



**GALE ASSOCIATES, INC.**

Review is only for conformance with the design concept of the project and for compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions and quantities to be confirmed and correlated at the site, for information that pertains to the fabrication process or to the means, methods, techniques, sequences and procedures of construction, and for the coordination of the work of all trades. The review and approval of a specific item shall not indicate approval of an assembly of which the item is a component.

- Approved
- Approved as Noted
- Revise and Resubmit
- Disapproved
- Received for Record

Submittal Number/Package 265668-2 Date Received 10/06/2021

Reviewed By Bree Sullivan Date Reviewed 10/19/2021

Section	Product	Status	Comment
26 56 68	Pole Foundation Design	Received for Record	Pole foundation design stamped by a register engineer in Rhode Island submitted in accordance with the specifications

\*\*\* All of the backup needs to be attached to the submittal stamp for record and future reference.

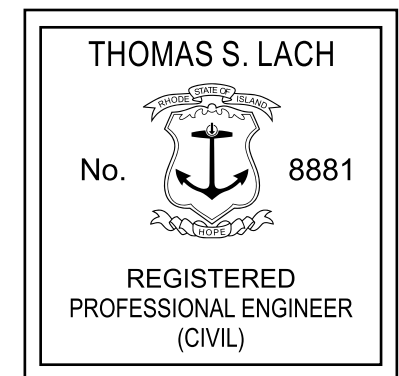
N:\715792\04 Construction\submittals\Submittal Review Stamp.docx



LACH ENGINEERING, LLC.  
 539 SILICON DR.  
 STE. 100  
 SOUTHLAKE, TX, 76092  
 (817) 416-9999  
[www.lachengineering.com](http://www.lachengineering.com)

Project Name  
**TECHLINE SPORTS LIGHTING, LLC.**  
 #21-3330  
**PROUT SCHOOL**  
**WAKEFIELD, RHODE ISLAND**  
**MULTI-PURPOSE FIELD**  
**70' LIGHTING POLE FOUNDATION**  
**POLE: P1-P4**  
**LOADING: 45.0 SQ. FT. EPA / 1350.0 LBS**

Stamp



Project Information

Project Number: 8784

Date: 10/04/2021

Sheet Information

Sheet Name: 8784-1

Drawing Scale: NTS

Drawn By: DHG

Sheet

**S - 1**

OF 1

## NOTES: FOUNDATION

1. ALL CONCRETE SHALL HAVE MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS. CONCRETE SHALL HAVE MAXIMUM WATER/CEMENT RATIO OF 0.5. FOUNDATION INSTALLATION SHALL BE IN ACCORDANCE WITH ACI 336, "STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF DRILLED PIERS", LATEST EDITION.

