


**New Jersey Department of Transportation
CORRECTIVE ACTION NOTICE**

CAN No. 090

CAPITAL PROGRAM SUPPORT

Director: Paul F. Schneider Telephone: (609) 963-1833


Approved: Paul F. Schneider
Date: 4/5/22

Subject: Design Forces for Alternate Foundation Design of NJDOT Sign and DMS Support Structures

Bureau(s) Affected: All Divisions of CPM, Operations, and Design Consultants

Description of Issue(s):

NJDOT is updating the Standard Drawings for sign and DMS support structures based on 2015 AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with NJDOT amendments. The draft Standard Drawings are being used upon NJDOT approval, including standard details and foundation design. However, due to specific project conditions, alternate foundation types may be required. This CAN is intended to publish design forces so the Designer may use the forces for alternate foundations.

Corrective Action Plan:

The tables of design forces at the base of different types of sign and DMS support structures with different spans, tower heights, and sign areas are included in this CAN for the Designer's use in alternate foundation design for different LRFD limit states on a project-by-project basis. Alternate foundation design shall be based on the current edition of AASHTO LRFD Bridge Design Specifications, and approved by the Designer and NJDOT Geotechnical Unit. Sign support superstructure details shall follow the latest draft NJDOT Standard Drawings upon NJDOT approval (or published 2022 Standard Drawings once officially published).

Implementation: Immediate

NJDOT Sign Support Structures Load Tables

Notes:

1. Refer to the sketches presented after each structure type table for the location of the load applications.
2. Tables 1 and 2 are for fixed-message sign support structures only. Tables 3 and 4 are for dynamic-message sign support structures only.
3. All Loads were computed in accordance with the 2015 AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with Current Interims (AASHTO LRFD for LTS), and with NJDOT Modifications or Amendments
4. Wind Loading:
 - a. Table 1 - Overhead Sign Support
 - i. Extreme 1 Case - 130 MPH Wind Velocity (1700 YR MRI)
 - ii. Service 1 Case - 80 MPH Wind Velocity (10 YR MRI)
 - iii. Strength 1 Case - Live Loading not applicable, only Dead Loads applied to the Structure
 - b. Table 2 - Cantilever Sign Support
 - i. Extreme 1 Case - 130 MPH Wind Velocity (1700 YR MRI)
 - ii. Service 1 Case - 80 MPH Wind Velocity (10 YR MRI)
 - iii. Strength 1 Case - Live Loading not applicable, only Dead Loads applied to the Structure
 - c. Table 3 - Cantilever DMS Sign Support
 - i. Extreme 1 Case - 130 MPH Wind Velocity (1700 YR MRI)
 - ii. Service 1 Case - 80 MPH Wind Velocity (10 YR MRI)
 - iii. Strength 1 Case - Dead Load and Live Load Limit State. Only Dead Load is presented in the following tables. The live load used for design is consistent for all Span Lengths and Tower Heights at 500 lbs per AASHTO LRFD for LTS section 3.6.
 - d. Table 4 - Butterfly DMS Sign Support
 - i. Extreme 1 Case - 130 MPH Wind Velocity (1700 YR MRI)
 - ii. Service 1 Case - 80 MPH Wind Velocity (10 YR MRI)
 - iii. Strength 1 Case - Dead Load and Live Load Limit State. Only Dead Load is presented in the following tables, live load used for design is a consistent 500 lbs per AASHTO LRFD for LTS section 3.6.
5. Loads in this table are Factored per the limit state in accordance with the 2015 AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with Current Interims (AASHTO LRFD for LTS), and with NJDOT Modifications or Amendments.
6. The Dead Loading for the Extreme 1 Case for all structure types is broken into Max and Min loads to account for the different dead load factors for that limit state. For Strength I and Service I for the Overhead Sign Support only, there are also Max and Min Dead Loads due to the change in location of the sign.
7. In the Overhead Sign Structures tower elevation sketch, the direction of Wind Load may be reversed due to a change in Wind Direction. The magnitude presented in the tables will not change.

