

KENNETH C. BALDWIN

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Also admitted in Massachusetts

October 16, 2018

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Petition No. 1285 – 221 West Main Street, Niantic (East Lyme), Connecticut**

Dear Attorney Bachman:

Condition No. 2 of the Connecticut Siting Council's February 21, 2017 approval of Petition No. 1285 required the submission of the final structural design for the replacement light pole at 221 West Main Street in Niantic. Attached is the stamped final structural design for the replacement pole and its foundation as requested.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,



Kenneth C. Baldwin

Attachment

Copy to:

Anthony Befera

MUSCO SPORTS LIGHTING, LLC
Light Structure Pole and Foundation Standard

This confidential report is provided exclusively for the use of engineering approval. The technical information provided herein is the confidential property of Musco Sports Lighting, LLC and reproduction of this report or use of this information for anything other than its limited, intended purpose as to this project, without the written permission of Musco Sports Lighting, LLC is prohibited.

ITEM:

Structural Calculations
Pole/Foundation Standard

PROJECT:

Niantic SC6 – Bridebrook Soccer – Verizon
Field Lighting & Cellular
Niantic, CT

PROJECT #:

184978

DATE:

10 November 2017

ENGINEER:

Structural Engineers, P.C.
114 Nicholas Drive
Marshalltown, IA 50158



Kyle G. Lacina – No. 24187
License Renewal Date: January 31, 2018
Structural Engineers, P.C. – COA No. 1067

STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC

PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)

DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES

REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

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S1; LSS80DEXT w/ 11 Fixtures	1-13

CODE REFERENCE

TIA-222-G-2005

Structural Standard for Antenna Supporting Structures and Antennas
Telecommunications Industry Association, Arlington, Virginia

CT SBC 2016

Connecticut State Building Code 2016

Connecticut Division of Construction Services, Hartford, Connecticut

STRUCTURAL ENGINEERS, PC

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DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES
REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

INDEX FOR POLE(S) S1:

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 REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DXT 11 (6+5)

WIND DESIGN PARAMETERS

REFERENCE:

Code: TIA-222-G-2005
 Wind Category: V = 120 mph
 Exposure Category C

Wind Design Pressures:

Elev. (ft)	K_z	q_z (psf)	C_f	F_{ST} / A_p (psf)
0.0-15.1	0.850	29.77	0.60	19.65
20.0	0.902	31.58	0.60	20.85
25.0	0.945	33.10	0.60	21.85
30.0	0.982	34.40	0.60	22.70
40.0	1.044	36.55	0.60	24.12
50.0	1.094	38.30	0.60	25.28
60.0	1.137	39.80	0.60	26.27
70.0	1.174	41.12	0.60	27.14
80.0	1.208	42.29	0.60	27.91
81.3	1.212	42.44	0.60	28.01
90.0	1.238	43.35		
100.0	1.266	44.32		
120.0	1.315	46.06		
140.0	1.359	47.58		
160.0	1.397	48.93		
180.0	1.432	50.16		

$q_z = 0.00256 * K_z * K_{zt} * K_d * V^2 * I$ (S2.6.9.6)

$K_z =$ As listed above. (S2.6.5.2)

$K_{zt} = 1.00$ (S2.6.6.4)

$K_d = 0.95$ (Table 2-2)

$I = 1.00$ (Table 2-3)

$F_{ST} = q_z * G_h * C_f * A_p$ (S2.6.9.1, 2.6.9.2)

$G_h = 1.10$ (S2.6.7.3)

$C_f =$ As listed above for pole. (Table 2-7)
 1.00 (For Fixtures - included in EPA)

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DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES

REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

WIND DESIGN PARAMETERS, CONTINUED

DEAD & WIND LOAD CASES - POLE TOP LUMINAIRES & ECE's					
Elev. (ft)	M _d (ft-lbs)	P _d (lbs)	M _w (ft-lbs)	V _w (lbs)	T _w (ft-lbs)
80.823	0	150	0	783	1,380
78.364	0	125	0	648	924
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
10.000	0	550	0	0	0

DEAD & WIND LOAD CASES - OTHER ATTACHMENTS					
Elev. (ft)	M _d (ft-lbs)	P _d (lbs)	M _w (ft-lbs)	V _w (lbs)	T _w (ft-lbs)
89.000	0	35	0	80	160
83.000	0	70	0	169	338
83.000	0	50	0	124	248
20.000	0	50	0	92	0
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA

STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC
PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)
DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES
REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

POLE INFORMATION

Wind loading in accordance with: TIA-222-G-2005

Light Structure Catalog No. = LSS80DEXT
Number of Fixtures = 11
Fixture Arrangement = (6+5)
Platforms = NA
EPA of Fixtures & Accessories = 41.4 sq ft
Weight of Dressed Pole = 5,624 lb
Wind Speed = 120 mph
Wind Speed - Serviceability = 60 mph
Exposure Category = C
Importance Factor = 1.00
Topographic Factor = 1.00

Light Structure Data: F_y (ksi)
Mounting Section NA
Extension No. 2 NA
Extension No. 1 55
Top Section 55
Bottom Section 55

Special Concentrated Loads (When Present):

Load No.	Elev.* (ft)	Quantity	Description	EPA (sq ft)	Weight (lbs)
1	89.00	1	ANTENNA	1.68	35
2	83.00	1	PIPE	3.60	70
3	83.00	1	RADIO	2.64	50
4	20.00	1	RADIO	2.64	50
5	NA	NA	NA	NA	NA
6	NA	NA	NA	NA	NA
7	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA
9	NA	NA	NA	NA	NA
10	NA	NA	NA	NA	NA

* Elevation listed is relative to local grade.

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 REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

Element Forces (D+W _s)				
Elev. (ft)	M (ft-k)	V (kips)	P (kips)	T (ft-k)
81.323	1.104	0.372	0.155	0.745
81.000	1.229	0.383	0.164	0.745
80.000	2.285	1.198	0.341	2.125
79.000	3.518	1.231	0.369	2.125
78.000	5.024	1.912	0.522	3.049
77.000	6.980	1.945	0.550	3.049
76.000	8.970	1.978	0.579	3.049
75.000	10.995	2.011	0.608	3.049
74.000	13.054	2.045	0.637	3.049
73.000	15.149	2.079	0.666	3.049
72.000	17.279	2.113	0.696	3.049
71.000	19.444	2.147	0.726	3.049
70.000	21.645	2.182	0.756	3.049
69.000	23.883	2.217	0.823	3.049
68.000	26.158	2.252	0.893	3.049
67.000	28.472	2.287	0.964	3.049
66.000	30.823	2.322	1.008	3.049
65.000	33.210	2.357	1.048	3.049
64.000	35.633	2.391	1.089	3.049
63.000	38.093	2.427	1.130	3.049
62.000	40.589	2.462	1.172	3.049
61.000	43.122	2.498	1.214	3.049
60.000	45.692	2.533	1.257	3.049
59.000	48.299	2.569	1.300	3.049
58.000	50.943	2.605	1.343	3.049
57.000	53.624	2.641	1.386	3.049
56.000	56.343	2.678	1.430	3.049
55.000	59.099	2.714	1.475	3.049
54.000	61.892	2.751	1.519	3.049
53.000	64.723	2.788	1.564	3.049
52.000	67.592	2.825	1.610	3.049
51.000	70.498	2.862	1.656	3.049
50.000	73.443	2.900	1.702	3.049
49.000	76.425	2.937	1.748	3.049
48.000	79.446	2.975	1.795	3.049
47.000	82.504	3.013	1.843	3.049
46.000	85.601	3.050	1.890	3.049
45.000	88.735	3.088	1.938	3.049
44.000	91.908	3.126	1.987	3.049
43.000	95.119	3.165	2.035	3.049