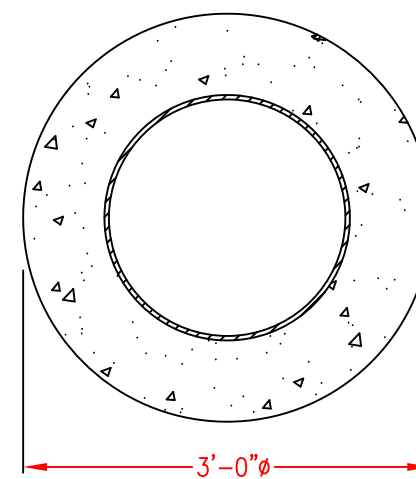
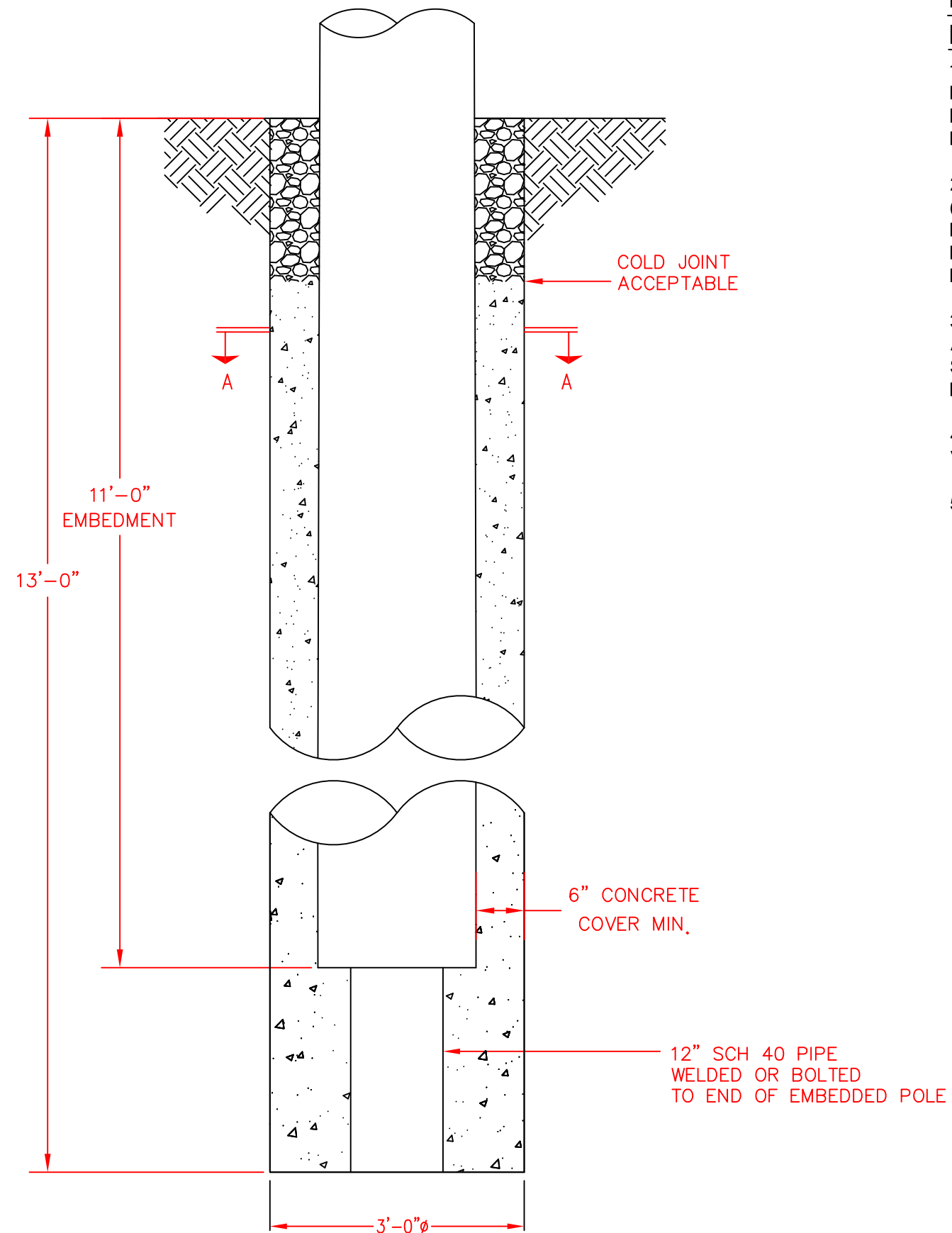
2. SOIL PARAMETERS ARE BASED UPON GEOTECHNICAL REPORT BY NOBIS GROUP (BORING B-4), DATED SEPTEMBER 28, 2017. REFER TO PAGE 2 OF 14 FOR SOIL PARAMETERS USED IN THE DESIGN. UPON CONSTRUCTION, IF SOIL PARAMETERS DO NOT MEET OR EXCEED THOSE CONTAINED HEREIN, DO NOT SET POLES AND CONTACT DESIGNER IMMEDIATELY.

3. FOUNDATION IS DESIGNED TO SUPPORT THE FOLLOWING LOADS:

AXIAL: 3.80 K  
 SHEAR: 4.10 K  
 MOMENT: 227.20 K-FT

4. GROUND SLOPE WAS ASSUMED TO NOT EXCEED 7H 1V. IF ACTUAL CONDITIONS VARY FROM THIS ASSUMPTION, PLEASE CONTACT ENGINEER BEFORE CONSTRUCTION.

