

PLP
COMPOSITE TECHNOLOGIES INC.
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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 CMDR
Nautical yardarm.....	16 feet long, 40 feet above ground
Gaff.....	11 feet long, 40 feet above ground
Height of pole.....	60 feet
Depth of bury in ground.....	6 feet
Base diameter.....	10.423 inches
Tip diameter.....	4.044 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 CMDR
FLAGPOLE
with 16 foot nautical yardarm and 11 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	4.044	2.231	1.103	0.000	0.000	13.948
59.000	4.322	2.736	1.266	12.376	117.311	13.566
58.000	4.677	3.484	1.490	49.236	396.606	13.184
57.000	5.136	7.793	3.035	110.002	434.965	12.803
56.000	5.359	7.718	2.880	194.537	810.463	12.423
55.000	5.598	8.827	3.153	303.544	1155.075	12.044
54.000	5.807	9.879	3.402	438.060	1544.970	11.665
53.000	6.006	10.956	3.648	599.062	1970.417	11.289
52.000	6.119	9.778	3.196	787.372	2956.456	10.914
51.000	6.258	10.473	3.347	1003.632	3598.395	10.542
50.000	6.377	11.093	3.479	1248.424	4306.114	10.174
49.000	6.483	11.666	3.599	1520.540	5070.089	9.810
48.000	6.717	17.826	5.308	1818.816	4111.970	9.450
47.000	6.822	18.696	5.481	2143.935	4693.705	9.094
46.000	6.936	19.673	5.673	2496.455	5281.097	8.742
45.000	7.026	20.467	5.826	2876.803	5925.463	8.395
44.000	7.146	21.558	6.034	3285.393	6534.088	8.053
43.000	7.245	22.488	6.208	3722.657	7196.079	7.716
42.000	7.367	23.669	6.426	4189.036	7822.934	7.385
41.000	7.464	24.638	6.602	4684.971	8515.851	7.061
40.000	7.576	25.788	6.808	5210.892	9184.982	6.743
39.000	7.767	35.150	9.051	6375.018	8452.084	6.433
38.000	7.878	36.720	9.322	7570.251	9744.827	6.129
37.000	8.026	46.710	11.640	8797.155	9069.542	5.833
36.000	8.089	43.880	10.849	10056.201	11122.900	5.543
35.000	8.264	55.310	13.386	11347.840	10173.079	5.262
34.000	8.370	57.539	13.749	12672.595	11060.582	4.988
33.000	8.522	69.828	16.388	14031.007	10274.353	4.722
32.000	8.614	72.202	16.764	15423.576	11040.595	4.463
31.000	8.666	73.568	16.978	16850.693	11909.724	4.212
30.000	8.830	87.730	19.871	18312.719	11059.014	3.969
29.000	8.881	89.324	20.116	19808.473	11816.711	3.734
28.000	8.998	98.104	21.806	21336.711	11741.852	3.506
27.000	9.110	112.241	24.641	22897.785	11150.947	3.287
26.000	9.191	115.410	25.114	24492.090	11702.999	3.075
25.000	9.329	131.687	28.232	26119.990	11102.426	2.870
24.000	9.407	135.194	28.743	27781.896	11598.649	2.673
23.000	9.517	145.847	30.650	29478.170	11541.284	2.482
22.000	9.638	163.199	33.866	31209.195	11058.661	2.300
21.000	9.698	166.446	34.326	32975.352	11527.899	2.124
20.000	9.830	185.553	37.752	34776.969	11054.233	1.955
19.000	9.897	189.611	38.317	36614.406	11466.836	1.793
18.000	9.995	201.757	40.372	38488.012	11440.118	1.638
17.000	10.038	204.538	40.753	40398.043	11895.542	1.490
16.000	10.214	229.035	44.847	42344.844	11330.409	1.349
15.000	10.262	232.496	45.312	44328.805	11739.621	1.214
14.000	10.391	248.629	47.855	46346.547	11621.841	1.087
13.000	10.512	271.567	51.668	48394.617	11239.751	0.966
12.000	10.537	266.868	50.654	50473.312	11957.299	0.852
11.000	10.653	290.380	54.516	52582.848	11574.459	0.744
10.000	10.725	296.741	55.336	54723.461	11867.116	0.643

9.000	10.834	320.936	59.246	56895.430	11523.882	0.548
8.000	10.957	340.160	62.090	59099.051	11421.944	0.460
7.000	10.992	343.683	62.533	61334.586	11769.974	0.378
6.000	11.108	363.104	65.377	63602.301	11674.257	0.303
5.000	11.152	367.775	65.957	65902.383	11990.097	0.234
4.000	11.274	396.553	70.348	68235.102	11639.530	0.171
3.000	11.351	413.230	72.809	70600.695	11635.967	0.115
2.000	11.429	422.521	73.938	72999.469	11847.604	0.065
1.000	11.511	440.550	76.544	75431.609	11825.581	0.020
0.000	11.686	479.446	82.055	77897.422	11392.014	0.000
-1.000	11.406	387.217	67.897	64914.520	11472.859	0.000
-2.000	11.095	289.779	52.236	51931.613	11930.100	0.000
-3.000	10.843	211.364	38.986	38948.711	11988.470	0.000
-4.000	10.610	137.827	25.981	25965.807	11993.160	0.000
-5.000	10.354	76.030	14.686	12982.903	10608.341	0.000
-6.000	10.423	77.587	14.888	0.000	0.000	0.000

Maximum stress is 11993.16 PSI, located at -4 FT above ground.