Deflection (D+W _s)		
Elev. (ft)	δ (in)	θ (deg)
81.323	5.3	0.55
81.000	5.3	0.55
80.000	5.2	0.55
79.000	5.1	0.55
78.000	5.0	0.55
77.000	4.8	0.55
76.000	4.7	0.54
75.000	4.6	0.54
74.000	4.5	0.54
73.000	4.4	0.54
72.000	4.3	0.53
71.000	4.2	0.53
70.000	4.1	0.53
69.000	3.9	0.52
68.000	3.8	0.52
67.000	3.7	0.51
66.000	3.6	0.51
65.000	3.5	0.50
64.000	3.4	0.50
63.000	3.3	0.49
62.000	3.2	0.49
61.000	3.1	0.48
60.000	3.0	0.48
59.000	2.9	0.47
58.000	2.8	0.46
57.000	2.7	0.46
56.000	2.6	0.45
55.000	2.5	0.45
54.000	2.4	0.44
53.000	2.3	0.43
52.000	2.2	0.42
51.000	2.2	0.42
50.000	2.1	0.41
49.000	2.0	0.40
48.000	1.9	0.39
47.000	1.8	0.39
46.000	1.7	0.38
45.000	1.7	0.37
44.000	1.6	0.36
43.000	1.5	0.35

Analysis in accordance with TIA-222-G-2005

STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC
 PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)
 DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES
 REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DXT 11 (6+5)

Element Forces (D+W _e)				
Elev. (ft)	M (ft-k)	V (kips)	P (kips)	T (ft-k)
42.000	98.369	3.203	2.085	3.049
41.000	101.656	3.241	2.134	3.049
40.000	104.982	3.280	2.184	3.049
39.000	108.346	3.318	2.234	3.049
38.000	111.748	3.357	2.285	3.049
37.000	115.189	3.396	2.336	3.049
36.000	118.668	3.434	2.387	3.049
35.000	122.184	3.473	2.439	3.049
34.000	125.739	3.512	2.491	3.049
33.000	129.332	3.551	2.543	3.049
32.000	132.964	3.590	2.641	3.049
31.000	136.634	3.629	2.761	3.049
30.000	140.344	3.668	2.882	3.049
29.000	144.093	3.706	3.004	3.049
28.000	147.880	3.745	3.073	3.049
27.000	151.704	3.783	3.142	3.049
26.000	155.565	3.821	3.212	3.049
25.000	159.463	3.859	3.282	3.049
24.000	163.398	3.896	3.352	3.049
23.000	167.369	3.934	3.423	3.049
22.000	171.376	3.972	3.495	3.049
21.000	175.419	4.009	3.566	3.049
20.000	179.499	4.138	3.689	3.049
19.000	183.706	4.176	3.762	3.049
18.000	187.949	4.213	3.835	3.049
17.000	192.226	4.249	3.909	3.049
16.000	196.538	4.286	3.983	3.049
15.000	200.884	4.323	4.058	3.049
14.000	205.265	4.359	4.133	3.049
13.000	209.679	4.396	4.209	3.049
12.000	214.128	4.433	4.285	3.049
11.000	218.611	4.470	4.362	3.049
10.000	223.130	4.507	4.989	3.049
9.000	227.685	4.545	5.067	3.049
8.000	232.275	4.582	5.145	3.049
7.000	236.898	4.620	5.223	3.049
6.000	241.556	4.659	5.303	3.049
5.000	246.249	4.697	5.382	3.049
4.000	250.976	4.736	5.462	3.049
3.000	255.738	4.775	5.543	3.049

Deflection (D+W _s)		
Elev. (ft)	δ (in)	θ (deg)
42.000	1.4	0.35
41.000	1.4	0.34
40.000	1.3	0.33
39.000	1.2	0.32
38.000	1.2	0.31
37.000	1.1	0.30
36.000	1.0	0.29
35.000	1.0	0.28
34.000	0.9	0.28
33.000	0.9	0.27
32.000	0.8	0.26
31.000	0.8	0.25
30.000	0.7	0.24
29.000	0.7	0.23
28.000	0.6	0.22
27.000	0.6	0.21
26.000	0.5	0.20
25.000	0.5	0.20
24.000	0.4	0.19
23.000	0.4	0.18
22.000	0.4	0.17
21.000	0.3	0.16
20.000	0.3	0.15
19.000	0.3	0.15
18.000	0.2	0.14
17.000	0.2	0.13
16.000	0.2	0.12
15.000	0.2	0.11
14.000	0.1	0.10
13.000	0.1	0.10
12.000	0.1	0.09
11.000	0.1	0.08
10.000	0.1	0.07
9.000	0.0	0.06
8.000	0.0	0.05
7.000	0.0	0.04
6.000	0.0	0.03
5.000	0.0	0.03
4.000	0.0	0.02
3.000	0.0	0.01

Analysis in accordance with TIA-222-G-2005

STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC

PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)

DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES

REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

Element Forces (D+W _o)				
Elev. (ft)	M (ft-k)	V (kips)	P (kips)	T (ft-k)
2.000	260.534	4.814	5.624	3.049

Deflection (D+W _s)		
Elev. (ft)	δ (in)	θ (deg)
2.000	0.0	0.00

Analysis in accordance with TIA-222-G-2005

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POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

Steel Shaft Verification					(1.2D+1.6W _o)
Elev. (ft)	M _u (ft-k)	øM _n (ft-k)	P _u (kips)	øP _n (kips)	Interaction Equation
81.323	1.767	120.325	0.186	18.708	0.015
81.000	1.967	121.084	0.197	18.771	0.017
80.000	3.661	123.451	0.410	18.964	0.032
79.000	5.639	125.841	0.443	19.157	0.047
78.000	8.056	128.254	0.626	19.350	0.066
77.000	11.194	130.690	0.660	19.544	0.089
76.000	14.388	133.149	0.695	19.737	0.112
75.000	17.637	135.630	0.729	19.930	0.134
74.000	20.943	138.134	0.764	20.123	0.155
73.000	24.305	140.661	0.800	20.317	0.176
72.000	27.723	143.211	0.835	20.510	0.197
71.000	31.199	145.783	0.871	20.703	0.218
70.000	34.732	148.378	0.908	20.896	0.238
69.000	38.325	150.996	0.988	21.090	0.258
68.000	41.979	153.637	1.072	21.283	0.278
67.000	45.695	156.301	1.157	21.476	0.297
66.000	49.471	208.045	1.209	28.126	0.241
65.000	53.306	211.631	1.258	28.384	0.255
64.000	57.199	215.248	1.307	28.642	0.269
63.000	61.151	218.894	1.357	28.900	0.283
62.000	65.161	222.571	1.407	29.157	0.296
61.000	69.231	226.279	1.457	29.415	0.309
60.000	73.361	230.017	1.508	29.673	0.322
59.000	77.549	233.785	1.560	29.930	0.335
58.000	81.798	237.583	1.611	30.188	0.348
57.000	86.106	241.412	1.664	30.446	0.360
56.000	90.475	245.272	1.716	30.704	0.373
55.000	94.903	249.161	1.770	30.961	0.385
54.000	99.392	253.081	1.823	31.219	0.396
53.000	103.941	257.032	1.877	31.477	0.408
52.000	108.551	261.012	1.932	31.734	0.420
51.000	113.222	265.024	1.987	31.992	0.431
50.000	117.953	269.065	2.042	32.250	0.442
49.000	122.746	273.137	2.098	32.508	0.454
48.000	127.599	277.239	2.154	32.765	0.464
47.000	132.513	281.372	2.211	33.023	0.475
46.000	137.488	285.535	2.268	33.281	0.486
45.000	142.525	289.728	2.326	33.538	0.496
44.000	147.622	293.952	2.384	33.796	0.507
43.000	152.781	298.206	2.443	34.054	0.517