5. TOP 2' OF FOUNDATION MAY BE FILLED WITH GRAVEL OR CONCRETE.



FOUNDATION

SECTION A - A

Dimensional Solutions	Shaft3D 2019	Product Version	21.1.2158.811	Date	10/4/2021 5:06:58 PM
Workspace Name	8784-1				
Designed By	DHG	Checked By:	NHT		
File Path	A:\Design Programs\Foundation Design Suite\S3D\7773-1\8784-1.S3D.dswksp				

**REPORT - 8784-1**

**PROJECT INFORMATION**

Client Name: TECHLINE SPORTS LIGHTING, LLC.  
Project Name: 70' LIGHTING POLE FOUNDATION (POLES: P1-P4)  
Project Number: 8784-1

**DESIGN CODE**                      **ACI\_318\_2014**                      **INPUT UNITS**                      **English**                      **OUTPUT UNITS**                      **English**

**CONCRETE PARAMETERS:**

Compressive Strength                      3000                      psi  
Unit Weight                      150                      pcf  
Pier Side Cover                      3                      in

**SOIL PARAMETERS:**

Unit Weight                      130                      pcf  
Soil Type                      Granular  
Soil Subtype                      Silt  
Ultimate Cohesion c                      0                      ksf  
Ultimate Adhesion Ad                      0                      ksf  
Passive Pressure Coefficient Ppc                      2  
Angle of Internal Friction                      31

**Axial Capacity Parameters**

Modulus of Subgrade Reaction Method	Constant	Shaft Type	Drilled
Constant Modulus	740                      kcf	Boundary Condition	Trans & Rot at Top
Coefficient A	0	Axial Capacity Method	Use Soil Parameters
Coefficient B	0	Tip Cohesion	0                      ksf
Coefficient n	0	Tip Angle of Internal Friction	38
Allowable Increase In Soil Pressure		Tip Soil Unit Weight	125                      pcf
Dead	0	Consider End Bearing	True
Live	0	Percent End Bearing	100
Wind	0	Consider Skin Resistance	True
Earthquake	0	Percent Skin Resistance	100
Erec	0	Safety Factor - End Bearing	2
Oper	0	Safety Factor - Skin Resistance	2
Test	0	Safety Factor - Pullout	2
		Safety Factor - Cohesion	2

**BUOYANCY CRITERIA:**

Consider Buoyancy: No  
Water Table Below Grade                      50                      ft

**Soil Profile**

No.	Name	Depth	Soil Type	Cohesion	Angle of Int Friction	Unit Weight	Subgrade Modulus	Alpha Factor	Beta Factor	Blow Count
		ft		ksf		pcf	kcf			
1	L1	5	Silt	0	31	130	740	0	0	0
2	L2	3	Sand	0	42	135	610	0	0	0
3	L3	9	Sand	0	38	125	280	0	0	0

## Shaft Geometry

Shaft Name	S	
Design Type	Concrete Drilled Shaft	
Shape Factor	1	
Grade Elevation	0	ft
Diameter	3	ft
Top Above Grade	0	ft
Neglected Soil Resistance Zone Length	0	ft
Length Below Neglected Soil Resistance	13	ft
Bell Diameter	0	ft
Bell Length	0	ft
Casing Length	0	ft
Consider Type Dependent Moment of Inertia	True	
Moment of Inertia	3.9760782	ft^4

## LOAD ELEMENT GEOMETRY AND APPLIED LOADS

### Shaft Element - S - Load Element - S

Geometry	Shape	X Dim	Z Dim	Length	Offset - X	Offset - Z	Min Reinf Ratio
		ft	ft	ft	ft	ft	
	Circle	3	3	13	0	0	0.005
Load Case		Axial Load	Shear-X	Mom-Z	Shear-Z	Mom-X	
		kips	kips	kip-ft	kips	kip-ft	
1 - Dead		3.8	0	0	0	0	
2 - Live		0	0	0	0	0	
3 - Wind		0	4.1	227.2	0	0	
4 - Earthquake		0	0	0	0	0	

## ALLOWABLE LOAD COMBINATIONS

### Shaft Element - S - Load Element - S

Load Combination	Axial Load	Shear-X	Mom-Z	Shear-Z	Mom-X
	kips	kips	kip-ft	kips	kip-ft
1 - Dead	3.8	0	0	0	0
2 - Dead + Wind	3.8	4.1	227.2	0	0
3 - 0.6 Dead + Wind	2.28	4.1	227.2	0	0

