	6900.	-0. 00255	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
0. 9450	0. 2549	2074037.	6900.	-0. 00255	0. 00	1. 04E+12
0. 00	0. 00	0. 00				
1. 0800	0. 2508	2085243.	6891.	-0. 00254	0. 00	1. 04E+12
-11. 1954	72. 3096	0. 00				
1. 2150	0. 2467	2096418.	6857.	-0. 00254	0. 00	1. 04E+12
-30. 2411	198. 5817	0. 00				
1. 3500	0. 2426	2107515.	6793.	-0. 00254	0. 00	1. 03E+12
-49. 4467	330. 1992	0. 00				
1. 4850	0. 2385	2118481.	6697.	-0. 00253	0. 00	1. 03E+12
-68. 7744	467. 1721	0. 00				
1. 6200	0. 2344	2129267.	6570.	-0. 00253	0. 00	1. 03E+12
-88. 1861	609. 5104	0. 00				
1. 7550	0. 2303	2139822.	6411.	-0. 00253	0. 00	1. 03E+12
-107. 6441	757. 2246	0. 00				
1. 8900	0. 2262	2150094.	6221.	-0. 00252	0. 00	1. 03E+12
-127. 1107	910. 3255	0. 00				
2. 0250	0. 2221	2160032.	5999.	-0. 00252	0. 00	1. 03E+12
-146. 5481	1069.	0. 00				
2. 1600	0. 2180	2169586.	5746.	-0. 00252	0. 00	1. 03E+12
-165. 9186	1233.	0. 00				
2. 2950	0. 2140	2178704.	5462.	-0. 00251	0. 00	1. 03E+12
-185. 1846	1402.	0. 00				
2. 4300	0. 2099	2187337.	5147.	-0. 00251	0. 00	1. 03E+12
-204. 3087	1577.	0. 00				
2. 5650	0. 2058	2195433.	4800.	-0. 00251	0. 00	1. 03E+12
-223. 2534	1757.	0. 00				
2. 7000	0. 2018	2202943.	4423.	-0. 00250	0. 00	1. 03E+12
-241. 9813	1943.	0. 00				
2. 8350	0. 1977	2209818.	4016.	-0. 00250	0. 00	1. 03E+12
-260. 4551	2134.	0. 00				
2. 9700	0. 1937	2216009.	3580.	-0. 00249	0. 00	1. 03E+12
-278. 6376	2330.	0. 00				
3. 1050	0. 1897	2221470.	3079.	-0. 00249	0. 00	1. 03E+12
-339. 2512	2898.	0. 00				
3. 2400	0. 1856	2226039.	2510.	-0. 00249	0. 00	1. 03E+12
-363. 4336	3172.	0. 00				
3. 3750	0. 1816	2229655.	1901.	-0. 00248	0. 00	1. 03E+12
-388. 1264	3463.	0. 00				
3. 5100	0. 1776	2232253.	1253.	-0. 00248	0. 00	1. 03E+12
-412. 5694	3764.	0. 00				
3. 6450	0. 1736	2233767.	564. 7884	-0. 00248	0. 00	1. 03E+12
-436. 7160	4076.	0. 00				

Pol e D. l p10o						
3. 7800	0. 1695	2234135.	-161. 9729	-0. 00247	0. 00	1. 03E+12
-460. 5201	4400.	0. 00				
3. 9150	0. 1655	2233295.	-926. 9820	-0. 00247	0. 00	1. 03E+12
-483. 9356	4736.	0. 00				
4. 0500	0. 1615	2231185.	-1730.	-0. 00247	0. 00	1. 03E+12
-506. 9165	5084.	0. 00				
4. 1850	0. 1575	2227744.	-2569.	-0. 00246	0. 00	1. 03E+12
-529. 4171	5444.	0. 00				
4. 3200	0. 1536	2222914.	-3444.	-0. 00246	0. 00	1. 03E+12
-550. 5891	5809.	0. 00				
4. 4550	0. 1496	2216639.	-4342.	-0. 00246	0. 00	1. 03E+12
-558. 1175	6045.	0. 00				
4. 5900	0. 1456	2208899.	-5251.	-0. 00245	0. 00	1. 03E+12
-564. 5063	6281.	0. 00				
4. 7250	0. 1416	2199677.	-6170.	-0. 00245	0. 00	1. 03E+12
-569. 7581	6517.	0. 00				
4. 8600	0. 1377	2188961.	-7096.	-0. 00245	0. 00	1. 03E+12
-573. 8751	6753.	0. 00				
4. 9950	0. 1337	2176738.	-8028.	-0. 00244	0. 00	1. 03E+12
-576. 8597	6990.	0. 00				
5. 1300	0. 1297	2163001.	-8964.	-0. 00244	0. 00	1. 03E+12
-578. 7142	7226.	0. 00				
5. 2650	0. 1258	2147745.	-9902.	-0. 00244	0. 00	1. 03E+12
-579. 4408	7462.	0. 00				
5. 4000	0. 1219	2130969.	-10841.	-0. 00243	0. 00	1. 03E+12
-579. 0417	7698.	0. 00				
5. 5350	0. 1179	2112673.	-11778.	-0. 00243	0. 00	1. 03E+12
-577. 5191	7934.	0. 00				
5. 6700	0. 1140	2092861.	-12711.	-0. 00243	0. 00	1. 04E+12
-574. 8752	8171.	0. 00				
5. 8050	0. 1101	2071541.	-13639.	-0. 00242	0. 00	1. 04E+12
-571. 1120	8407.	0. 00				
5. 9400	0. 1061	2048721.	-14561.	-0. 00242	0. 00	1. 04E+12
-566. 2315	8643.	0. 00				
6. 0750	0. 1022	2024416.	-15473.	-0. 00242	0. 00	1. 04E+12
-560. 2358	8879.	0. 00				
6. 2100	0. 09830	1998640.	-16375.	-0. 00241	0. 00	1. 04E+12
-553. 1267	9115.	0. 00				
6. 3450	0. 09440	1971413.	-17264.	-0. 00241	0. 00	1. 04E+12
-544. 9061	9352.	0. 00				
6. 4800	0. 09049	1942756.	-18139.	-0. 00241	0. 00	1. 04E+12
-535. 5758	9588.	0. 00				
6. 6150	0. 08660	1912693.	-18999.	-0. 00240	0. 00	1. 04E+12
-525. 1376	9824.	0. 00				
6. 7500	0. 08270	1881251.	-19840.	-0. 00240	0. 00	1. 04E+12
-513. 5931	10060.	0. 00				
6. 8850	0. 07882	1848462.	-20662.	-0. 00240	0. 00	1. 04E+12
-500. 9439	10296.	0. 00				
7. 0200	0. 07493	1814358.	-21462.	-0. 00240	0. 00	1. 04E+12