Analysis in accordance with TIA-222-G-2005

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REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

Steel Shaft Verification (1.2D+1.6W _o)					
Elev. (ft)	M _u (ft-k)	øM _n (ft-k)	P _u (kips)	øP _n (kips)	Interaction Equation
42.000	158.001	302.490	2.501	34.312	0.527
41.000	163.282	306.805	2.561	34.569	0.537
40.000	168.624	311.150	2.621	34.827	0.547
39.000	174.028	315.526	2.681	35.085	0.556
38.000	179.492	319.932	2.742	35.342	0.566
37.000	185.017	324.368	2.803	35.600	0.575
36.000	190.604	328.835	2.865	35.858	0.585
35.000	196.251	333.332	2.927	36.116	0.594
34.000	201.959	337.859	2.989	36.373	0.603
33.000	207.727	342.417	3.052	36.631	0.612
32.000	213.557	347.005	3.169	36.889	0.621
31.000	219.450	351.623	3.313	37.146	0.630
30.000	225.405	356.272	3.458	37.404	0.638
29.000	231.423	360.952	3.605	37.662	0.647
28.000	237.502	467.883	3.688	48.233	0.512
27.000	243.640	474.024	3.771	48.570	0.518
26.000	249.837	480.206	3.854	48.907	0.525
25.000	256.092	486.427	3.938	49.244	0.531
24.000	262.405	492.687	4.023	49.580	0.537
23.000	268.777	498.988	4.108	49.917	0.543
22.000	275.206	505.328	4.194	50.254	0.549
21.000	281.692	511.708	4.280	50.591	0.555
20.000	288.236	518.127	4.427	50.928	0.561
19.000	294.983	524.587	4.514	51.265	0.567
18.000	301.787	531.085	4.602	51.601	0.573
17.000	308.645	537.624	4.691	51.938	0.579
16.000	315.559	544.202	4.780	52.275	0.585
15.000	322.526	550.820	4.870	52.612	0.591
14.000	329.548	557.478	4.960	52.949	0.596
13.000	336.623	564.175	5.051	53.286	0.602
12.000	343.752	570.913	5.142	53.623	0.608
11.000	350.935	577.689	5.234	53.959	0.613
10.000	358.175	584.506	5.987	54.296	0.619
9.000	365.473	591.362	6.080	54.633	0.624
8.000	372.824	598.258	6.174	54.970	0.629
7.000	380.229	605.193	6.268	55.307	0.635
6.000	387.688	612.168	6.363	55.644	0.640
5.000	395.200	619.183	6.459	55.980	0.645
4.000	402.767	626.238	6.555	56.317	0.650
3.000	410.388	633.332	6.651	56.654	0.655

Analysis in accordance with TIA-222-G-2005

STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC

PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)

DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES

REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

Steel Shaft Verification					(1.2D+1.6W _o)
Elev. (ft)	M _u (ft-k)	φM _n (ft-k)	P _u (kips)	φP _n (kips)	Interaction Equation
2.000	418.063	640.466	6.749	56.991	0.659

Analysis in accordance with TIA-222-G-2005

STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC

PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)

DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES

REFERENCE: TIA STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

Reaction Forces & Structural Adequacy		(D+W)
1. Reaction Forces		
Load Combination D+W		
Moment	M =	270.162 ft-k
Shear	V =	4.814 kips
Axial	P =	5.624 kips
Torque	T =	3.049 ft-k
Component Forces: D		
Moment	$M_d =$	3.777 ft-k
Including P-delta	$M_{d-pd} =$	3.777 ft-k
Axial	$P_d =$	5.624 kips
Component Forces: W		
Moment	$M_w =$	266.385 ft-k
Shear	$V_w =$	4.814 kips
Torque	$T_w =$	3.049 ft-k
2. Pole Adequacy		
Interaction Equation:	0.659	OK
Pole Top Deflection	$\delta_{max} =$	5 in
Allowable Deflection	$\delta_{all} =$	48 in
		OK
3. Precast Base Adequacy		
	Load Combinaton	1.2D+1.6W
Required Moment Strength	$M_u =$	433.468 ft-k
Design Moment Strength	$\phi M_n =$	545.000 ft-k
	Ratio/ASl:	0.795
		OK

CRETEX CONCRETE PRODUCTS NORTH, INC.

SCOPE: Analysis of an annular prestressed concrete pole member based on compatible strain procedure per ACI-318-11* with an ultimate concrete strain of 0.003.

PROJECT: Musco Standard Pole Base
 DATE: May-1-2014 9:52 AM
 POLE TYPE: 7B
 PROGRAM VERSION 2.3 Standard

USER DEFINED INPUTS

CROSS-SECTION OUTER DIAMETER, D_o	D_o	=	23.66 in	60.10 cm
HOLLOW CORE INSIDE DIAMETER, D_i	D_i	=	11.38 in	28.89 cm
TENDON CIRCLE DIAMETER, D_t	D_t	=	20.63 in	52.39 cm
NUMBER OF TENDONS, N (56 or less and even)	N	=	26	
TENDON DIAMETER, d_t	d_t	=	0.5 in	1.27 cm
NOMINAL TENDON AREA, A_{ps}	A_{ps}	=	0.153 in ²	0.99 cm ²
ULTIMATE TENDON STRENGTH, f_{pu}	f_{pu}	=	270 ksi	1862 MPa
TENDON YIELD STRENGTH, f_{py}	f_{py}	=	230 ksi	1586 MPa
CONCRETE COMPRESSIVE STRENGTH, f'_c	f'_c	=	9500 psi	65.5 MPa
MODULUS OF ELASTICITY (STEEL), E_s	E_s	=	29000 ksi	199948 MPa
INITIAL PRESTRESS FACTOR, IPF	IPF	=	0.64	
PRESTRESS LOSS FACTOR, PLF	PLF	=	0.82	
*PHI FACTOR CALCULATED PER ACI-318-99 OR ACI-318-11:	ACI-318-99			

OUTPUT

PHI FACTOR, Φ	Φ	=	0.90	
PRESTRESSING STRAIN IN TENDON, ϵ_{ps}	ϵ_{ps}	=	0.0049	
CONCRETE SERVICE STRESS DUE TO PRESTRESS		=	1669 psi	11.51 MPa
CROSS SECTIONAL AREA		=	338 in ²	2181 cm ²
GROSS MOMENT OF INERTIA		=	14548 in ⁴	605533 cm ⁴
DISTANCE TO NEUTRAL AXIS FROM COMP. SIDE, c	c	=	8.77 in	22.28 cm
CONCRETE COMPRESSIVE FORCE, C_c	C_c	=	650 kips	2891 kN
AREA OF BONDED REINFORCEMENT		=	3.98 in ²	25.68 cm ²
MINIMUM BONDED REINF. AREA (ACI 18.9.2)		=	0.68 in ²	4.39 cm ²
SATISFIED				
REINFORCEMENT RATIO, ρ	ρ	=	0.0137	
REINFORCEMENT INDEX, ω	ω	=	0.2968	
MAXIMUM REINFORCEMENT INDEX (ACI 318-99, 18.8.1)		=	0.234	
EXCEEDED				
STRAND DEVELOPMENT LENGTH, ℓ_d	ℓ_d	=	68 in	172.7 cm