## ULTIMATE LOAD COMBINATIONS

### Shaft Element - S - Load Element - S

Load Combination	Axial Load	Shear-X	Mom-Z	Shear-Z	Mom-X
	kips	kips	kip-ft	kips	kip-ft
1 - 1.4 Dead	5.32	0	0	0	0
2 - 1.2 Dead + 1.6 Wind	4.56	6.56	363.52	0	0
3 - 1.2 Dead + 0.8 Wind	4.56	3.28	181.76	0	0
4 - 0.9 Dead + 1.6 Wind	3.42	6.56	363.52	0	0

Shaft Element - S

SELF WEIGHTS AND APPLIED EXTERNAL LOAD - Allowable Load Combinations

Load Combination	Load Element Weight kips	Soil Weight kips	Footing Weight kips	App Axial Load kips	Total Axial Load kips	Buoyant Load kips
1 - Dead	13.7837	0	0	3.8	17.5837	
2 - Dead + Wind	13.7837	0	0	3.8	17.5837	
3 - 0.6 Dead + Wind	13.7837	0	0	2.28	16.0637	

Base Shears and Moments - Allowable Load Combinations

Load Combination	Shear-X kips	Mom-Z kip-ft	Shear-Z kips	Mom-X kip-ft
1 - Dead	0	0	0	0
2 - Dead + Wind	4.1	280.5	0	0
3 - 0.6 Dead + Wind	4.1	280.5	0	0

SELF WEIGHTS AND APPLIED EXTERNAL LOAD - Ultimate Load Combinations

Load Combination	Load Element Weight kips	Soil Weight kips	Footing Weight kips	App Axial Load kips	Total Axial Load kips	Buoyant Load kips
1 - 1.4 Dead	19.2972	0	0	5.32	24.6172	
2 - 1.2 Dead + 1.6 Wind	16.5405	0	0	4.56	21.1005	
3 - 1.2 Dead + 0.8 Wind	16.5405	0	0	4.56	21.1005	
4 - 0.9 Dead + 1.6 Wind	16.5405	0	0	3.42	19.9605	

Base Shears and Moments - Ultimate Load Combinations

Load Combination	Shear-X kips	Mom-Z kip-ft	Shear-Z kips	Mom-X kip-ft
1 - 1.4 Dead	0	0	0	0
2 - 1.2 Dead + 1.6 Wind	6.56	448.8	0	0
3 - 1.2 Dead + 0.8 Wind	3.28	224.4	0	0
4 - 0.9 Dead + 1.6 Wind	6.56	448.8	0	0

## Axial Capacity - Allowable Load Combinations

### Shaft Element - S

Load Combination	App Axial Load kips	All Axial Load kips	Net Uplift Load kips	All Pullout Load kips	Vertical Settlement in	Max Bear Pressure ksf	All Bearing Pressure ksf
1 - Dead	3.8	557.5946	0	-29.2808	0.0167	0	76.6911
2 - Dead + Wind	3.8	557.5946	0	-29.2808	0.0167	0	76.6911
3 - 0.6 Dead + Wind	2.28	557.5946	0	-29.2808	0.013	0	76.6911

## Rigid Analysis - Ultimate Load Combinations

### Shaft Element - S

Load Combination	Max Mom Location ft	Max Mom Value kip-ft	Crossover Location ft
1 - 1.4 Dead	0	0	13
2 - 1.2 Dead + 1.6 Wind	3.2815	377.8712	13
3 - 1.2 Dead + 0.8 Wind	2.3204	186.8339	10.1966
4 - 0.9 Dead + 1.6 Wind	3.2815	377.8712	13

### Finite Element Analysis - Deflections - Allowable Load Combinations

LC #1 : Dead

LC #2 : Dead + Wind

### Finite Element Analysis - Deflections - X Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ft	LC #2 ft	LC #3 ft
1	0.0000	0.0000	0.0063	0.0063
2	0.6250	0.0000	0.0053	0.0053
3	1.2500	0.0000	0.0044	0.0044
4	1.8750	0.0000	0.0036	0.0036
5	2.5000	0.0000	0.0028	0.0028
6	3.1250	0.0000	0.0020	0.0020
7	3.7500	0.0000	0.0013	0.0013
8	4.3750	0.0000	0.0006	0.0006
9	5.0000	0.0000	-0.0001	-0.0001
10	6.0000	0.0000	-0.0011	-0.0011
11	7.0000	0.0000	-0.0020	-0.0020
12	8.0000	0.0000	-0.0029	-0.0029
13	9.7500	0.0000	-0.0044	-0.0044
14	11.3750	0.0000	-0.0057	-0.0057
15	13.0000	0.0000	-0.0070	-0.0070