			Pol e D. l p10o				
-487. 1916	10533.	0. 00					
7. 1550	0. 07106	1778976.	-22239.	-0. 00239	0. 00	1. 04E+12	
-472. 3377	10769.	0. 00					
7. 2900	0. 06718	1742354.	-22992.	-0. 00239	0. 00	1. 04E+12	
-456. 3835	11005.	0. 00					
7. 4250	0. 06331	1704534.	-23717.	-0. 00239	0. 00	1. 04E+12	
-439. 3303	11241.	0. 00					
7. 5600	0. 05945	1665561.	-24414.	-0. 00238	0. 00	1. 04E+12	
-421. 1795	11477.	0. 00					
7. 6950	0. 05559	1625483.	-25081.	-0. 00238	0. 00	1. 04E+12	
-401. 9321	11714.	0. 00					
7. 8300	0. 05173	1584350.	-25716.	-0. 00238	0. 00	1. 04E+12	
-381. 5894	11950.	0. 00					
7. 9650	0. 04788	1542215.	-26316.	-0. 00238	0. 00	1. 04E+12	
-360. 1522	12186.	0. 00					
8. 1000	0. 04403	1499136.	-26882.	-0. 00237	0. 00	1. 04E+12	
-337. 6215	12422.	0. 00					
8. 2350	0. 04019	1455170.	-27409.	-0. 00237	0. 00	1. 04E+12	
-313. 9982	12658.	0. 00					
8. 3700	0. 03634	1410380.	-27898.	-0. 00237	0. 00	1. 04E+12	
-289. 2831	12895.	0. 00					
8. 5050	0. 03251	1364831.	-28346.	-0. 00237	0. 00	1. 04E+12	
-263. 4767	13131.	0. 00					
8. 6400	0. 02867	1318590.	-28751.	-0. 00237	0. 00	1. 04E+12	
-236. 5798	13367.	0. 00					
8. 7750	0. 02484	1271729.	-29111.	-0. 00236	0. 00	1. 04E+12	
-208. 5928	13603.	0. 00					
8. 9100	0. 02101	1224320.	-29426.	-0. 00236	0. 00	1. 04E+12	
-179. 5161	13839.	0. 00					
9. 0450	0. 01719	1176439.	-29692.	-0. 00236	0. 00	1. 04E+12	
-149. 3502	14076.	0. 00					
9. 1800	0. 01337	1128167.	-29909.	-0. 00236	0. 00	1. 04E+12	
-118. 0954	14312.	0. 00					
9. 3150	0. 00955	1079585.	-30074.	-0. 00236	0. 00	1. 04E+12	
-85. 7517	14548.	0. 00					
9. 4500	0. 00573	1030778.	-30186.	-0. 00235	0. 00	1. 04E+12	
-52. 3194	14784.	0. 00					
9. 5850	0. 00192	981834.	-30243.	-0. 00235	0. 00	1. 04E+12	
-17. 7985	15020.	0. 00					
9. 7200	-0. 00189	932843.	-30243.	-0. 00235	0. 00	1. 04E+12	
17. 8110	15257.	0. 00					
9. 8550	-0. 00570	883898.	-30184.	-0. 00235	0. 00	1. 04E+12	
54. 5093	15493.	0. 00					
9. 9900	-0. 00951	835097.	-30065.	-0. 00235	0. 00	1. 04E+12	
92. 2966	15729.	0. 00					
10. 1250	-0. 01331	786538.	-29884.	-0. 00235	0. 00	1. 04E+12	
131. 1729	15965.	0. 00					
10. 2600	-0. 01711	738323.	-29639.	-0. 00235	0. 00	1. 04E+12	
171. 1388	16201.	0. 00					

			Pol e D. l p10o			
10. 3950	-0. 02091	690557.	-29329.	-0. 00235	0. 00	1. 04E+12
212. 1944	16437.	0. 00				
10. 5300	-0. 02471	643348.	-28951.	-0. 00234	0. 00	1. 04E+12
254. 3404	16674.	0. 00				
10. 6650	-0. 02851	596806.	-28504.	-0. 00234	0. 00	1. 04E+12
297. 5771	16910.	0. 00				
10. 8000	-0. 03230	551046.	-27986.	-0. 00234	0. 00	1. 04E+12
341. 9051	17146.	0. 00				
10. 9350	-0. 03610	506183.	-27395.	-0. 00234	0. 00	1. 04E+12
387. 3250	17382.	0. 00				
11. 0700	-0. 03989	462336.	-26730.	-0. 00234	0. 00	1. 04E+12
433. 8374	17618.	0. 00				
11. 2050	-0. 04368	419628.	-25989.	-0. 00234	0. 00	1. 04E+12
481. 4429	17855.	0. 00				
11. 3400	-0. 04747	378183.	-25169.	-0. 00234	0. 00	1. 04E+12
530. 1422	18091.	0. 00				
11. 4750	-0. 05126	338130.	-24270.	-0. 00234	0. 00	1. 04E+12
579. 9362	18327.	0. 00				
11. 6100	-0. 05505	299598.	-23289.	-0. 00234	0. 00	1. 04E+12
630. 8254	18563.	0. 00				
11. 7450	-0. 05884	262722.	-22225.	-0. 00234	0. 00	1. 04E+12
682. 8107	18799.	0. 00				
11. 8800	-0. 06263	227638.	-21076.	-0. 00234	0. 00	1. 04E+12
735. 8928	19036.	0. 00				
12. 0150	-0. 06641	194486.	-19840.	-0. 00234	0. 00	1. 04E+12
790. 0724	19272.	0. 00				
12. 1500	-0. 07020	163406.	-18515.	-0. 00234	0. 00	1. 04E+12
845. 3504	19508.	0. 00				
12. 2850	-0. 07399	134546.	-17100.	-0. 00234	0. 00	1. 04E+12
901. 7275	19744.	0. 00				
12. 4200	-0. 07777	108052.	-15593.	-0. 00234	0. 00	1. 04E+12
959. 2044	19980.	0. 00				
12. 5550	-0. 08156	84075.	-13992.	-0. 00234	0. 00	1. 04E+12
1018. 20217.		0. 00				
12. 6900	-0. 08534	62769.	-12294.	-0. 00234	0. 00	1. 04E+12
1077. 20453.		0. 00				
12. 8250	-0. 08913	44291.	-10500.	-0. 00234	0. 00	1. 04E+12
1138. 20689.		0. 00				
12. 9600	-0. 09291	28800.	-8606.	-0. 00234	0. 00	1. 04E+12
1200. 20925.		0. 00				
13. 0950	-0. 09670	16459.	-6610.	-0. 00234	0. 00	1. 04E+12
1263. 21161.		0. 00				
13. 2300	-0. 1005	7432.	-4512.	-0. 00234	0. 00	1. 04E+12
1327. 21398.		0. 00				
13. 3650	-0. 1043	1889.	-2309.	-0. 00234	0. 00	1. 04E+12
1392. 21634.		0. 00				
13. 5000	-0. 1081	0. 00	0. 00	-0. 00234	0. 00	1. 04E+12
1459. 10935.		0. 00				

Pole D.1p10o

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.28393229 inches
 Computed slope at pile head = -0.00256776 radians
 Maximum bending moment = 2234135. inch-lbs
 Maximum shear force = -30243. lbs
 Depth of maximum bending moment = 3.78000000 feet below pile head
 Depth of maximum shear force = 9.58500000 feet below pile head
 Number of iterations = 7
 Number of zero deflection points = 1

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

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 11900.0 lbs
 Applied moment at pile head = 3456000.0 in-lbs
 Axial thrust load on pile head = 11500.0 lbs

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Load Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
0.00	0.00	0.7193	3456000.	11900.	-0.00627	0.00	1.03E+12	
0.00	0.00	0.00	0.00					
0.1350	0.00	0.7091	3475395.	11900.	-0.00626	0.00	1.03E+12	
0.00	0.00	0.00	0.00					
0.2700	0.00	0.6990	3494789.	11900.	-0.00625	0.00	1.03E+12	
0.00	0.00	0.00	0.00					
0.4050	0.00	0.6889	3514184.	11900.	-0.00625	0.00	1.03E+12	
0.00	0.00	0.00	0.00					
0.5400	0.00	0.6787	3533578.	11900.	-0.00624	0.00	1.03E+12	