RESULTS

NOMINAL MOMENT CAPACITY, M_n	M_n	=	605 ft-k	820 kN-m
DESIGN MOMENT CAPACITY, ΦM_n	ΦM_n	=	545 ft-k	739 kN-m
CRACKING LOAD MOMENT (ACI 18.8.2), M_{cr}	M_{cr}	=	246 ft-k	334 kN-m
SATISFIED				

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STRUCTURAL ENGINEERS, PC

CLIENT: MUSCO SPORTS LIGHTING, LLC
 PROJECT: NIAN TIC SC6 - BRIDEBROOK SOCCER - VERIZON; NIAN TIC, CT (184978)
 DESCRIPTION: LIGHT STRUCTURE POLE AND FOUNDATION, LS SERIES
 REFERENCE: CONNECTICUT STATE BUILDING CODE 2016

POLE DESCRIPTION: S1; LSS80DEXT 11 (6+5)

DRILLED PIER FOUNDATION DESIGN

APPLIED LOADS:

V = 4.81 kips
 M = 270.16 ft-k Ignored Depth = 0.0 ft
 M_{adj} = 270.16 ft-k Equivalent Moment Arm, h = 56.1 ft

Input Soil Profile Information for Each Zone				
Soil Zone No.	Depth to Top of Zone (ft)	Diameter b (ft)	Allowable Pressure, S (ksf/ft)	Zone Thickness (ft)
1	0.0	1.98	0.100	2.0
2	2.0	3.00	0.200	

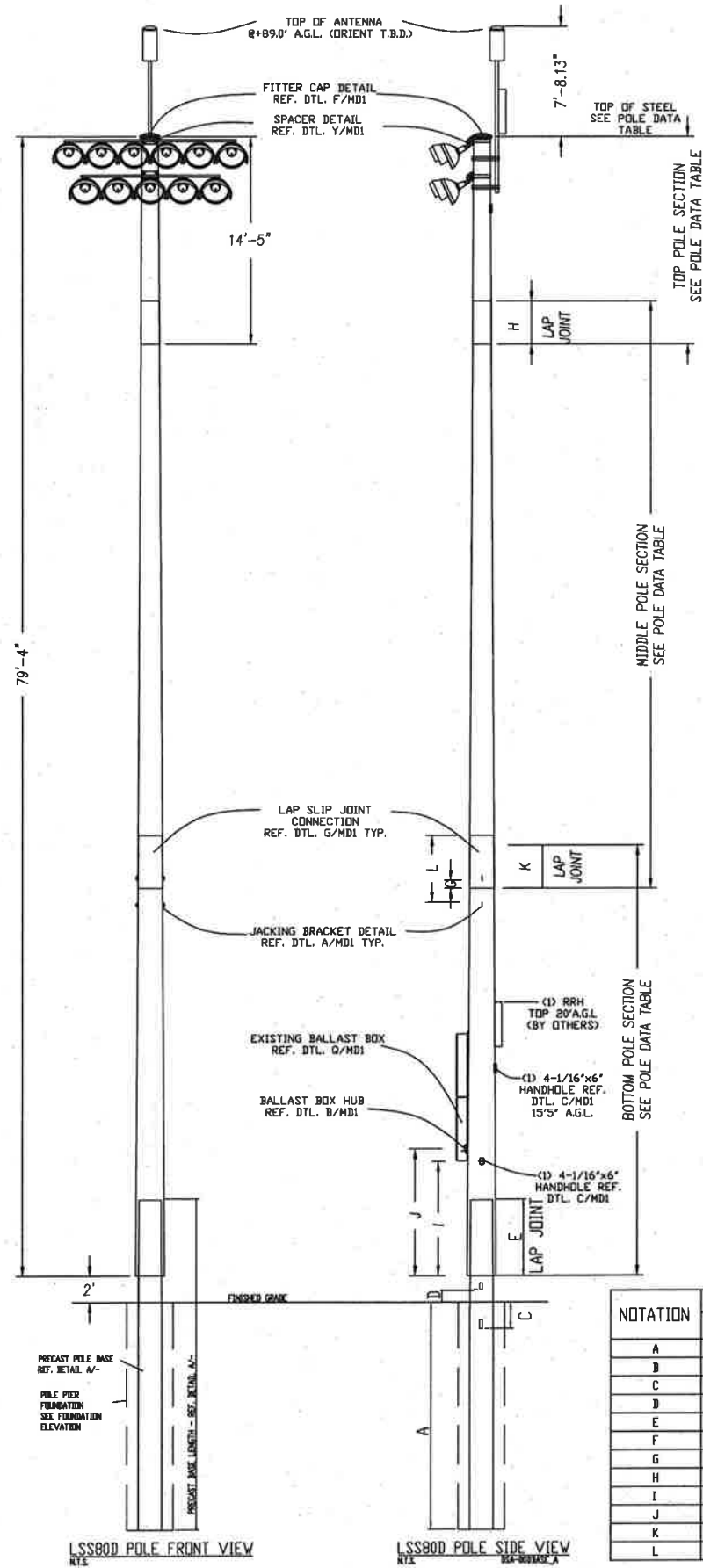
Solve NONCONSTRAINED Depth of Embedment Formula for Each Zone:						
Soil Zone No.	Test d (ft)	Pressure @ d/3, S ₁ (ksf)	Parameter A (ft)	Solve d (ft)	Percent Contributed	Depth Contributed (ft)
1	24.45	0.815	6.983	24.45	0.082	2.000
2	16.34	1.090	3.446	16.34	0.918	15.007
Sum					1.000	17.007

Total Embedment Depth Required: D = 17.007 (ft)
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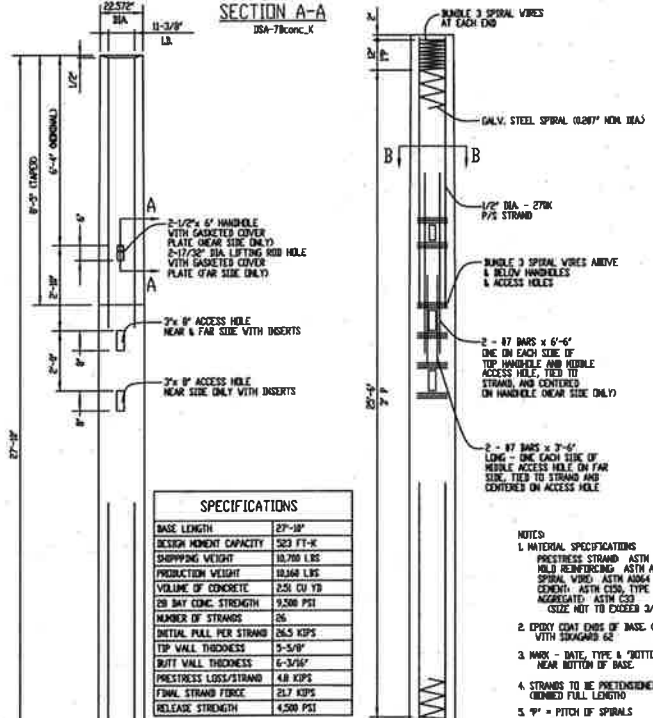
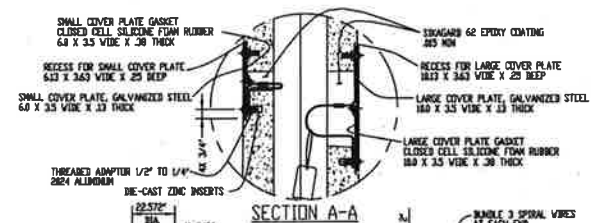
EQUATION REFERENCE: Section 1807.3.2.1 $A = (2.34 * V) / (S_1 * b)$ $d = 0.5A * (1 + \sqrt{1 + 4.36 * h / A})$ See Table 1806.2, Class 5 and Section 1806.3.4