### Finite Element Analysis - Deflections - Z Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ft	LC #2 ft	LC #3 ft
1	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000

### Finite Element Analysis - Deflections - Ultimate Load Combinations

LC #1 : 1.4 Dead

LC #2 : 1.2 Dead + 1.6 Wind

LC #3 : 1.2 Dead + 0.8 Wind

### Finite Element Analysis - Deflections - X Dir - Ultimate Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ft	LC #2 ft	LC #3 ft	LC #4 ft
1	0.0000	0.0000	0.0100	0.0050	0.0100
2	0.6250	0.0000	0.0085	0.0043	0.0085
3	1.2500	0.0000	0.0071	0.0035	0.0071
4	1.8750	0.0000	0.0057	0.0029	0.0057
5	2.5000	0.0000	0.0044	0.0022	0.0044
6	3.1250	0.0000	0.0032	0.0016	0.0032
7	3.7500	0.0000	0.0021	0.0010	0.0021
8	4.3750	0.0000	0.0010	0.0005	0.0010
9	5.0000	0.0000	-0.0001	0.0000	-0.0001
10	6.0000	0.0000	-0.0017	-0.0008	-0.0017
11	7.0000	0.0000	-0.0032	-0.0016	-0.0032
12	8.0000	0.0000	-0.0046	-0.0023	-0.0046
13	9.7500	0.0000	-0.0070	-0.0035	-0.0070
14	11.3750	0.0000	-0.0091	-0.0046	-0.0091
15	13.0000	0.0000	-0.0113	-0.0056	-0.0113

### Finite Element Analysis - Deflections - Z Dir - Ultimate Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ft	LC #2 ft	LC #3 ft	LC #4 ft
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000	0.0000



### Finite Element Analysis - Soil Pressure - Allowable Load Combinations

LC #1 : Dead

LC #2 : Dead + Wind

### Finite Element Analysis - Soil Pressure - X Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ksf	LC #2 ksf	LC #3 ksf
1	0.0000	0.0000	4.6323	4.6323
2	0.6250	0.0000	3.9365	3.9365
3	1.2500	0.0000	3.2751	3.2751
4	1.8750	0.0000	2.6473	2.6473
5	2.5000	0.0000	2.0520	2.0520
6	3.1250	0.0000	1.4874	1.4874
7	3.7500	0.0000	0.9512	0.9512
8	4.3750	0.0000	0.4412	0.4412
9	5.0000	0.0000	-0.0373	-0.0373
10	6.0000	0.0000	-0.6440	-0.6440
11	7.0000	0.0000	-1.2153	-1.2153
12	8.0000	0.0000	-0.8077	-0.8077
13	9.7500	0.0000	-1.2247	-1.2247
14	11.3750	0.0000	-1.5995	-1.5995
15	13.0000	0.0000	-1.9705	-1.9705

### Finite Element Analysis - Soil Pressure - Z Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ksf	LC #2 ksf	LC #3 ksf
1	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000

### Finite Element Analysis - Soil Pressure - Ultimate Load Combinations

LC #1 : 1.4 Dead

LC #2 : 1.2 Dead + 1.6 Wind

LC #3 : 1.2 Dead + 0.8 Wind

### Finite Element Analysis - Soil Pressure - X Dir - Ultimate Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ksf	LC #2 ksf	LC #3 ksf	LC #4 ksf
1	0.0000	0.0000	7.4117	3.7059	7.4117
2	0.6250	0.0000	6.2984	3.1492	6.2984
3	1.2500	0.0000	5.2401	2.6201	5.2401
4	1.8750	0.0000	4.2357	2.1179	4.2357
5	2.5000	0.0000	3.2832	1.6416	3.2832
6	3.1250	0.0000	2.3798	1.1899	2.3798
7	3.7500	0.0000	1.5219	0.7610	1.5219
8	4.3750	0.0000	0.7059	0.3530	0.7059
9	5.0000	0.0000	-0.0597	-0.0299	-0.0597
10	6.0000	0.0000	-1.0303	-0.5152	-1.0303
11	7.0000	0.0000	-1.9445	-0.9722	-1.9445
12	8.0000	0.0000	-1.2923	-0.6461	-1.2923
13	9.7500	0.0000	-1.9595	-0.9798	-1.9595
14	11.3750	0.0000	-2.5593	-1.2796	-2.5593
15	13.0000	0.0000	-3.1529	-1.5764	-3.1529