			Pol e D. I p10o			
0. 00	0. 00	0. 00				
0. 6750	0. 6686	3552972.	11900.	-0. 00624	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
0. 8100	0. 6585	3572367.	11900.	-0. 00623	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
0. 9450	0. 6484	3591761.	11900.	-0. 00623	0. 00	1. 03E+12
0. 00	0. 00	0. 00				
1. 0800	0. 6383	3611155.	11888.	-0. 00622	0. 00	1. 03E+12
-14. 2576	36. 1830	0. 00				
1. 2150	0. 6283	3630511.	11846.	-0. 00622	0. 00	1. 03E+12
-38. 5747	99. 4648	0. 00				
1. 3500	0. 6182	3649766.	11763.	-0. 00621	0. 00	1. 03E+12
-63. 1768	165. 5529	0. 00				
1. 4850	0. 6082	3668855.	11641.	-0. 00620	0. 00	1. 03E+12
-88. 0190	234. 4647	0. 00				
1. 6200	0. 5981	3687713.	11478.	-0. 00620	0. 00	1. 03E+12
-113. 0566	306. 2179	0. 00				
1. 7550	0. 5881	3706275.	11274.	-0. 00619	0. 00	1. 03E+12
-138. 2449	380. 8315	0. 00				
1. 8900	0. 5780	3724473.	11030.	-0. 00619	0. 00	1. 03E+12
-163. 5389	458. 3246	0. 00				
2. 0250	0. 5680	3742242.	10744.	-0. 00618	0. 00	1. 03E+12
-188. 8936	538. 7176	0. 00				
2. 1600	0. 5580	3759515.	10418.	-0. 00617	0. 00	1. 03E+12
-214. 2639	622. 0314	0. 00				
2. 2950	0. 5480	3776226.	10050.	-0. 00617	0. 00	1. 03E+12
-239. 6045	708. 2879	0. 00				
2. 4300	0. 5380	3792308.	9642.	-0. 00616	0. 00	1. 03E+12
-264. 8701	797. 5101	0. 00				
2. 5650	0. 5281	3807694.	9192.	-0. 00616	0. 00	1. 03E+12
-290. 0153	889. 7217	0. 00				
2. 7000	0. 5181	3822320.	8702.	-0. 00615	0. 00	1. 03E+12
-314. 9945	984. 9478	0. 00				
2. 8350	0. 5081	3836118.	8172.	-0. 00614	0. 00	1. 03E+12
-339. 7620	1083.	0. 00				
2. 9700	0. 4982	3849025.	7601.	-0. 00614	0. 00	1. 03E+12
-364. 2720	1185.	0. 00				
3. 1050	0. 4882	3860976.	6947.	-0. 00613	0. 00	1. 03E+12
-443. 1552	1470.	0. 00				
3. 2400	0. 4783	3871763.	6203.	-0. 00613	0. 00	1. 03E+12
-475. 6558	1611.	0. 00				
3. 3750	0. 4684	3881302.	5406.	-0. 00612	0. 00	1. 03E+12
-508. 4471	1759.	0. 00				
3. 5100	0. 4585	3889507.	4556.	-0. 00611	0. 00	1. 03E+12
-540. 9852	1912.	0. 00				
3. 6450	0. 4486	3896292.	3654.	-0. 00611	0. 00	1. 03E+12
-573. 2113	2070.	0. 00				
3. 7800	0. 4387	3901572.	2699.	-0. 00610	0. 00	1. 03E+12
-605. 0671	2234.	0. 00				

			Pol e D. l p10o			
3. 9150	0. 4288	3905265.	1693.	-0. 00610	0. 00	1. 03E+12
-636. 4941	2405.	0. 00				
4. 0500	0. 4189	3907286.	637. 3102	-0. 00609	0. 00	1. 03E+12
-667. 4343	2581.	0. 00				
4. 1850	0. 4091	3907556.	-468. 5535	-0. 00608	0. 00	1. 03E+12
-697. 8294	2763.	0. 00				
4. 3200	0. 3992	3905995.	-1623.	-0. 00608	0. 00	1. 03E+12
-727. 6213	2953.	0. 00				
4. 4550	0. 3894	3902524.	-2826.	-0. 00607	0. 00	1. 03E+12
-756. 7516	3148.	0. 00				
4. 5900	0. 3796	3897066.	-4074.	-0. 00606	0. 00	1. 03E+12
-785. 1622	3351.	0. 00				
4. 7250	0. 3697	3889548.	-5369.	-0. 00606	0. 00	1. 03E+12
-812. 7944	3561.	0. 00				
4. 8600	0. 3599	3879897.	-6707.	-0. 00605	0. 00	1. 03E+12
-839. 5897	3779.	0. 00				
4. 9950	0. 3501	3868042.	-8088.	-0. 00605	0. 00	1. 03E+12
-865. 4891	4004.	0. 00				
5. 1300	0. 3403	3853916.	-9511.	-0. 00604	0. 00	1. 03E+12
-890. 4334	4238.	0. 00				
5. 2650	0. 3306	3837453.	-10973.	-0. 00603	0. 00	1. 03E+12
-914. 7791	4483.	0. 00				
5. 4000	0. 3208	3818589.	-12474.	-0. 00603	0. 00	1. 03E+12
-938. 7169	4740.	0. 00				
5. 5350	0. 3110	3797261.	-14013.	-0. 00602	0. 00	1. 03E+12
-961. 6147	5009.	0. 00				
5. 6700	0. 3013	3773410.	-15589.	-0. 00602	0. 00	1. 03E+12
-983. 4131	5288.	0. 00				
5. 8050	0. 2915	3746977.	-17199.	-0. 00601	0. 00	1. 03E+12
-1004.	5579.	0. 00				
5. 9400	0. 2818	3717910.	-18841.	-0. 00600	0. 00	1. 03E+12
-1023.	5883.	0. 00				
6. 0750	0. 2721	3686156.	-20514.	-0. 00600	0. 00	1. 03E+12
-1042.	6202.	0. 00				
6. 2100	0. 2624	3651668.	-22215.	-0. 00599	0. 00	1. 03E+12
-1058.	6535.	0. 00				
6. 3450	0. 2527	3614403.	-23942.	-0. 00599	0. 00	1. 03E+12
-1074.	6884.	0. 00				
6. 4800	0. 2430	3574320.	-25693.	-0. 00598	0. 00	1. 03E+12
-1088.	7252.	0. 00				
6. 6150	0. 2333	3531382.	-27464.	-0. 00598	0. 00	1. 03E+12
-1100.	7638.	0. 00				
6. 7500	0. 2236	3485558.	-29255.	-0. 00597	0. 00	1. 03E+12
-1111.	8046.	0. 00				
6. 8850	0. 2139	3436819.	-31062.	-0. 00596	0. 00	1. 03E+12
-1120.	8478.	0. 00				
7. 0200	0. 2043	3385141.	-32881.	-0. 00596	0. 00	1. 03E+12
-1127.	8936.	0. 00				
7. 1550	0. 1946	3330506.	-34711.	-0. 00595	0. 00	1. 03E+12

			Pol e D. l p10o			
-1132.	9423.	0.00				
7. 2900	0. 1850	3272899.	-36549.	-0. 00595	0. 00	1. 03E+12
-1137.	9959.	0. 00				
7. 4250	0. 1754	3212308.	-38395.	-0. 00594	0. 00	1. 03E+12
-1142.	10546.	0. 00				
7. 5600	0. 1657	3148721.	-40246.	-0. 00594	0. 00	1. 03E+12
-1144.	11181.	0. 00				
7. 6950	0. 1561	3082131.	-42087.	-0. 00593	0. 00	1. 03E+12
-1129.	11714.	0. 00				
7. 8300	0. 1465	3012579.	-43877.	-0. 00593	0. 00	1. 03E+12
-1081.	11950.	0. 00				
7. 9650	0. 1369	2940190.	-45587.	-0. 00592	0. 00	1. 03E+12
-1030.	12186.	0. 00				
8. 1000	0. 1273	2865099.	-47212.	-0. 00592	0. 00	1. 03E+12
-976. 2792	12422.	0. 00				
8. 2350	0. 1177	2787445.	-48748.	-0. 00592	0. 00	1. 03E+12
-919. 9345	12658.	0. 00				
8. 3700	0. 1082	2707377.	-50190.	-0. 00591	0. 00	1. 03E+12
-860. 8508	12895.	0. 00				
8. 5050	0. 09858	2625049.	-51535.	-0. 00591	0. 00	1. 03E+12
-799. 0295	13131.	0. 00				
8. 6400	0. 08901	2540625.	-52777.	-0. 00590	0. 00	1. 03E+12
-734. 4719	13367.	0. 00				
8. 7750	0. 07945	2454273.	-53912.	-0. 00590	0. 00	1. 03E+12
-667. 1790	13603.	0. 00				
8. 9100	0. 06990	2366170.	-54936.	-0. 00590	0. 00	1. 03E+12
-597. 1519	13839.	0. 00				
9. 0450	0. 06035	2276499.	-55845.	-0. 00589	0. 00	1. 03E+12
-524. 3912	14076.	0. 00				
9. 1800	0. 05081	2185453.	-56633.	-0. 00589	0. 00	1. 03E+12
-448. 8975	14312.	0. 00				
9. 3150	0. 04128	2093228.	-57297.	-0. 00588	0. 00	1. 04E+12
-370. 6714	14548.	0. 00				
9. 4500	0. 03175	2000031.	-57832.	-0. 00588	0. 00	1. 04E+12
-289. 7130	14784.	0. 00				
9. 5850	0. 02222	1906073.	-58233.	-0. 00588	0. 00	1. 04E+12
-206. 0224	15020.	0. 00				
9. 7200	0. 01270	1811574.	-58497.	-0. 00588	0. 00	1. 04E+12
-119. 5997	15257.	0. 00				
9. 8550	0. 00318	1716761.	-58619.	-0. 00587	0. 00	1. 04E+12
-30. 4446	15493.	0. 00				
9. 9900	-0. 00633	1621869.	-58593.	-0. 00587	0. 00	1. 04E+12
61. 4431	15729.	0. 00				
10. 1250	-0. 01584	1527137.	-58417.	-0. 00587	0. 00	1. 04E+12
156. 0641	15965.	0. 00				
10. 2600	-0. 02534	1432815.	-58086.	-0. 00587	0. 00	1. 04E+12
253. 4189	16201.	0. 00				
10. 3950	-0. 03484	1339158.	-57594.	-0. 00586	0. 00	1. 04E+12
353. 5083	16437.	0. 00				