PIER DETAILS

Diameter = 36 in
 Embedment Depth = 20.0 ft

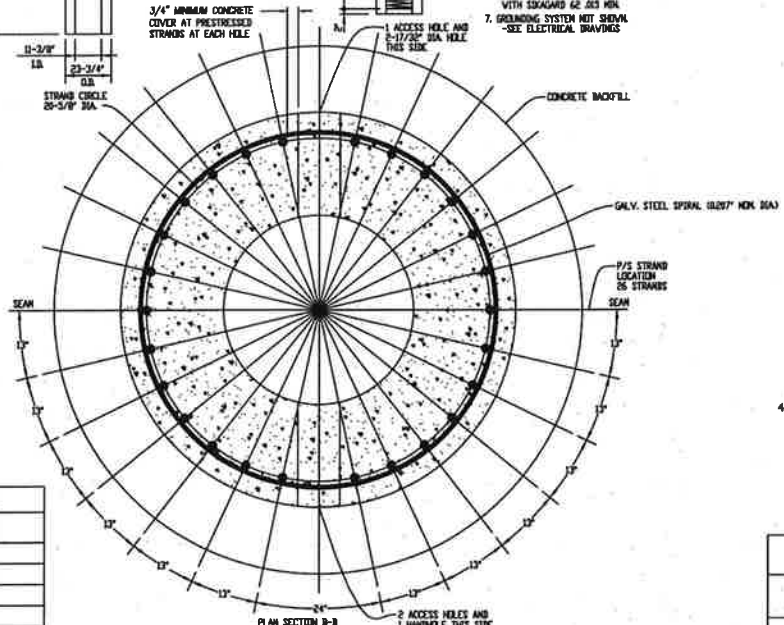


NOTATION	DIMENSION
LSS80-D	
A	20'-0"
B	---
C	2'-0" NOM.
D	1'-0" NOM.
E	5'-8 7/8" NOM. 5'-5" MIN.
F	---
G	6'
H	1'-11" MIN. (2'-7" NOM.)
I	7'-7-1/2"
J	8'-9-1/2"
K	2'-6" MIN. (3'-0" NOM.)
L	5'-4" NOM.



SPECIFICATIONS	
BASE LENGTH	27'-0"
DESIGN MOMENT CAPACITY	523 FT-K
SHOPPING WEIGHT	18,700 LBS
PRODUCTION WEIGHT	18,200 LBS
VOLUME OF CONCRETE	2.55 CU YD
28 DAY CONG. STRENGTH	9,500 PSI
NUMBER OF STRANDS	26
MINIMUM PULL PER STRAND	26.5 KIPS
TOP WALL THICKNESS	5'-5/8"
BUTT WALL THICKNESS	6'-3/16"
PRESSURE LOSS/STRAND	4.8 KIPS
TENSILE STRAND FORCE	25.7 KIPS
RELEASE STRENGTH	4,500 PSI

- NOTES:
- MATERIAL SPECIFICATIONS: PRESTRESS STRAND ASTM A416 GR 270 (LOW RELAXATION); WELDED REINFORCING ASTM A615 GR 60; SPIRAL WIRE ASTM A664 F=70 X21; CONCRETE ASTM C1191; AGGREGATE ASTM C33 (SIZE NOT TO EXCEED 3/4");
 - EPoxy COAT ENDS OF BASE (1 AND 2) WITH STRAGGLES;
 - MARK - DATE, TYPE & BOTTOM NEAR BOTTOM OF BASE;
 - STRANDS TO BE PRETENSIONED - ORDERED FULL LENGTH;
 - 7" = PITCH OF SPIRALS;
 - EPoxy COAT INSIDE SURFACES AT EACH HOLE WITH SIKAGARD 62 263 NOK;
 - GROUNDING SYSTEM NET SEVERAL - SEE ELECTRICAL DRAWINGS;



(A) TYPE 7B PRECAST BASE DETAIL N.T.S. 10A-7Bconc_K

POLE DESIGNATION	FORCES (1)			DRILLED PIER		
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	DIAMETER INCHES	EMBEDMENT DEPTH	CONCRETE BACKFILL YD (2)
B1	270,182	4,814	5,624	30	20'-0"	2.7

- ASD LOAD COMBINATION D+W. VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT).
- MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.

DESIGN NOTES

DESIGN PARAMETERS:
 BUILDING CODE: CONNECTICUT STATE BUILDING CODE 2015
 WIND: V = 120 MPH (EXPOSURE C, I = 1.00)
 PER TELECOMMUNICATIONS STANDARD TA-222-G-2005.

GEOTECHNICAL PARAMETERS:
 ALLOWABLE END BEARING SOIL PRESSURE: 1,500 PSF OR SKIN FRICTION: 200 PSF
 ALLOWABLE LATERAL SOIL BEARING PRESSURE:
 100 PSF/FT (GRADE TO 2'-0"); 200 PSF/FT (BELOW 2'-0")
 IN ACCORDANCE WITH THE 2015 EDITION OF THE CONNECTICUT STATE BUILDING CODE, CHAPTER 18. SEE TABLE 1806.2, SOIL MATERIAL CLASS 5 & SECTION 1808.3.4.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

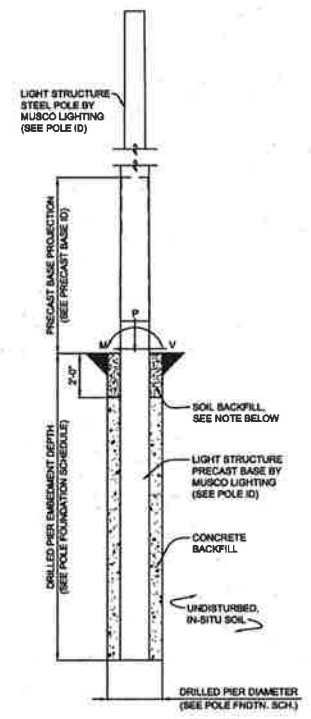
ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 8'-0".

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM IF NECESSARY TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

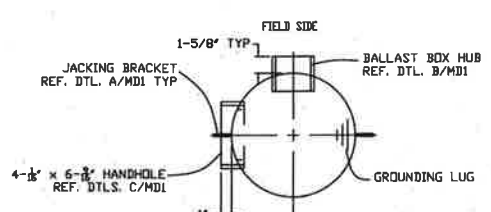
CONCRETE:
 CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A MINIMUM COMPRESSIVE DESIGN STRENGTH AT 28 DAYS OF 3,000 PSI. 3,000 PSI CONCRETE SPECIFIED FOR EARLY POLE ERECTION. ACTUAL REQUIRED MINIMUM ALLOWABLE CONCRETE STRENGTH IS 1,000 PSI. ALL PIERS AND CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM UNDISTURBED SOIL.