Table 1 - Overhead Sign Support

Overhead - Extreme I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate					
			Py, DL (max)	Py, DL (min)	Py, Twind	Hz, Twind	Hx, Lwind	Mz, Lwind
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips-ft)
40%	45	30'	6.31	1.82	77.61	11.91	2.95	69.04
60%	45	30'	7.01	2.27	90.14	13.84	3.07	71.92
70%	45	30'	7.43	2.45	94.53	14.51	3.14	73.38
80%	45	30'	7.67	2.73	97.66	14.99	3.20	74.88
40%	55	30'	7.49	2.44	101.02	15.13	3.23	76.34
60%	55	30'	8.19	2.89	107.82	16.74	3.39	80.05
70%	55	30'	8.61	3.07	111.44	17.62	3.48	81.99
80%	55	30'	8.96	3.29	115.07	18.51	3.57	83.93
40%	65	30'	8.21	2.49	122.00	16.20	3.47	83.69
60%	65	30'	9.23	3.06	128.46	18.01	3.70	88.92
70%	65	30'	9.84	3.29	131.86	19.01	3.83	91.69
80%	65	30'	10.35	3.57	135.27	20.01	3.95	94.47
40%	75	30'	9.67	3.18	134.97	18.02	3.96	94.32
60%	75	30'	10.87	3.81	143.64	21.24	4.11	98.81
70%	75	30'	11.59	4.06	148.25	23.13	4.18	101.17
80%	75	30'	12.19	4.38	152.86	25.02	4.26	103.52
40%	85	30'	11.85	2.40	140.00	21.73	5.14	125.83
60%	85	30'	12.35	3.86	163.42	25.37	5.35	131.07
70%	85	30'	14.89	4.58	171.61	26.64	5.46	133.75
80%	85	30'	14.33	5.36	177.47	27.55	5.57	136.48
40%	95	30'	14.27	3.94	156.72	26.16	5.43	129.03
60%	95	30'	14.77	5.40	181.06	30.22	5.66	134.41
70%	95	30'	17.31	6.13	189.57	31.64	5.78	137.15
80%	95	30'	17.15	6.88	195.66	32.66	5.89	139.95
40%	105	30'	16.69	5.48	181.04	26.65	5.82	143.57
60%	105	30'	17.18	6.94	196.76	31.72	6.02	149.02
70%	105	30'	19.72	7.67	205.31	34.75	6.12	151.85
80%	105	30'	19.97	8.40	213.85	37.77	6.22	154.69
40%	115	30'	18.92	8.20	202.47	35.12	6.28	157.72
60%	115	30'	20.82	9.25	212.54	38.01	6.66	166.70
70%	115	30'	21.96	9.67	217.82	39.57	6.86	171.44
80%	115	30'	22.90	10.20	223.11	41.14	7.06	176.18
40%	125	30'	23.18	11.07	191.20	35.72	6.64	156.46
60%	125	30'	24.80	11.82	219.81	41.06	6.92	162.98
70%	125	30'	25.78	12.12	229.83	42.93	7.06	166.30
80%	125	30'	26.59	12.50	236.98	44.27	7.20	169.70
40%	135	30'	27.44	13.94	225.41	40.62	6.64	165.77
60%	135	30'	28.79	14.39	237.79	43.88	6.99	174.30
70%	135	30'	29.59	14.57	244.32	45.64	7.17	178.79
80%	135	30'	30.27	14.80	250.85	47.40	7.35	183.27
40%	145	30'	25.29	9.82	217.64	42.82	6.89	174.02
60%	145	30'	30.87	14.07	249.15	49.02	7.18	181.27
70%	145	30'	34.23	15.77	260.19	51.19	7.33	184.97
80%	145	30'	37.02	17.89	268.07	52.74	7.48	188.75
40%	155	30'	30.48	14.24	232.65	45.77	7.37	186.02

Table 1 - Overhead Sign Support (cont.)