			Pole D. Ip10o			
10. 5300	-0. 04434	1246429.	-56938.	-0. 00586	0. 00	1. 04E+12
456. 3330	16674.	0. 00				
10. 6650	-0. 05383	1154898.	-56113.	-0. 00586	0. 00	1. 04E+12
561. 8942	16910.	0. 00				
10. 8000	-0. 06332	1064841.	-55115.	-0. 00586	0. 00	1. 04E+12
670. 1929	17146.	0. 00				
10. 9350	-0. 07281	976543.	-53940.	-0. 00586	0. 00	1. 04E+12
781. 2302	17382.	0. 00				
11. 0700	-0. 08229	890295.	-52582.	-0. 00585	0. 00	1. 04E+12
895. 0075	17618.	0. 00				
11. 2050	-0. 09178	806396.	-51038.	-0. 00585	0. 00	1. 04E+12
1012.	17855.	0. 00				
11. 3400	-0. 1013	725151.	-49302.	-0. 00585	0. 00	1. 04E+12
1131.	18091.	0. 00				
11. 4750	-0. 1107	646874.	-47372.	-0. 00585	0. 00	1. 04E+12
1253.	18327.	0. 00				
11. 6100	-0. 1202	571885.	-45241.	-0. 00585	0. 00	1. 04E+12
1378.	18563.	0. 00				
11. 7450	-0. 1297	500512.	-42935.	-0. 00585	0. 00	1. 04E+12
1470.	18360.	0. 00				
11. 8800	-0. 1392	432995.	-40519.	-0. 00585	0. 00	1. 04E+12
1512.	17604.	0. 00				
12. 0150	-0. 1486	369448.	-38036.	-0. 00585	0. 00	1. 04E+12
1553.	16928.	0. 00				
12. 1500	-0. 1581	309976.	-35488.	-0. 00585	0. 00	1. 04E+12
1593.	16318.	0. 00				
12. 2850	-0. 1676	254685.	-32877.	-0. 00585	0. 00	1. 04E+12
1631.	15764.	0. 00				
12. 4200	-0. 1771	203673.	-30205.	-0. 00585	0. 00	1. 04E+12
1668.	15258.	0. 00				
12. 5550	-0. 1865	157038.	-27077.	-0. 00585	0. 00	1. 04E+12
2194.	19056.	0. 00				
12. 6900	-0. 1960	116162.	-23477.	-0. 00585	0. 00	1. 04E+12
2250.	18597.	0. 00				
12. 8250	-0. 2055	81190.	-19787.	-0. 00585	0. 00	1. 04E+12
2306.	18179.	0. 00				
12. 9600	-0. 2149	52269.	-16006.	-0. 00585	0. 00	1. 04E+12
2362.	17800.	0. 00				
13. 0950	-0. 2244	29547.	-12136.	-0. 00585	0. 00	1. 04E+12
2417.	17446.	0. 00				
13. 2300	-0. 2339	13167.	-8177.	-0. 00585	0. 00	1. 04E+12
2471.	17114.	0. 00				
13. 3650	-0. 2434	3271.	-4131.	-0. 00585	0. 00	1. 04E+12
2524.	16802.	0. 00				
13. 5000	-0. 2528	0. 00	0. 00	-0. 00585	0. 00	1. 04E+12
2576.	8253.	0. 00				

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses

Pole D.1p10o

are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 2:

Pile-head deflection = 0.71926036 inches
 Computed slope at pile head = -0.00626545 radians
 Maximum bending moment = 3907556. inch-lbs
 Maximum shear force = -58619. lbs
 Depth of maximum bending moment = 4.18500000 feet below pile head
 Depth of maximum shear force = 9.85500000 feet below pile head
 Number of iterations = 21
 Number of zero deflection points = 1

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in lbs
1	V, lb	6900.	M, in-lb	1995600.	6600.	0.2839	-0.00257
2	V, lb	11900.	M, in-lb	3456000.	11500.	0.7193	-0.00627
		3907556.					

Maximum pile-head deflection = 0.7192603646 inches
 Maximum pile-head rotation = -0.0062654508 radians = -0.358984 deg.

The analysis ended normally.



Computations

Project: Tall Cedars @ Stone Springs
Location: Loudoun County, VA
Calculated by: AMM
Checked by: KBP
Title: Drilled Shaft Foundation Design - Poles A, C, and D

Project #: 38026.39
Sheet: 1 of 4
Date: 11/15/2019
Date: 11/20/2019

Assumptions

Design Standards:

- AASHTO LTS 6th Edition
- AASHTO Standard Specifications for Highway Bridges 17th Edition
- ACI 318-11
- VDOT Standards for Signals and Signs

Loads and Methods:

- Pole Loads were taken from the "Drilled Shafts - Rev 3" Document
- Pile Loads were taken from the L-Pile output for poles A, C, and D.
- Analysis and design based on Load Factored Design method
- For flexure analysis shaft was analyzed as an effective square

Design Assumptions:

- Clear Cover = 3 inches
- For combined shear and torsion analysis ACI 318-11 was used (AASHTO 8.16.6.1.2)
- Concrete is VDOT Class A3, $f'_c = 3,000$ psi
- All reinforcing steel is ASTM A615 Gr. 60 deformed bars
- Based on soil stability calculations, dia = 4 ft, height = 13 ft 6 in with 1 ft above the ground



Computations

Project: Tall Cedars @ Stone Springs
 Location: Loudoun County, VA
 Calculated by: AMM
 Checked by: KBP
 Title: Drilled Shaft Foundation Design - Poles A, C, and D

Project #: 38026.39
 Sheet: 2 of 4
 Date: 11/15/2019
 Date: 11/20/2019

Design Checks

Loads (AASHTO 3.22.1)

Base Reactions From Pole:

Axial = 5.1 k
 Shear = 5.3 k
 Bending = 128 k-ft
 Torsion = 134.6 k-ft

Design Loads (L-Pile):

Axial, N_u = 6.63 k
 Shear, V_u = 64.871 k
 Bending, M_u = 331.119 k-ft
 Torsion, T_u = 174.98 k-ft

Structural Design Load Factor = 1.3

Strength-Reduction Factors, Φ (AASHTO 8.16.1.2.2)

Flexure = 0.90
 Shear (&Torsion) = 0.85
 Axial Compression w/ Ties = 0.70

Foundation Data

Diameter, h = 48 in
 Equivalent Sq. Width, b = 42.5 in
 Cover = 3 in
 Concrete Strength, f'_c = 3 ksi
 Lightweight? No
 Rebar Yield Strength, F_y = 60 ksi
 Long. Rebar Size = 8
 Long. Rebar Dia. = 1 in
 Long. Rebar Area = 0.79 in²

I (circle) = 260576 in⁴
 I (square) = 271878 in⁴

Equivalent? Yes

Trans. Rebar Size = 4
 Rebar Dia. = 0.50 in
 Rebar Area = 0.20 in²

Flexure Analysis

AASHTO 8.17.1.2 states, "the requirements of article 8.17.1.1 (moment greater than 1.2 times the cracking moment) may be waved if area of reinforcement is at least 1/3 greater than what's required by analysis."