### Finite Element Analysis - Soil Pressure - Z Dir - Ultimate Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 ksf	LC #2 ksf	LC #3 ksf	LC #4 ksf
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000	0.0000

### Finite Element Analysis - Shear Forces - Allowable Load Combinations

LC #1 : Dead

LC #2 : Dead + Wind

### Finite Element Analysis - Shear Forces - X Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 kips	LC #2 kips	LC #3 kips
1	0.0000	0.0000	-4.1000	-4.1000
2	0.6250	0.0000	0.2428	0.2428
3	1.2500	0.0000	7.6237	7.6237
4	1.8750	0.0000	13.7645	13.7645
5	2.5000	0.0000	18.7282	18.7282
6	3.1250	0.0000	22.5758	22.5758
7	3.7500	0.0000	25.3646	25.3646
8	4.3750	0.0000	27.1481	27.1481
9	5.0000	0.0000	27.9511	27.9511
10	6.0000	0.0000	27.8577	27.8577
11	7.0000	0.0000	25.9258	25.9258
12	8.0000	0.0000	22.6086	22.6086
13	9.7500	0.0000	18.8010	18.8010
14	11.3750	0.0000	12.6010	12.6010
15	13.0000	0.0000	4.8032	4.8032

### Finite Element Analysis - Shear Forces - Z Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 kips	LC #2 kips	LC #3 kips
1	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000

### Finite Element Analysis - Shear Forces - Ultimate Load Combinations

LC #1 : 1.4 Dead

LC #2 : 1.2 Dead + 1.6 Wind

LC #3 : 1.2 Dead + 0.8 Wind

### Finite Element Analysis - Shear Forces - X Dir - Ultimate Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 kips	LC #2 kips	LC #3 kips	LC #4 kips
1	0.0000	0.0000	-6.5600	-3.2800	-6.5600
2	0.6250	0.0000	0.3885	0.1942	0.3885
3	1.2500	0.0000	12.1979	6.0990	12.1979
4	1.8750	0.0000	22.0232	11.0116	22.0232
5	2.5000	0.0000	29.9652	14.9826	29.9652
6	3.1250	0.0000	36.1213	18.0606	36.1213
7	3.7500	0.0000	40.5834	20.2917	40.5834
8	4.3750	0.0000	43.4370	21.7185	43.4370
9	5.0000	0.0000	44.7218	22.3609	44.7218
10	6.0000	0.0000	44.5723	22.2862	44.5723
11	7.0000	0.0000	41.4813	20.7406	41.4813
12	8.0000	0.0000	36.1738	18.0869	36.1738
13	9.7500	0.0000	30.0816	15.0408	30.0816
14	11.3750	0.0000	20.1616	10.0808	20.1616
15	13.0000	0.0000	7.6851	3.8425	7.6851

### Finite Element Analysis - Shear Forces - Z Dir - Ultimate Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 kips	LC #2 kips	LC #3 kips	LC #4 kips
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000	0.0000

### Finite Element Analysis - Bending Moments - Allowable Load Combinations

LC #1 : Dead

LC #2 : Dead + Wind

### Finite Element Analysis - Bending Moments - X Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 kip-ft	LC #2 kip-ft	LC #3 kip-ft
1	0.0000	0.0000	-227.2000	-227.2000
2	0.6250	0.0000	-227.0483	-227.0483
3	1.2500	0.0000	-222.2834	-222.2834
4	1.8750	0.0000	-213.6806	-213.6806
5	2.5000	0.0000	-201.9755	-201.9755
6	3.1250	0.0000	-187.8656	-187.8656
7	3.7500	0.0000	-172.0127	-172.0127
8	4.3750	0.0000	-155.0452	-155.0452
9	5.0000	0.0000	-137.5757	-137.5757
10	6.0000	0.0000	-109.7180	-109.7180
11	7.0000	0.0000	-83.7922	-83.7922
12	8.0000	0.0000	-61.1836	-61.1836
13	9.7500	0.0000	-28.2818	-28.2818
14	11.3750	0.0000	-7.8052	-7.8052
15	13.0000	0.0000	0.0000	0.0000