Overhead - Extreme I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate					
			Py, DL (max)	Py, DL (min)	Py, Twind	Hx, Twind	Hx, Lwind	Mz, Lwind
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips-ft)
60%	155	30'	36.07	18.48	266.34	52.40	7.68	193.78
70%	155	30'	39.42	20.18	278.13	54.72	7.83	197.73
80%	155	30'	42.21	22.30	286.55	56.38	7.99	201.77
40%	165	30'	35.67	18.65	269.57	50.94	7.80	195.12
60%	165	30'	41.26	22.89	286.76	55.29	8.14	204.72
70%	165	30'	44.62	24.59	295.90	57.65	8.33	209.75
80%	165	30'	47.41	26.72	305.04	60.01	8.51	214.78
40%	45	40'	7.23	2.99	108.81	11.96	3.41	102.78
60%	45	40'	7.99	3.23	127.04	13.96	3.56	107.07
70%	45	40'	8.45	3.33	133.42	14.66	3.63	109.25
80%	45	40'	8.57	3.56	137.97	15.17	3.70	111.48
40%	55	40'	8.17	3.25	128.29	14.05	3.71	113.70
60%	55	40'	8.93	3.48	150.65	16.50	3.86	118.44
70%	55	40'	9.39	3.58	158.47	17.36	3.94	120.85
80%	55	40'	9.61	3.79	164.06	17.97	4.02	123.32
40%	65	40'	9.81	4.16	160.41	18.27	4.19	128.04
60%	65	40'	10.58	4.40	172.47	19.83	4.35	133.93
70%	65	40'	11.04	4.50	178.96	20.67	4.44	137.01
80%	65	40'	11.42	4.61	185.44	21.52	4.52	140.09
40%	75	40'	11.08	4.54	181.86	20.88	4.51	139.92
60%	75	40'	11.94	4.85	196.84	22.81	4.67	145.84
70%	75	40'	12.46	4.98	204.95	23.87	4.75	148.92
80%	75	40'	12.89	5.13	213.06	24.92	4.84	152.00
40%	85	40'	11.52	3.36	203.60	26.06	5.67	184.60
60%	85	40'	13.85	5.06	233.16	29.85	5.90	192.29
70%	85	40'	15.25	5.74	243.51	31.17	6.02	196.21
80%	85	40'	16.13	6.81	250.90	32.12	6.15	200.22
40%	95	40'	14.38	5.52	230.78	28.25	4.67	148.14
60%	95	40'	16.71	7.22	247.91	31.79	5.69	182.98
70%	95	40'	18.11	7.90	257.11	33.78	6.30	204.50
80%	95	40'	19.27	8.75	266.32	35.77	6.92	226.02
40%	105	40'	17.43	7.45	263.41	33.82	6.30	208.21
60%	105	40'	19.10	8.50	277.84	36.42	6.67	219.49
70%	105	40'	20.11	8.92	285.44	37.82	6.86	225.44
80%	105	40'	20.95	9.45	293.05	39.22	7.06	231.39
40%	115	40'	16.90	6.72	276.32	35.96	7.26	239.04
60%	115	40'	20.38	9.11	297.90	39.51	7.53	248.83
70%	115	40'	22.46	10.06	309.52	41.45	7.66	253.93
80%	115	40'	24.20	11.26	321.15	43.40	7.80	259.02
40%	125	40'	23.60	10.78	324.96	34.44	6.47	214.64
60%	125	40'	27.17	14.04	315.54	39.91	7.30	240.41
70%	125	40'	29.31	15.35	310.96	43.08	7.78	254.83
80%	125	40'	31.10	16.98	306.39	46.24	8.25	269.26
40%	135	40'	32.95	18.97	267.13	40.21	7.78	254.87
60%	135	40'	33.45	18.94	307.06	46.23	8.10	265.49
70%	135	40'	34.56	18.92	321.03	48.33	8.27	270.91

Table 1 - Overhead Sign Support (cont.)

Overhead - Extreme I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate					
			Py, DL (max)	Py, DL (min)	Py, Twind	Hx, Twind	Hx, Lwind	Mz, Lwind
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips-ft)
80%	135	40'	34.58	19.04	331.02	49.83	8.44	276.44
40%	145	40'	35.29	20.41	294.55	44.63	8.63	283.53
60%	145	40'	35.80	20.37	325.21	49.06	8.93	294.87
70%	145	40'	36.90	20.35	342.14	51.49	9.09	300.77
80%	145	40'	37.16	20.34	359.07	53.92	9.25	306.67
40%	155	40'	36.03	20.80	310.85	47.61	8.87	292.69
60%	155	40'	39.53	22.90	344.72	52.57	9.18	304.04
70%	155	40'	41.62	23.75	363.50	55.30	9.34	309.94
80%	155	40'	43.37	24.80	382.28	58.04	9.49	315.84
40%	165	40'	38.50	22.07	326.48	49.89	8.65	284.42
60%	165	40'	43.79	25.78	362.73	55.20	9.01	297.57
70%	165	40'	46.96	27.27	382.88	58.14	9.19	304.46
80%	165	40'	49.61	29.13	403.02	61.07	9.38	311.34

Table 1 - Overhead Sign Support (cont.)