Modulus of Rupture, f_r = 0.411 ksi

AASHTO 8.15.2.1.1

$$f_r = 7.5\sqrt{f'_c}$$

Moment of Inertia, I = 271878 in⁴

$$I = \frac{d^4}{12}$$

Center of Gravity dist., c = 21 in

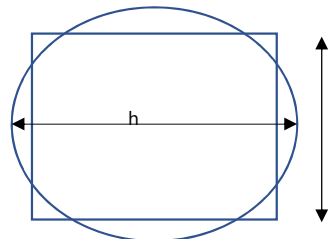
$$M_{cr} = \frac{f_r I}{c}$$

Cracking Moment, M_{cr} = 5255.8 k-in
 $1.2M_{cr}$ = 6306.9 k-in

M_u = 3973.4 k-in

Dist. Rein. to compression fiber, d = 38.5 in

$$\phi M_n \geq 1.2M_{cr}$$



Solve for A_s (based on cracking moment):

Coefficients $\frac{f_y^2}{1.7f'_c b}$ $f_y d$
 16.6089965 2310

A_s = 2.786 in²

$$\phi M_n = \phi A_s f_y \left(d - \frac{a}{2} \right)$$

Solve for A_s (Based on M_u/Φ):

Coefficients $\frac{f_y^2}{1.7f'_c b}$ $f_y d$
 16.6089965 2310

A_s = 1.938 in²

$1.33A_s$ = 2.584 in²

$$\phi M_n = A_s f_y d - \frac{A_s^2 f_y^2}{1.7f'_c b}$$



Computations

Project: Tall Cedars @ Stone Springs
 Location: Loudoun County, VA
 Calculated by: AMM
 Checked by: KBP
 Title: Drilled Shaft Foundation Design - Poles A, C, and D

Project #: 38026.39
 Sheet: 3 of 4
 Date: 11/15/2019
 Date: 11/20/2019

Design Checks

Shear Analysis (AASHTO 8.16.6)

Width of shaft, b_w = 48 in
 Dist. Rein. to compression fiber, d = 44.5 in

$$V_u \leq \phi(V_c + V_s)$$

Concrete Shear Strength, V_c = 233.99 k AASHTO 8.16.6.2

$$V_c = 2\sqrt{f'_c}b_wd$$

ϕV_c = 198.89 k > V_u = 64.871 k

Note - Since ϕV_c is greater than V_u , shear reinforcement is NOT needed for strength.

Minimum shear reinforcement (AASHTO 8.19.1):

"a minimum area of shear reinforcement is required when the factored shear force, V_u exceeds 1/2 the shear strength provide by the concrete, ϕV_c "

1/2 ϕV_c = 99.44 k > V_u = 64.871 k

Note - Since 1/2 ϕV_c is greater than V_u , shear reinforcement is NOT needed for minimum requirements.

Torsion Analysis (ACI 11.5)

Cross-Sectional Area of concrete, A_{cp} = 1809.56 in²
 Perimeter of concrete, P_{cp} = 150.80 in

No torsion reinforcement required if:

$$T_u \leq \phi \lambda \sqrt{f'_c} \left(\frac{A_{cp}^2}{P_{cp}} \right)$$

Lightweight concrete mod. factor, λ = 1
 Strength reduction factor, Φ = 0.85
 Concrete Strength, f'_c = 3 ksi

Torsion Threshold = 84.25 k-ft < T_u = 174.98 k-ft

Note - Since the torsion threshold is less than the applied torsion, T_u torsion reinforcement IS required.

Check Cross-Section Dimension Limitation (ACI 11.5.3):

Width of shaft, b_w = 48 in
 Dist. Rein. to compression fiber, d = 44.5 in

$$\sqrt{\left(\frac{V_u}{b_w d} \right)^2 + \left(\frac{T_u p_h}{1.7 A_{oh}^2} \right)^2} \leq \phi \left(\frac{V_c}{b_w d} + 8 \sqrt{f'_c} \right)$$

Perimeter of torsion reinforcement, P_h = 130.38 in
 Area of concrete within ties, A_{oh} = 1352.65 in²

93.11 < 465.56 O.K.

Strength reduction factor, Φ = 0.85
 Concrete Strength, f'_c = 3 ksi

Computing Transverse Steel (ACI 11.5.3.6):

A_t/s^* = 0.017905 in²/in

*this is per leg of steel

$$\frac{A_t}{s} = \frac{\left(\frac{T_u}{\phi} \right)}{2 \times .85 A_{oh} f_y \cot(45)}$$



Computations

Project: Tall Cedars @ Stone Springs
Location: Loudoun County, VA
Calculated by: AMM
Checked by: KBP
Title: Drilled Shaft Foundation Design - Poles A, C, and D

Project #: 38026.39
Sheet: 4 of 4
Date: 11/15/2019
Date: 11/20/2019

Design Checks

Computing Longitudinal Steel (ACI 11.5.3.7):

$$A_t = 2.334331 \text{ in}^2$$

$$A_t = \frac{A_t}{s} p_h \left(\frac{f_{yt}}{f_y} \right) \cot^2(45)$$

Minimum Transverse Closed Stirrups (ACI 11.5.5.2):

$$\text{Min. Total Shear Area} = 0.040 \text{ in}^2/\text{in}$$

$$\frac{A_v + 2A_t}{s} = 0.75 \sqrt{f'_c} \frac{b_w}{f_{yt}} \geq \frac{50b_w}{f_{yt}}$$

Minimum Torsional Longitudinal Steel (ACI 11.5.5.3):

$$\text{Min. Total Long. Area} = 5.925 \text{ in}^2$$

$$A_{l,min} = \frac{5\sqrt{f'_c} A_{cp}}{f_y} - \left(\frac{A_t}{s} \right) p_h \frac{f_{yt}}{f_y}$$

Reinforcement Requirements:

Longitudinal Reinforcement (in ²)	
From Flexure	2.584
From Torsion	5.925
	16.26

Transverse Reinforcement (in ² /in)	
From Shear	0
From Torsion	0.04
	0.04

Minimum (AASHTO 8.18.1.2) 18.10

Total = 0.04 in²/in

Total = 18.10 in²

Reinforcement Design:

Say #8 Bars Area = 0.79 in²

Say #4 Bars Area = 0.20 in²

Longitudinal Bars = 22.91

Bar Spacing = 10.00

Use (23) #11 Bars

Use #4 Bars @ 9in Spacing

Check: $A_{prov'd} = 18.17 > 18.10 \text{ in}^2$

$A_{prov'd} = 0.044 > 0.04 \text{ in}^2$



Computations

Project: Tall Cedars @ Stone Springs
Location: Loudoun County, VA
Calculated by: AMM
Checked by: KBP
Title: Spread Footing Foundation Design - Pole B

Project #: 38026.39
Sheet: 1 of 6
Date: 11/15/2019
Date: 11/20/2019

Assumptions

Design Standards:

- AASHTO LTS 6th Edition
- AASHTO Standard Specifications for Highway Bridges 17th Edition
- ACI 318-11
- VDOT Standards for Signals and Signs

Loads and Methods:

- Loads were taken from the "Spread Footing - Rev 3" Document
- Analysis and design based on Load Factored Design method
- Footing steel designed to resist soil pressure moment in strips directly underneath pedestal
- Moment at bottom of footing was taken based on the highest corner soil pressure

Design Assumptions:

- Clear Cover = 3 inches
- For combined shear and torsion analysis use ACI 318-11 (AASHTO 8.16.6.1.2)
- Concrete is VDOT Class A3, $f'_c = 3,000$ psi
- All reinforcing steel is ASTM A615 Gr. 60 deformed bars



