

PLP
COMPOSITE TECHNOLOGIES INC.
57 Creamery Road
P.O. Box 429
Fitzwilliam, New Hampshire 03447

DATE: 04-02-2014

Computerized Composite FLAGPOLE Engineering and Design
with Load Calculations Based on Standards Established by
The National Association of Architectural Metal Manufacturers (NAAMM)
and

The American Association of State Highway and Transportation Officials (AASHTO)
6th Edition 2013, using Appendix C-Alternate Method for Wind Pressures.

TABLE 1

GIVEN INFORMATION

Flagpole name.....	60 ADM
Nautical yardarm.....	19 feet long, 36 feet above ground
Gaff.....	15 feet long, 36 feet above ground
Height of pole.....	60 feet
Depth of bury in ground.....	7 feet
Base diameter.....	10.719 inches
Tip diameter.....	5.359 inches
Flag size, hoist x fly.....	0 feet x 0 feet (polyester fabric)
Flags, nautical yardarm (2)...	0 feet x 0 feet (polyester fabric)
Flag, gaff.....	0 feet x 0 feet (polyester fabric)
Wind speed.....	150 MPH, gust factor 1.3
Material.....	PLP16, 50 inches wide
Breaking Stress.....	24000 psi
Modulus of Elasticity.....	2000000 psi
Wall Th./Inside Dia. ratio....	.018

TABLE 2

60 ADM
FLAGPOLE
with 19 foot nautical yardarm and 15 foot gaff

BENDING MOMENT, STRESS, & DEFLECTION

POLE HEIGHT feet	OUTSIDE DIAMETER inches	INERTIA MOMENT inch ⁴	SECTION MODULUS inch ³	BENDING MOMENT ft-lbs	STRESS psi	DEFLECTION feet
60.000	5.359	7.718	2.880	0.000	0.000	13.875
59.000	5.598	8.827	3.153	12.499	47.563	13.503
58.000	5.807	9.879	3.402	50.508	178.133	13.130
57.000	6.006	10.956	3.648	115.002	378.262	12.758
56.000	6.119	9.778	3.196	206.804	776.517	12.386
55.000	6.258	10.473	3.347	326.557	1170.828	12.015
54.000	6.377	11.093	3.479	474.842	1637.842	11.646
53.000	6.483	11.666	3.599	652.210	2174.729	11.277
52.000	6.717	17.826	5.308	859.306	1942.715	10.911
51.000	6.822	18.696	5.481	1096.905	2401.448	10.546
50.000	6.936	19.673	5.673	1365.643	2888.934	10.184
49.000	7.026	20.467	5.826	1664.091	3427.593	9.824
48.000	7.146	21.558	6.034	1990.782	3959.327	9.467
47.000	7.245	22.488	6.208	2346.146	4535.216	9.113
46.000	7.367	23.669	6.426	2730.625	5099.383	8.763
45.000	7.464	24.638	6.602	3144.660	5716.035	8.418
44.000	7.576	25.788	6.808	3588.682	6325.593	8.076
43.000	7.629	22.788	5.974	4063.066	8161.424	7.740
42.000	7.740	23.816	6.154	4568.141	8907.688	7.411
41.000	7.796	24.346	6.246	5104.242	9806.799	7.088
40.000	7.905	25.400	6.426	5671.699	10590.812	6.773
39.000	8.080	35.591	8.810	6270.965	8542.029	6.465
38.000	8.186	37.043	9.050	6902.606	9152.340	6.164
37.000	8.246	37.882	9.188	7567.072	9883.022	5.870
36.000	8.338	39.193	9.401	8264.683	10549.406	5.583
35.000	8.482	50.793	11.977	9746.407	9765.407	5.303
34.000	8.554	52.133	12.189	11262.115	11087.256	5.031
33.000	8.697	64.793	14.900	12812.247	10318.550	4.766
32.000	8.768	66.444	15.156	14397.228	11399.144	4.508
31.000	8.880	79.368	17.876	16017.457	10752.508	4.258
30.000	9.007	88.191	19.583	17673.361	10829.985	4.015
29.000	9.053	89.602	19.795	19363.697	11738.591	3.780
28.000	9.223	105.990	22.984	21087.197	11009.748	3.552
27.000	9.287	108.308	23.325	22844.271	11752.875	3.332
26.000	9.408	124.192	26.401	24635.287	11197.270	3.119
25.000	9.468	126.697	26.763	26460.600	11864.347	2.913
24.000	9.554	136.205	28.513	28320.496	11919.115	2.715
23.000	9.713	155.552	32.030	30215.332	11320.259	2.524
22.000	9.765	158.197	32.401	32145.531	11905.435	2.340
21.000	9.900	177.692	35.897	34111.453	11402.994	2.164
20.000	10.030	191.565	38.198	36113.508	11345.024	1.994
19.000	10.078	194.490	38.597	38152.098	11861.678	1.832
18.000	10.207	209.158	40.983	40227.555	11778.706	1.676
17.000	10.328	230.689	44.673	42340.258	11373.482	1.527
16.000	10.399	235.786	45.348	44490.625	11773.187	1.385
15.000	10.515	258.252	49.121	46678.992	11403.484	1.249
14.000	10.633	274.741	51.677	48901.875	11355.584	1.121
13.000	10.650	276.151	51.859	51155.750	11837.199	0.998
12.000	10.819	305.184	56.416	53440.832	11367.108	0.882
11.000	10.900	319.991	58.714	55757.457	11395.737	0.773
10.000	10.970	326.652	59.554	58105.883	11708.259	0.670

9.000	11.060	343.030	62.031	60486.367	11701.252	0.573
8.000	11.182	370.983	66.354	62899.180	11375.263	0.482
7.000	11.213	374.318	66.765	65344.578	11744.705	0.398
6.000	11.337	395.878	69.838	67822.750	11653.702	0.320
5.000	11.373	399.959	70.335	70333.906	11999.845	0.248
4.000	11.502	423.137	73.576	72878.297	11886.161	0.182
3.000	11.636	456.285	78.426	75456.305	11545.554	0.123
2.000	11.693	463.582	79.292	78068.211	11814.747	0.070
1.000	11.809	487.438	82.554	80714.312	11732.623	0.022
0.000	11.898	499.476	83.960	83394.898	11919.276	0.000
-1.000	11.688	427.944	73.228	71481.344	11713.771	0.000
-2.000	11.527	364.871	63.307	59567.785	11291.185	0.000
-3.000	11.236	274.400	48.843	47654.227	11707.939	0.000
-4.000	11.041	204.969	37.129	35740.672	11551.388	0.000
-5.000	10.783	135.415	25.116	23827.113	11384.039	0.000
-6.000	10.652	92.667	17.399	11913.557	8216.695	0.000
-7.000	10.719	94.462	17.625	0.000	0.000	0.000

Maximum stress is 11999.84 PSI, located at 5 FT above ground.