Overhead - Strength I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate	
			Py, DL (max) (kips)	Py, DL (min) (kips)
40%	45	30'	7.43	2.95
60%	45	30'	8.13	3.39
70%	45	30'	8.65	3.73
80%	45	30'	8.71	3.79
40%	55	30'	8.61	3.57
60%	55	30'	9.31	4.01
70%	55	30'	9.83	4.34
80%	55	30'	10.18	4.57
40%	65	30'	9.47	3.68
60%	65	30'	10.49	4.25
70%	65	30'	11.25	4.68
80%	65	30'	11.76	4.96
40%	75	30'	11.15	4.66
60%	75	30'	12.35	5.29
70%	75	30'	13.25	5.76
80%	75	30'	13.85	6.08
40%	85	30'	14.20	4.53
60%	85	30'	14.69	6.55
70%	85	30'	17.61	7.57
80%	85	30'	16.28	7.44
40%	95	30'	16.61	6.07
60%	95	30'	17.11	8.10
70%	95	30'	20.03	9.11
80%	95	30'	19.49	9.55
40%	105	30'	19.03	7.61
60%	105	30'	19.52	9.64
70%	105	30'	22.45	10.65
80%	105	30'	22.69	11.66
40%	115	30'	21.76	11.80
60%	115	30'	23.66	12.85
70%	115	30'	25.08	13.64
80%	115	30'	26.03	14.16
40%	125	30'	26.56	15.67
60%	125	30'	28.18	16.42
70%	125	30'	29.40	16.98
80%	125	30'	30.21	17.36
40%	135	30'	31.36	19.54
60%	135	30'	32.71	19.99
70%	135	30'	33.72	20.33
80%	135	30'	34.40	20.56
40%	145	30'	30.91	18.73
60%	145	30'	36.50	22.97

Table 1 - Overhead Sign Support (cont.)

Overhead - Strength I Loading				
Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate	
(%)	(ft)	(ft)	Py, DL (max) (kips)	Py, DL (min) (kips)
70%	145	30'	40.69	26.16
80%	145	30'	43.49	28.28
40%	155	30'	36.11	23.14
60%	155	30'	41.70	27.39
70%	155	30'	45.89	30.57
80%	155	30'	48.68	32.69
40%	165	30'	41.30	27.55
60%	165	30'	46.89	31.80
70%	165	30'	51.08	34.98
80%	165	30'	53.87	37.11
40%	45	40'	8.67	4.71
60%	45	40'	9.43	4.94
70%	45	40'	10.01	5.12
80%	45	40'	9.74	4.95
40%	55	40'	9.61	4.96
60%	55	40'	10.37	5.19
70%	55	40'	10.95	5.37
80%	55	40'	10.92	5.26
40%	65	40'	11.26	5.87
60%	65	40'	12.02	6.11
70%	65	40'	12.60	6.29
80%	65	40'	12.98	6.41
40%	75	40'	12.71	6.43
60%	75	40'	13.57	6.74
70%	75	40'	14.22	6.97
80%	75	40'	14.65	7.13
40%	85	40'	13.80	6.17
60%	85	40'	16.13	7.87
70%	85	40'	17.88	9.15
80%	85	40'	18.33	9.46
40%	95	40'	16.66	8.32
60%	95	40'	18.99	10.03
70%	95	40'	20.73	11.31
80%	95	40'	21.90	12.16
40%	105	40'	20.03	10.75
60%	105	40'	21.71	11.81
70%	105	40'	22.96	12.59
80%	105	40'	23.80	13.12
40%	115	40'	19.68	10.26
60%	115	40'	23.16	12.65
70%	115	40'	25.76	14.44
80%	115	40'	27.50	15.64

Table 1 - Overhead Sign Support (cont.)

Overhead - Strength I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate	
			Py, DL (max) (kips)	Py, DL (min) (kips)
40%	125	40'	27.31	16.24
60%	125	40'	30.87	19.50
70%	125	40'	33.55	21.95
80%	125	40'	35.34	23.58
40%	135	40'	37.83	26.91
60%	135	40'	38.34	26.86
70%	135	40'	39.63	26.83
80%	135	40'	39.29	26.45
40%	145	40'	40.17	28.34
60%	145	40'	40.68	28.29
70%	145	40'	41.97	28.27
80%	145	40'	42.22	28.24
40%	155	40'	41.42	29.70
60%	155	40'	44.92	31.81
70%	155	40'	47.54	33.39
80%	155	40'	49.29	34.45
40%	165	40'	44.47	32.09
60%	165	40'	49.76	35.81
70%	165	40'	53.73	38.60
80%	165	40'	56.37	40.46

Table 1 - Overhead Sign Support (cont.)