GENERAL NOTES:
 FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H:1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.

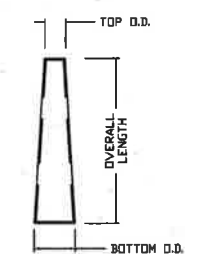


POLE FOUNDATION ELEV. SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:
 THE TOP TWO FEET OF ANNULUS SHALL BE BACKFILLED WITH SOIL WITH A CLASSIFICATION OF CLASS 6 (TABLE 1806.2) OR BETTER. COMPACTION, 96% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D998).



POLE ORIENTATION N.T.S.



TYP POLE SECTION N.T.S.

POLE SCHEDULE						
SITE LOCATION	POLE MARK	REFERENCE LOCATION	POLE TYPE	FIXTURE CONFIGURATION	TOTAL EPA ¹	BALLAST BOX REQUIREMENTS
SEE SITE PLAN	S1	---	LSS800	11 (6+5) SEE DET 1/M/1	40.6	0/M/1

- CONTAINS COMBINED EPA OF LIGHT FIXTURES, CROSS ARM AND MISCELLANEOUS FIXTURE MOUNTING APPARATUS.
- FIXTURE WEIGHT 25 LBS. THIS INCLUDES THE WEIGHT OF FIXTURE, CROSS ARM & MISC. MOUNTING APPARATUS. ELECTRICAL BALLAST BOX WEIGHT 50 LBS PER FIXTURE SERVICED.

CELL ANTENNA INFORMATION:

- ANTENNAS REQUIRED #12"x28.7" FLAT AREA: 2.4 SQ FT 35 LBS., EACH
- RRU 11.8"x25.8" FLAT AREA: 2.2 SQ FT EST. 50 LBS., EACH

POLE DATA TABLE										
POLE TYPE	# of Crossarms	PIECE MARK	POLE SECTION	TOP O.D. (INCHES)	BTM. O.D. (INCHES)	OVERALL LENGTH	TAPER LENGTH	THICKNESS (INCHES)	TOP OF STEEL	ASTM REFERENCE
LSS800 MODIFIED TO 80'-4'	2	NP-SBT-TRIMMED	TOP	13.73"	15.75	14'-5"	14'-5"	.179	79'-4"	A595A (fy=55ksi) or A572, Gr 55 or 65
		NP-7BT	MIDDLE	14.97"	20.7"	40'-11 1/4"	40'-11 1/4"	.239	(ABOVE 8TH STL.)	A595A (fy=55ksi) or A572, Gr 55 or 65
		NP-8BT	BOTTOM	19.71"	24.0"	30'-8"	30'-8"	.313		A595A (fy=55ksi) or A572, Gr 55 or 65



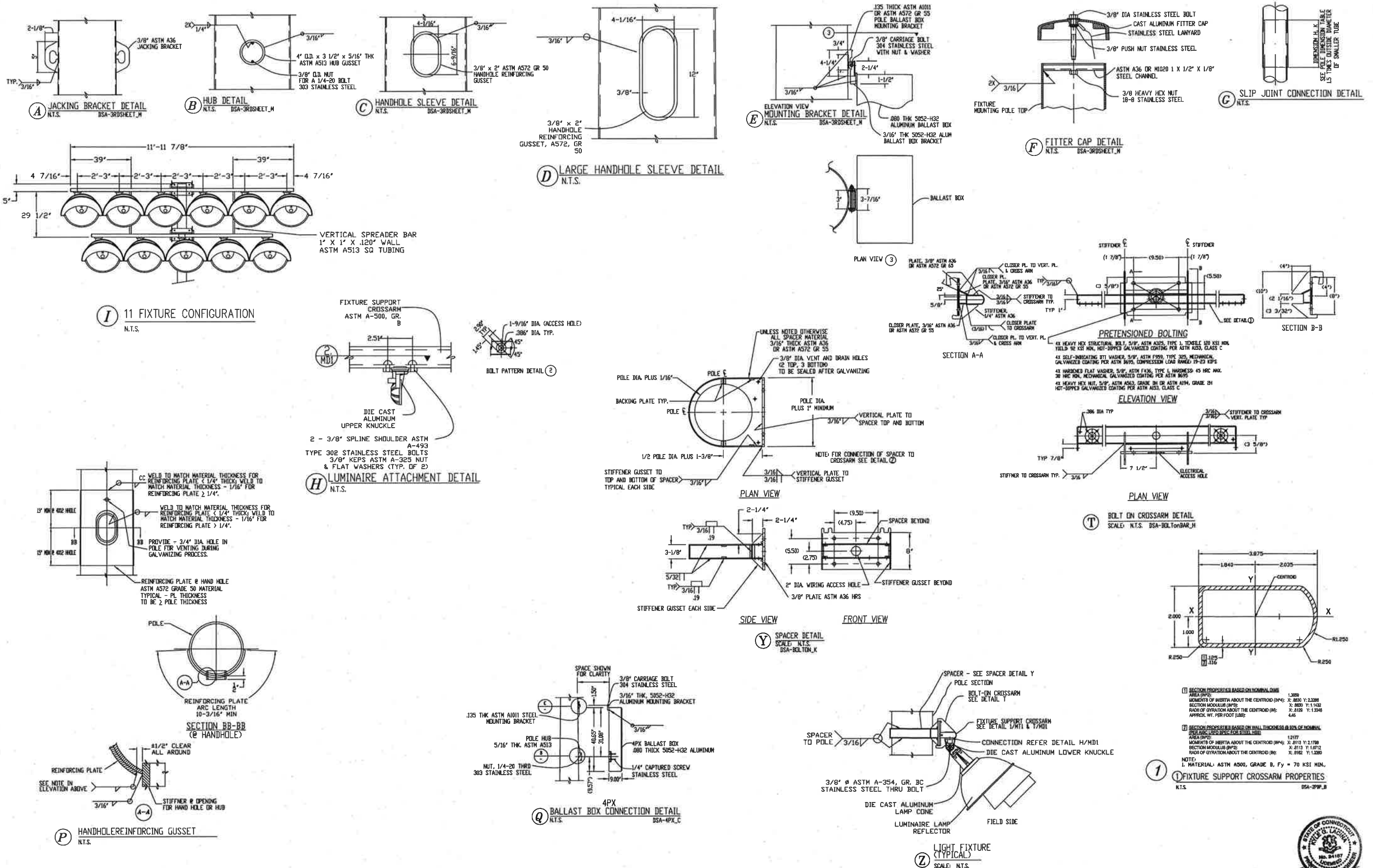
STRUCTURAL ENGINEERS, P.C.
 114 NICHOLAS DRIVE
 MARSHALLTOWN, IOWA 50158
 TELEPHONE NUMBER: 641-752-6334
 EMAIL: MSL.INFO@SEPC.BIZ



NIANTIC SC6 - BRIDEBROOK SOCCER FIELD LIGHTING/CELL POLE NIANTIC, CT

PROJECT NO. 184978
 DATE: 3/2/17
 DRAWN BY: A.MULLEN
 BRANDING NO. MS1

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STRUCTURAL ENGINEERS, P.C.
114 NICHOLAS DRIVE
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MUSCO SPORTS LIGHTING, LLC
100 FIRST AVENUE WEST
DES MOINES, IOWA 50319
641-272-9411

NIANTIC SC6 - BRIDEBROOK SOCCER FIELD LIGHTING/CELL POLE NIANTIC, CT

DRAWING TITLE:	POLE DETAILS
REVISION:	
REFERENCE:	