### Finite Element Analysis - Bending Moments - Z Dir - Allowable Load Combinations

#### Shaft Element - S

Node No	Depth ft	LC #1 kip-ft	LC #2 kip-ft	LC #3 kip-ft
1	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000

**Finite Element Analysis - Bending Moments - Ultimate Load Combinations**

LC #1 : 1.4 Dead

LC #2 : 1.2 Dead + 1.6 Wind

LC #3 : 1.2 Dead + 0.8 Wind

**Finite Element Analysis - Bending Moments - X Dir - Ultimate Load Combinations**

**Shaft Element - S**

Node No	Depth ft	LC #1 kip-ft	LC #2 kip-ft	LC #3 kip-ft	LC #4 kip-ft
1	0.0000	0.0000	-363.5200	-181.7600	-363.5200
2	0.6250	0.0000	-363.2772	-181.6386	-363.2772
3	1.2500	0.0000	-355.6535	-177.8267	-355.6535
4	1.8750	0.0000	-341.8890	-170.9445	-341.8890
5	2.5000	0.0000	-323.1608	-161.5804	-323.1608
6	3.1250	0.0000	-300.5850	-150.2925	-300.5850
7	3.7500	0.0000	-275.2204	-137.6102	-275.2204
8	4.3750	0.0000	-248.0723	-124.0361	-248.0723
9	5.0000	0.0000	-220.1211	-110.0606	-220.1211
10	6.0000	0.0000	-175.5488	-87.7744	-175.5488
11	7.0000	0.0000	-134.0675	-67.0338	-134.0675
12	8.0000	0.0000	-97.8937	-48.9469	-97.8937
13	9.7500	0.0000	-45.2508	-22.6254	-45.2508
14	11.3750	0.0000	-12.4883	-6.2441	-12.4883
15	13.0000	0.0000	0.0000	0.0000	0.0000

**Finite Element Analysis - Bending Moments - Z Dir - Ultimate Load Combinations**

**Shaft Element - S**

Node No	Depth ft	LC #1 kip-ft	LC #2 kip-ft	LC #3 kip-ft	LC #4 kip-ft
1	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.6250	0.0000	0.0000	0.0000	0.0000
3	1.2500	0.0000	0.0000	0.0000	0.0000
4	1.8750	0.0000	0.0000	0.0000	0.0000
5	2.5000	0.0000	0.0000	0.0000	0.0000
6	3.1250	0.0000	0.0000	0.0000	0.0000
7	3.7500	0.0000	0.0000	0.0000	0.0000
8	4.3750	0.0000	0.0000	0.0000	0.0000
9	5.0000	0.0000	0.0000	0.0000	0.0000
10	6.0000	0.0000	0.0000	0.0000	0.0000
11	7.0000	0.0000	0.0000	0.0000	0.0000
12	8.0000	0.0000	0.0000	0.0000	0.0000
13	9.7500	0.0000	0.0000	0.0000	0.0000
14	11.3750	0.0000	0.0000	0.0000	0.0000
15	13.0000	0.0000	0.0000	0.0000	0.0000

**PIER DESIGN - Ultimate Load Combinations**

**Modulus of Elasticity of Concrete - Section 19.2**

**Concrete Stress Distribution - Section 22.2.2**

**Design Axial Strength - Section 22.4**

**Shaft Element - S**

**Load Element - S**

**Geometry**

Shape	Circle		
X Dim	3	ft	
Z Dim	3	ft	
Height	13	ft	
Offset - X	0	ft	
Offset - Z	0	ft	

**Pier Concrete Capacity**

Load Combination	Applied Axial Load	Allowable Axial Load	Applied Moment Resultant	Allowable Moment Resultant	Capacity Ratio
	kips	kips	kip-ft	kip-ft	
1 - 1.4 Dead	5.32	1017.4254	0	0.1017	191.2454
2 - 1.2 Dead + 1.6 Wind	4.56	5.4913	377.8712	455.0413	1.2042
3 - 1.2 Dead + 0.8 Wind	4.56	11.3766	186.8339	466.1247	2.4949
4 - 0.9 Dead + 1.6 Wind	3.42	4.0963	377.8712	452.5914	1.1977