Overhead - Service I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate					
			Py, DL (max)	Py, DL (min)	Py, Twind	Hz, Twind	Hx, Lwind	Mz, Lwind
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips-ft)
40%	45	30'	5.57	2.15	29.70	4.56	1.10	25.71
60%	45	30'	6.27	2.59	34.44	5.29	1.15	26.78
70%	45	30'	6.62	2.81	36.11	5.54	1.17	27.32
80%	45	30'	6.97	3.04	37.29	5.72	1.20	27.88
40%	55	30'	6.74	2.76	39.58	5.99	1.29	29.65
60%	55	30'	7.45	3.21	42.12	6.60	1.35	31.01
70%	55	30'	7.80	3.43	43.47	6.93	1.38	31.72
80%	55	30'	8.15	3.65	44.82	7.27	1.42	32.44
40%	65	30'	7.37	2.83	46.26	6.09	1.22	29.96
60%	65	30'	8.39	3.40	49.73	6.97	1.38	32.99
70%	65	30'	8.90	3.68	51.60	7.46	1.47	34.65
80%	65	30'	9.41	3.97	53.47	7.96	1.56	36.32
40%	75	30'	8.68	3.60	53.70	7.22	1.55	36.15
60%	75	30'	9.88	4.23	56.92	8.47	1.61	37.87
70%	75	30'	10.48	4.55	58.62	9.20	1.64	38.76
80%	75	30'	11.08	4.86	60.33	9.94	1.67	39.66
40%	85	30'	10.29	3.01	56.29	8.80	2.07	49.79
60%	85	30'	10.79	4.63	65.10	10.17	2.16	51.87
70%	85	30'	13.07	5.44	68.18	10.66	2.20	52.92
80%	85	30'	13.02	5.95	70.38	11.00	2.25	54.00
40%	95	30'	12.71	4.55	62.11	11.03	2.18	52.95
60%	95	30'	13.20	6.17	70.77	12.57	2.27	55.16
70%	95	30'	15.49	6.98	73.81	13.11	2.32	56.28
80%	95	30'	15.59	7.64	75.97	13.49	2.37	57.43
40%	105	30'	15.13	6.09	74.79	10.65	2.37	57.03
60%	105	30'	15.62	7.71	79.25	12.60	2.43	58.91
70%	105	30'	17.91	8.52	81.61	13.76	2.46	59.89
80%	105	30'	18.15	9.33	83.97	14.91	2.49	60.86
40%	115	30'	17.03	9.23	77.89	13.60	2.54	62.41
60%	115	30'	18.93	10.28	81.60	14.68	2.67	65.56
70%	115	30'	19.87	10.81	83.54	15.25	2.74	67.22
80%	115	30'	20.82	11.33	85.48	15.83	2.81	68.87
40%	125	30'	20.93	12.38	77.16	14.48	3.55	90.07
60%	125	30'	22.55	13.14	87.95	16.50	3.69	93.83
70%	125	30'	23.36	13.51	91.73	17.21	3.77	95.74
80%	125	30'	24.17	13.89	94.43	17.71	3.85	97.69
40%	135	30'	24.82	15.54	94.56	17.10	3.89	98.92
60%	135	30'	26.17	15.99	98.87	18.30	4.02	102.16
70%	135	30'	26.84	16.22	101.12	18.95	4.09	103.84
80%	135	30'	27.52	16.45	103.37	19.59	4.15	105.51
40%	145	30'	21.54	12.37	90.38	17.84	3.94	101.06
60%	145	30'	27.12	16.61	102.27	20.19	4.11	105.27
70%	145	30'	29.92	18.74	106.43	21.01	4.19	107.42
80%	145	30'	32.71	20.86	109.41	21.59	4.28	109.61

Table 1 - Overhead Sign Support (cont.)