PROJECT NO:	184978
DATE:	3/3/17
DRAWN BY:	AMULLEN
DRAWING NO:	MD1



KYLE G. LACINA - NO. 20187
LICENSE RENEWAL DATE: JANUARY 31, 2018
STRUCTURAL ENGINEER, P.C. - COA NO. 107

POLE IDENTIFICATION AND RESULTANT FORCES

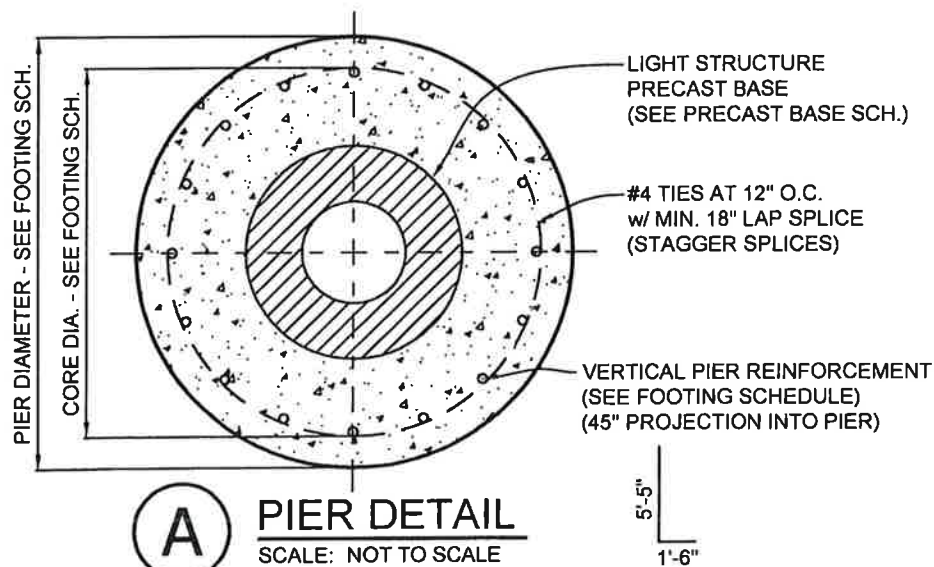
POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)	FORCES (1.)		
					MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS
S1	LSS80D	7B	11 (6+5)	41.4	270,162	4,814	5,624

1. ASD LOAD COMBINATION D + W. VERTICAL FORCE IS WEIGHT OF DRESSED POLE.
2. POLE S1 HAS ANTENNA EQUIPMENT MOUNTED ABOVE LIGHT FIXTURES AT POLE TOP INCLUDED IN EPA ABOVE.

PRECAST BASE ID FOR SPREAD FOOTING

PRECAST BASE TYPE	PRECAST BASE WEIGHT (1.)	PRECAST BASE LENGTH (1.)	PROJECTION ABOVE TOP OF PIER	STANDARD EMBEDMENT (1.)	OUTSIDE DIAMETER	CUT LENGTH OFF BOTTOM (2.)	EMBEDMENT INTO PIER & FOOTING (3.)
7B	10,160 LBS	27'-10"	7'-10"	20'-0"	23.75"	NA	6'-0"

1. PRECAST BASE WEIGHT, LENGTH AND STANDARD EMBEDMENT ARE PRECUT PROPERTIES
2. NA - NOT APPLICABLE TO CURRENT SCENARIO.
3. EMBEDMENT EQUALS 4'-0" PIER HEIGHT PLUS 2'-0" DEPTH INTO FOOTING



CONCRETE/REINFORCEMENT NOTES

CONCRETE SHALL COMPLY WITH THE FOLLOWING ASTM STANDARDS: MIXTURE WITH ASTM C-94, PORTLAND CEMENT WITH ASTM C-150 TYPE 1-A, AGGREGATES (MAX 0.75") WITH ASTM C-33 AND BE IN CONFORMANCE WITH ACI 318. CONCRETE SHALL BE AIR-ENTRAINED (COMPLY WITH ASTM C-260), HAVE A MAXIMUM WATER-CEMENT RATIO, w/cm = 0.45 AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,500 PSI.

DESIGN SLUMP LIMITS ARE 4" MINIMUM AND 6" MAXIMUM. THE JOB SITE SLUMP MAY BE INCREASED BY THE USE OF A WATER REDUCING AGENT MEETING ASTM C494-92.

CONCRETE REINFORCEMENT SHALL COMPLY WITH ASTM A615 GRADE 60 AND BE IN CONFORMANCE WITH ACI 315 & 318.

CONCRETE MUST ATTAIN DESIGN STRENGTH PRIOR TO POLE INSTALLATION AND FIXTURE MOUNTING.

DESIGN NOTES

DESIGN PARAMETERS:
 BUILDING CODE: CONNECTICUT STATE BUILDING CODE 2016
 WIND: V = 120 MPH (EXPOSURE C, I = 1.00)
 PER TELECOMMUNICATIONS STANDARD TIA-222-G-2005.

GEOTECHNICAL PARAMETERS:
 ALLOWABLE END BEARING SOIL PRESSURE: 1,500 PSF
 IN ACCORDANCE WITH THE 2016 EDITION OF THE CONNECTICUT STATE BUILDING CODE, CHAPTER 18.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOIL BORING INVESTIGATION (4/12/18) BY CLARENCE WELTI ASSOC., INC.; GLASTONBURY, CT.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT.

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

GENERAL NOTES:
 FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



KYLE G. LACINA - NO. 24187
 LICENSE RENEWAL DATE: JANUARY 31, 2019
 STRUCTURAL ENGINEERS, P.C. - COA NO. 1067

BRIDEBROOK
SOCCER
FIELD LIGHTING & CELLULAR
NIANTIC, CT



STRUCTURAL ENGINEERS, P.C.
 114 NICHOLAS DRIVE
 MARSHALLTOWN, IOWA 50158
 PHONE NUMBER: 641-752-6334
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DRAWING TITLE:
 POLE AND FOUNDATION
 SCALE: SEE PLAN
 NOTES:

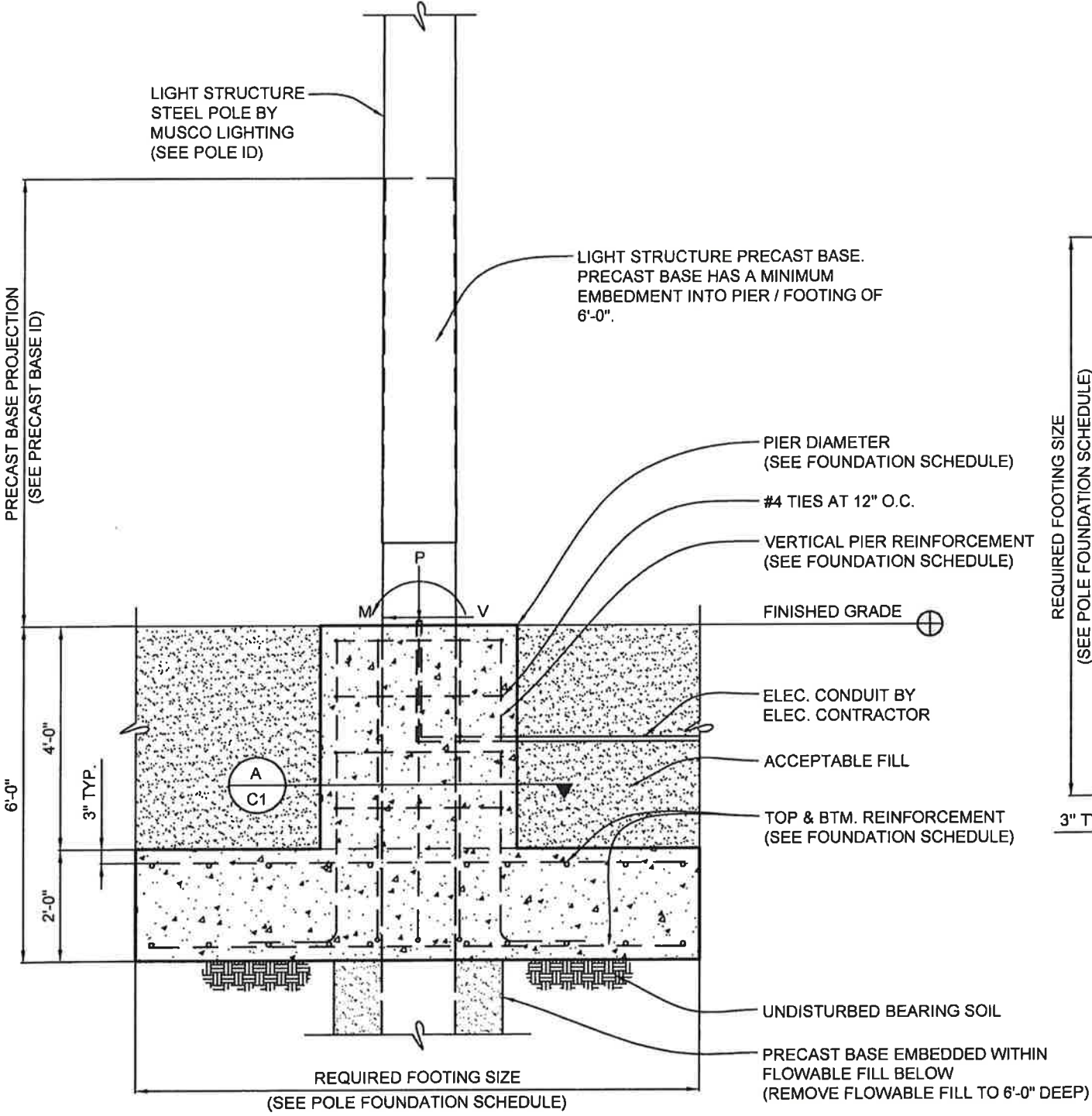
PROJECT NUMBER
 SVC-406603

DATE
 26 JUNE 2018

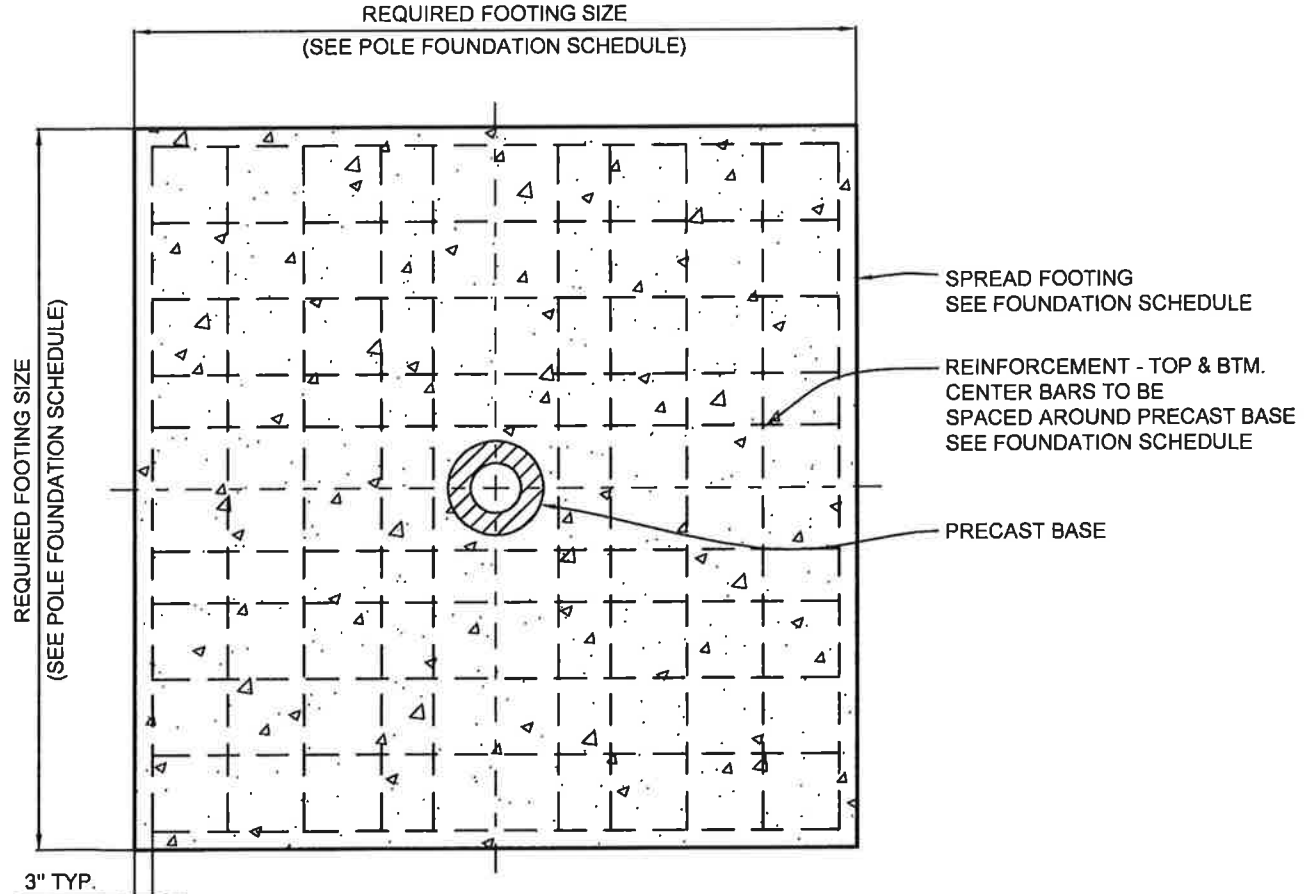
DRAWING NUMBER
C1
 OF TWO

POLE FOUNDATION SCHEDULE							
POLE DESIGNATION	FOOTING			PIER			
	SIZE	THICKNESS	REINFORCEMENT TOP & BOTTOM (TOTAL) QUANTITY - SIZE	DIAMETER INCHES	CORE DIA. INCHES (1.)	VERTICAL REINFORCING	HORIZONTAL TIES
S1	14'-0" x 14'-0"	2'-0"	(56) 14 - #7's EACH WAY	48	41	16 - #7	#4 @ 12"

1. CORE DIAMETER EQUAL TO INSIDE DIAMETER OF TIES.



POLE FOUNDATION ELEVATION
SCALE: NOT TO SCALE



SPREAD FOOTING PLAN VIEW
SCALE: NOT TO SCALE

BRIDEBROOK
SOCCER
FIELD LIGHTING & CELLULAR
NIANTIC, CT



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DRAWING NUMBER
C2

OF TWO



KYLE G. LACINA - NO. 24187
LICENSE RENEWAL DATE: JANUARY 31, 2019
STRUCTURAL ENGINEERS, P.C. - COA NO. 1067