Computations

Project: Tall Cedars @ Stone Springs
 Location: Loudoun County, VA
 Calculated by: AMM
 Checked by: KBP
 Title: Spread Footing Foundation Design - Pole B

Project #: 38026.39
 Sheet: 2 of 6
 Date: 11/15/2019
 Date: 11/20/2019

Pedestal Design Checks

Loads (AASHTO 3.22.1)

Base Reactions From Pole:

Axial = 3.8 k
 Shear = 4.8 k
 Bending = 104.7 k-ft
 Torsion = 93.9 k-ft

Design Loads (L-Pile):

Axial, N_u = 4.94 k
 Shear, V_u = 6.24 k
 Bending, M_u = 136.11 k-ft
 Torsion, T_u = 122.07 k-ft

Structural Design Load Factor = 1.3

Strength-Reduction Factors, Φ (AASHTO 8.16.1.2.2)

Flexure = 0.90
 Shear (&Torsion) = 0.85
 Axial Compression w/ Ties = 0.70

Foundation Data

Diameter, h = 48 in
 Equivalent Sq. Width, b = 42.5 in
 Cover = 3 in
 Concrete Strength, f'_c = 3 ksi
 Lightweight? No
 Rebar Yield Strength, F_y = 60 ksi
 Long. Rebar Size = 8
 Long. Rebar Dia. = 1 in
 Long. Rebar Area = 0.79 in²

I (circle) = 260576 in⁴
 I (square) = 271878 in⁴

Equivalent? Yes

Trans. Rebar Size = 4
 Rebar Dia. = 0.50 in
 Rebar Area = 0.20 in²

Flexure Analysis

AASHTO 8.17.1.2 states, "the requirements of article 8.17.1.1 (moment greater than 1.2 times the cracking moment) may be waved if area of reinforcement is at least 1/3 greater than what's required by analysis."

Modulus of Rupture, f_r = 0.411 ksi

AASHTO 8.15.2.1.1

$$f_r = 7.5\sqrt{f'_c}$$

Moment of Inertia, I = 271878 in⁴

$$I = \frac{d^4}{12}$$

Center of Gravity dist., c = 21 in

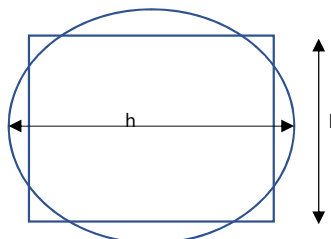
$$M_{cr} = \frac{f_r I}{c}$$

Cracking Moment, M_{cr} = 5255.8 k-in
 $1.2M_{cr}$ = 6306.9 k-in

M_u = 1633.3 k-in

$$\phi M_n \geq 1.2M_{cr}$$

Dist. Rein. to compression fiber, d = 38.5 in



Solve for A_s (based on cracking moment):

Coefficients $\frac{f_y^2}{1.7f'_c b}$ $f_y d$
 16.6089965 2310

A_s = 2.786 in²

$$\phi M_n = \phi A_s f_y \left(d - \frac{a}{2} \right)$$

Solve for A_s (Based on M_u/Φ):

Coefficients $\frac{f_y^2}{1.7f'_c b}$ $f_y d$
 16.6089965 2310

A_s = 0.790 in²

$1.33A_s$ = 1.053 in²

$$\phi M_n = A_s f_y d - \frac{A_s^2 f_y^2}{1.7f'_c b}$$



Computations

Project: Tall Cedars @ Stone Springs
Location: Loudoun County, VA
Calculated by: AMM
Checked by: KBP
Title: Spread Footing Foundation Design - Pole B

Project #: 38026.39
Sheet: 3 of 6
Date: 11/15/2019
Date: 11/20/2019

Pedestal Design Checks

Shear Analysis (AASHTO 8.16.6)

Width of shaft, $b_w = 48$ in
Dist. Rein. to compression fiber, $d = 44.5$ in

$$V_u \leq \phi(V_c + V_s)$$

Concrete Shear Strength, $V_c = 233.99$ k AASHTO 8.16.6.2

$$V_c = 2\sqrt{f'_c}b_wd$$

$\phi V_c = 198.89$ k > $V_u = 6.24$ k

Note - Since ϕV_c is greater than V_u , shear reinforcement is NOT needed for strength.

Minimum shear reinforcement (AASHTO 8.19.1):

"a minimum area of shear reinforcement is required when the factored shear force, V_u exceeds 1/2 the shear strength provide by the concrete, ϕV_c "

1/2 $\phi V_c = 99.44$ k > $V_u = 6.24$ k

Note - Since 1/2 ϕV_c is greater than V_u , shear reinforcement is NOT needed for minimum requirements.

Torsion Analysis (ACI 11.5)

Cross-Sectional Area of concrete, $A_{cp} = 1809.56$ in²
Perimeter of concrete, $P_{cp} = 150.80$ in

No torsion reinforcement required if:

$$T_u \leq \phi \lambda \sqrt{f'_c} \left(\frac{A_{cp}^2}{P_{cp}} \right)$$

Lightweight concrete mod. factor, $\lambda = 1$
Strength reduction factor, $\Phi = 0.85$
Concrete Strength, $f'_c = 3$ ksi

Torsion Threshold = 84.25 k-ft < $T_u = 122.07$ k-ft

Note - Since the torsion threshold is less than the applied torsion, T_u torsion reinforcement IS required.

Check Cross-Section Dimension Limitation (ACI 11.5.3):

Width of shaft, $b_w = 48$ in
Dist. Rein. to compression fiber, $d = 44.5$ in

$$\sqrt{\left(\frac{V_u}{b_wd}\right)^2 + \left(\frac{T_u p_h}{1.7A_{oh}^2}\right)^2} \leq \phi \left(\frac{V_c}{b_wd} + 8\sqrt{f'_c} \right)$$

Perimeter of torsion reinforcement, $P_h = 130.38$ in
Area of concrete within ties, $A_{oh} = 1352.65$ in²

61.47 < 465.56 O.K.

Strength reduction factor, $\Phi = 0.85$
Concrete Strength, $f'_c = 3$ ksi

Computing Transverse Steel (ACI 11.5.3.6):

$A_t/s^* = 0.012491$ in²/in

*this is per leg of steel

$$\frac{A_t}{s} = \frac{\left(\frac{T_u}{\phi}\right)}{2 \times .85 A_{oh} f_y \cot(45^\circ)}$$



Computations

Project: Tall Cedars @ Stone Springs
Location: Loudoun County, VA
Calculated by: AMM
Checked by: KBP
Title: Spread Footing Foundation Design - Pole B

Project #: 38026.39
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Date: 11/20/2019

Pedestal Design Checks

Computing Longitudinal Steel (ACI 11.5.3.7):

$$A_t = 1.628482 \text{ in}^2$$

$$A_t = \frac{A_t}{s} p_h \left(\frac{f_{yt}}{f_y} \right) \cot^2(45)$$

Minimum Transverse Closed Stirrups (ACI 11.5.5.2):

$$\text{Min. Total Shear Area} = 0.040 \text{ in}^2/\text{in}$$

$$\frac{A_v + 2A_t}{s} = 0.75 \sqrt{f'_c} \frac{b_w}{f_{yt}} \geq \frac{50b_w}{f_{yt}}$$

Minimum Torsional Longitudinal Steel (ACI 11.5.5.3):

$$\text{Min. Total Long. Area} = 6.631 \text{ in}^2$$

$$A_{l,min} = \frac{5\sqrt{f'_c} A_{cp}}{f_y} - \left(\frac{A_t}{s} \right) p_h \frac{f_{yt}}{f_y}$$

Reinforcement Requirements:

Longitudinal Reinforcement (in ²)	
From Flexure	2.786
From Torsion	6.631
	17.78

Transverse Reinforcement (in ² /in)	
From Shear	0
From Torsion	0.04
	0.04

Minimum (AASHTO 8.18.1.2) 18.10

Total = 0.04 in²/in

Total = 18.10 in²

Reinforcement Design:

Say #8 Bars Area = 0.79 in²

Say #4 Bars Area = 0.20 in²

Longitudinal Bars = 22.91

Bar Spacing = 10.00

Use (23) #8 Bars

Use #4 Bars @ 9in Spacing

Check: A_{prov'd} = 18.17 > 18.10 in²

A_{prov'd} = 0.044 > 0.04 in²



Computations

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Footing Design Checks

Loads (AASHTO 3.22.1)

Bottom of Footing Moment = 87.793
 Top of Footing Moment = 31.033
 Shear in Footing = 63.8495

Design Loads:

Bottom Bending, $M_u = 87.7930625$ k-ft
 Top Bending, $M_u = 31.033$ k-ft
 Shear, $V_u = 63.8495$ k

Structural Design Load Factor = 1.3

Top of Footing:	Length (ft)	Width (ft)	Thick (ft)	Density (kcf)	M. Arm (ft)	Factor	Shear (k)	Moment (k-ft)
Concrete	2.75	9.5	2	0.15	1.375	1.3	10.18875	14.010
Soil	2.75	9.5	3.17	0.115	1.375	1.3	12.3810294	17.024

Bottom of Footing:	Pressure (ksf)	Length (ft)	Width (ft)	M. Arm (ft)	Factor	Shear (k)	Moment (k-ft)
	1.88	2.75	9.5	1.375	1.3	63.8495	87.793

Foundation Data

Pedestal Dia. = 48 in
 Pedestal Height = 3.58 ft
 Footing Length = 9.5 ft
 Footing Width = 9.5 ft
 Footing Thickness = 2 ft
 Cover = 3 in
 Concrete Strength, $f'_c = 3$ ksi
 Lightweight? No

Rebar Yield Strength, $F_y = 60$ ksi
 Top Rebar Size = 5
 Top Rebar Dia. = 0.625 in
 Top Rebar Area = 0.31 in²
 Bot. Rebar Size = 5
 Bot. Rebar Dia. = 0.63 in
 Bot. Rebar Area = 0.31 in²

Strength-Reduction Factors, Φ (AASHTO 8.16.1.2.2)

Flexure = 0.90
 Shear = 0.85

Flexure Analysis (AASHTO 8.16.3)

Top, $M_u = 372.4$ k-in
 Bottom, $M_u = 1053.5$ k-in

Dist. Rein. to compression fiber, $d = 20.6875$ in

Design Width*, $b = 48$ in

*Note: Strip underneath pedestal, equal to pedestal diameter.

$$\phi M_n = \phi A_s f_y \left(d - \frac{a}{2} \right) \quad a = \frac{A_s f_y}{0.85 f'_c b}$$

$$\phi M_n = A_s f_y d - \frac{A_s^2 f_y^2}{1.7 f'_c b}$$

Solve for A_s (Top Based on M_u/Φ):

Coefficients $f_y^2/1.7f'_c b$ $f_y d$
 14.706 1241.25

$A_s = 0.335$ in²

$1.33A_s = 0.446$ in²

Solve for A_s (Bottom Based on M_u/Φ):

Coefficients $f_y^2/1.7f'_c b$ $f_y d$
 14.706 1241.25

$A_s = 0.954$ in²

$1.33A_s = 1.272$ in²



Computations

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Footing Design Checks

Shear Analysis (AASHTO 8.16.6)

Design Width, b_w = 48 in
Dist. Rein. to compression fiber, d = 20.6875 in
Concrete Shear Strength, V_c = 108.78 k

AASHTO 8.16.6.2

$$V_u \leq \phi(V_c + V_s)$$

$$V_c = 2\sqrt{f'_c}b_wd$$

$$\phi V_c = 92.46 \text{ k} > V_u = 63.8495 \text{ k}$$

Note - Since ϕV_c is greater than V_u , shear reinforcement is NOT needed for strength.

Minimum shear reinforcement (AASHTO 8.19.1):

"a minimum area of shear reinforcement is required when the factored shear force, V_u exceeds 1/2 the shear strength provide by the concrete, ϕV_c "

$$1/2 \phi V_c = 46.23 \text{ k} > V_u = 63.8495 \text{ k}$$

Note - Since 1/2 ϕV_c is less than V_u , shear reinforcement is needed for minimum requirements.

For shear try #5 at 12" c/c:

$$A_v \text{ req'd} = 0.48 \text{ in}^2$$

$$A_v \text{ pro'd} = 0.62 \text{ in}^2$$

Check? O.K.

$$A_v = \frac{50b_ws}{f_y}$$

Temperature and Shrinkage Analysis (AASHTO 8.20.1)

AASHTO states, "The total area of reinforcement provided shall be at least 1/8 square inch per foot in each direction."

For areas without flexure reinforcement, use #5's at 12" c/c.

Check: Area of #5's = 0.31 in²

$$\text{Reinforcing per foot} = 0.31 \text{ in}^2/\text{ft} > 0.125 \text{ in}^2/\text{ft} \quad \text{O.K.}$$

Reinforcement Requirements:

Top Reinforcement (in ²)	
From Flexure	0.446
	0.45
Total =	0.45 in²

Bottom Reinforcement (in ²)	
From Flexure	1.272
	1.27
Total =	1.27 in²

Reinforcement Design:

Say #5 Bars Area = 0.31 in²
Top Bars = 1.44

Say #5 Bars Area = 0.31 in²
Bottom Bars = 4.10

Use (5) #5 Bars spaced evenly across design width 48"

Top reinforcement sized to match bottom reinforcement.

Use (5) #5 Bars spaced evenly across design width 48"

Check: $A_{\text{prov'd}} = 1.55 > 0.45 \text{ in}^2$

$A_{\text{prov'd}} = 1.55 > 1.27 \text{ in}^2$



Computations

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Ref:

- (1) ATS Sales Mast Arm Pole submittal 5/1/2018
- (2) Virginia DOT Instructional & Information Memorandum S&B-90.2
- (3) AASHTO Signs, Signs Luminaires and Traffic Signals 6th Ed
- (4) ECS Mid-Atlantic Geotechnical Report 9/19/2019

		POLE B			
Arm Length	49 feet	Load Factors ⁽²⁾			
		1.3	2.25		
		Service Load ⁽¹⁾	Structure	Geotech	
Base of Pole Forces					
Axial	3.8	5.0	8.6	k	
Shear	4.8	6.2	10.7	k	
Moment	104.7	136.2	235.7	k-ft	
Torsion	93.9	122.1	211.4	k-ft	

- (1) Page 125 of 165
- (2) Section 13 page 5 of 10, Load Factors for Drilled Shaft Foundations

Soils		ESC Mid-Atlantic geotech report 9/13/2019		
Boring	B-2			
Depth	Density (γ)	Friction	f_{max}	
feet	pcf	degrees	psf	
2	115	27	138	
5.5	135	35	560	

$$f_{max} = \beta * \gamma * \text{layer thickness (cumulative)}$$

Beta (β) 1.2 confirm value

L/C 1 ⁽³⁾		Service	Structure	Geotech	
1.00	M_x	104.7	136.2	235.7	k-ft
0.20	M_y	20.9	27.2	47.1	k-ft
1.00	V_x	4.8	6.2	10.7	k
0.20	V_y	1.0	1.2	2.1	k
L/C 2 ⁽³⁾		Service	Structure	Geotech	
0.600	M_x	62.8	81.7	141.4	k-ft
0.300	M_y	31.4	40.9	70.7	k-ft
0.600	V_x	2.9	3.7	6.4	k
0.300	V_y	1.4	1.9	3.2	k

- (3) Section 3.9.3, Although intended only for Wind Loading, conservatively applied to all loads



Computations

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 Title: **Spread Footing - Pole B**

FG at C/L Pole **0.0** Elev.
 BOF below F.G. ⁽⁴⁾ **4.0** feet
 Ground Slope **12** H : 1V conservative based on site grading
 Min. Fill over Footing **2.0** feet
 Max. Fill over Footing 2.79 feet
 BOF -4.0 Elev. **Note: INTO weathered rock**
 (4) Table 5.1.1.2, BOF to be 2' min below F.G.

Moments at Bottom of Footing
 M_{xu} (L/C 1) 116.17 k-ft $M_x + V_y$ * (top pedestal to BOF), inc. effect of grade slope when applicable
 M_{yu} (L/C 1) 45.54 k-ft $M_y + V_x$ * (top pedestal to BOF)

 M_{xu} (L/C 2) 77.30 k-ft $M_x + V_y$ * (top pedestal to BOF), inc. effect of grade slope when applicable
 M_{yu} (L/C 2) 47.31 k-ft $M_y + V_x$ * (top pedestal to BOF)

Footing Size
 Length (x-dir) **9.5** feet
 Width (y-dir) **9.5** feet
 Thickness **2.0** feet

Pedestal Size
 Length (x-dir) **3.54** feet
 Width (y-dir) **3.54** feet equivalent square area for 4' dia. circular pedestal
 Above F.G. 1.148 feet average
 Pedestal Height 3.1475 feet

Axial Loading
 Footing 27.08 k
 Pedestal 5.92 k
 γ_{soil} (fill) ⁽⁴⁾ **115** pcf
 Soil overburdened 2.396 feet average
 Soil 21.41 k
 Pole & Appurtenances 3.82 k 100% Axial - Service Load
 Gross Axial Load 58.24 k
 (4) Table 5.1.1

Soil-Concrete Friction Coeff. **0.55** confirm value
 Sliding Resistance Force 32.03 k

F.S. ⁽²⁾ sliding **6.71** **OK**

(2) Section 13 page 5 of 10, Min. Factor of Safety for Sliding 1.2

Gross Ave. Bearing pressure 0.645 ksf



Computations

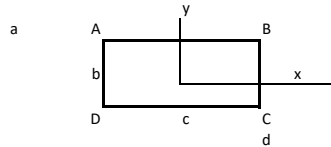
Project: **Tall Cedars @ Stone Springs**
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Footing Section Modulus - Horizontal plane

$$S_x = 142.90 \text{ feet}^3$$

$$S_y = 142.90 \text{ feet}^3$$



LOAD CASE 1

Corner Pressure		ref point
$Q(A) = P/A + M_x/S_x - M_y/S_y$	1.140 ksf	A
$Q(B) = P/A + M_x/S_x + M_y/S_y$	1.777 ksf	B
$Q(C) = P/A - M_x/S_x + M_y/S_y$	0.151 ksf	C
$Q(D) = P/A - M_x/S_x - M_y/S_y$	-0.486 ksf	D
eccentricity (x-dir)	0.78 feet	
eccentricity (y-dir)	1.99 feet	

If any corner pressures are < 0, then pressure is redistributed to find a line of zero pressure that runs through the footing

distance along zero pressure line from reference points

	X	Y	distance
full length (L1) - a to d	24.958	9.784	26.81
beyond y-dir. (L2) - a to b	15.458	6.060	16.60
beyond x-dir. (L3) - c to d	0.724	0.284	0.78

slope of the zero pressure line matches the slope of the load eccentricity. By similar triangles the ratio for each segment is the same. The cell highlighted **red** shall be iterated so that the total pressure w.r.t. the zero line equals the total axial force

Set equivalent to Gross Service Axial Load

Pressure equilibrium check **58.24 k**

Distance from zero pressure line to footing corners

d1	9.11 to point B
d2	5.64 to point A
d3	0.26 to point C
z	5.10 to eccentric load

Moment of Inertia about zero pressure line

$$I_{ef} = (L1 * d1^3)/12 - (L2 * d2^3)/12 - (L3 * d3^3)/12$$

$$I_{ef} = 1440 \text{ feet}^4$$

Net Corner Pressure - Redistributed

$Q(A) = P * d2 * z / I_{ef}$	1.163 ksf
$Q(B) = P * d1 * z / I_{ef}$	1.877 ksf
$Q(C) = P * d3 * z / I_{ef}$	0.054 ksf

Max. Corner Pressure 1.877 ksf

Allowable Bearing Pressure ⁽⁴⁾ **3.000** ksf

Applied Bearing Pressure Ratio ⁽⁴⁾ **1.60** **OK**

(4) Table 5.1.1.2, includes F.S. = 3.0 per 10/16/19 call with Geotech, therefore max pressure/allowable pressure ratio shall exceed 1.0

Overturning Resistance

M_x	276.6 k-ft
M_y	276.6 k-ft

F.S. Overturning ⁽²⁾ M_x	2.38 OK
F.S. Overturning ⁽²⁾ M_y	6.07 OK

(2) Section 13 page 5 of 10, Min. Factor of Safety for Overturning 1.5

LOAD CASE 2

Corner Pressure		ref point
$Q(A) = P/A + M_x/S_x - M_y/S_y$	0.855 ksf	A
$Q(B) = P/A + M_x/S_x + M_y/S_y$	1.517 ksf	B
$Q(C) = P/A - M_x/S_x + M_y/S_y$	0.435 ksf	C
$Q(D) = P/A - M_x/S_x - M_y/S_y$	-0.227 ksf	D
eccentricity (x-dir)	0.81 feet	
eccentricity (y-dir)	1.33 feet	

distance along zero pressure line from reference points

	X	Y	distance
full length (L1) - a to d	21.547	13.189	25.26
beyond y-dir. (L2) - a to b	12.047	7.374	14.12
beyond x-dir. (L3) - c to d	6.026	3.689	7.07

Pressure equilibrium check **58.24 k**

Distance from zero pressure line to footing corners

d1	11.25 to point B
d2	6.29 to point A
d3	3.15 to point C
z	6.27 to eccentric load

Moment of Inertia about zero pressure line

$$I_{ef} = (L1 * d1^3)/12 - (L2 * d2^3)/12 - (L3 * d3^3)/12$$

$$I_{ef} = 2685 \text{ feet}^4$$

L/C 1: Corner Pressure - redistributed

$Q(A) = P * d2 * z / I_{ef}$	0.856 ksf
$Q(B) = P * d1 * z / I_{ef}$	1.531 ksf
$Q(C) = P * d3 * z / I_{ef}$	0.428 ksf

Max. Corner Pressure 1.531 ksf

Applied Bearing Pressure Ratio ⁽⁴⁾ **1.96** **OK**

(4) Table 5.1.1.2, includes F.S. = 3.0 per 10/16/19 call with Geotech, therefore max pressure/allowable pressure ratio shall exceed 1.0

Overturning Resistance

M_x	276.6 k-ft
M_y	276.6 k-ft

F.S. Overturning ⁽²⁾ M_x	3.58 OK
F.S. Overturning ⁽²⁾ M_y	5.85 OK

(2) Section 13 page 5 of 10, Min. Factor of Safety for Overturning 1.5



Computations

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Location: Loudoun County, VA Sheet: _____
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Torsional Capacity from Passive Pressure

Passive Earth Pressure on footing only	soil density (pcf)	friction angle	Kp
properties of layer in range below	135	35	3.690
		H (feet)	q (psf)
top of footing		2.40	1194
btm of footing		4.40	2190
		Total	3383 lbs/ft
max force per footing face (x-dir) a corner			8036 lbs
length of linear force distribution			4.8 feet
Torsion resistance (x-dir)			25.45 k-ft
number of X faces			2
max force per footing face (x-dir) a corner			8036 lbs
length of linear force distribution			4.8 feet
Torsion resistance (y-dir)			25.45 k-ft
number of Y faces			2
Total Torsional Pressure Resistance			101.8 k/ft
Allowable (50%) per VDOT ⁽²⁾			50.9 k/ft

(2) Section 13, page 5 of 10, Passive Resistance limit, footnote 2

Torsional Capacity from Friction (base)

Soil-Concrete Friction Coeff.	0.55
DL and Soil (no pole)	54.4 k
Moment Arm (2/3 distance from center)	3.17 feet
Torsional Friction Resistance	94.8 k-ft
Total Torsional Resistance	145.7
F.S. Torsion ⁽²⁾	1.55

(2) Section 13, page 5 of 10, Min. Factor of Safety for Torsion 1.2