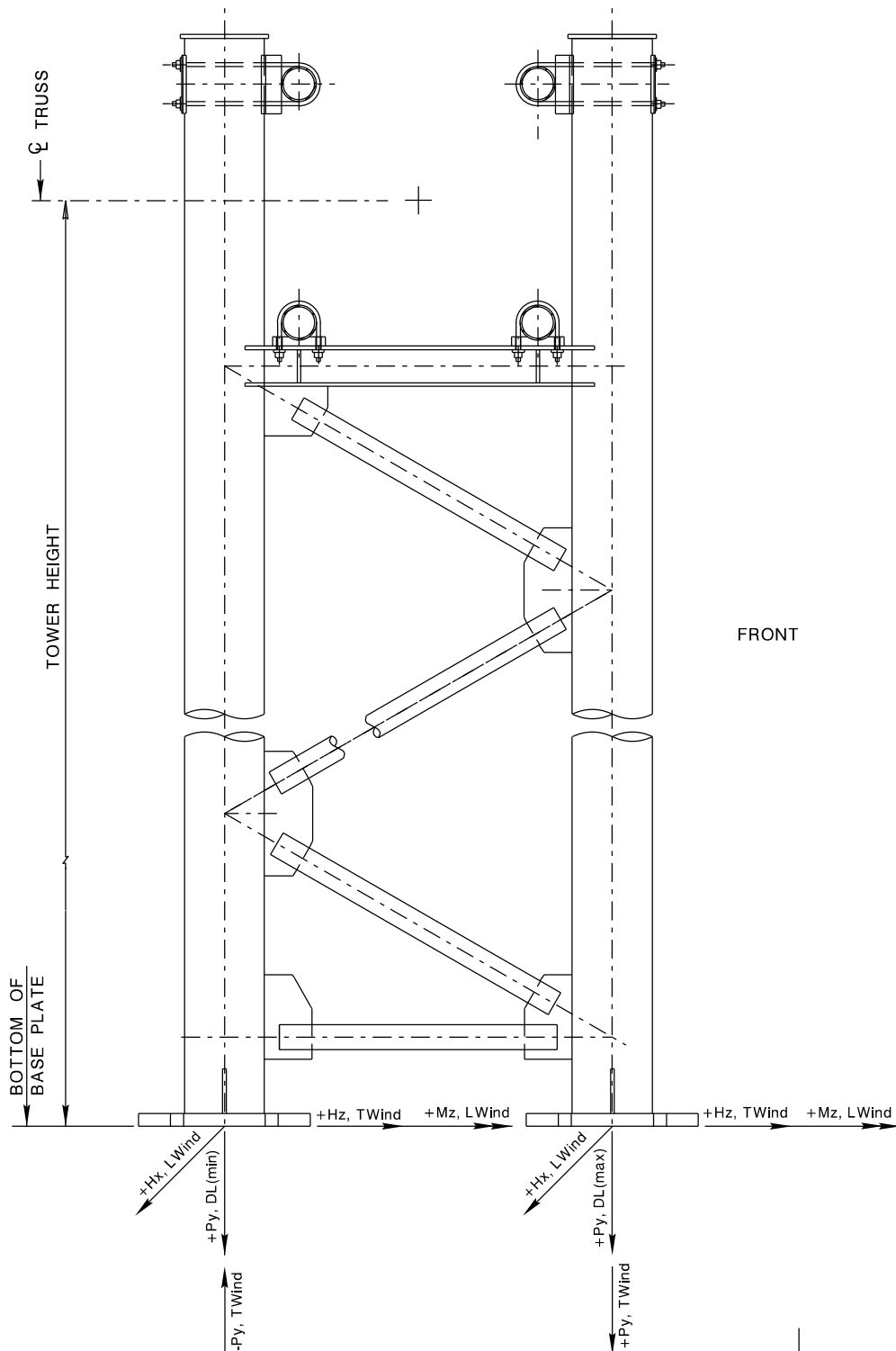
Overhead - Service I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate					
			Py, DL (max)	Py, DL (min)	Py, Twind	Hx, Twind	Hx, Lwind	Mz, Lwind
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips-ft)
40%	155	30'	26.73	16.78	96.61	19.07	4.21	108.03
60%	155	30'	32.32	21.03	109.32	21.58	4.39	112.53
70%	155	30'	35.11	23.15	113.78	22.46	4.48	114.82
80%	155	30'	37.90	25.27	116.95	23.08	4.57	117.17
40%	165	30'	31.92	21.19	111.83	21.20	4.59	117.14
60%	165	30'	37.51	25.44	117.99	22.82	4.73	120.87
70%	165	30'	40.31	27.56	121.25	23.70	4.80	122.80
80%	165	30'	43.10	29.68	124.50	24.57	4.87	124.73
40%	45	40'	6.26	3.48	42.22	4.70	1.38	40.38
60%	45	40'	7.03	3.72	49.03	5.46	1.44	42.06
70%	45	40'	7.41	3.84	51.42	5.73	1.47	42.92
80%	45	40'	7.79	3.96	53.12	5.92	1.50	43.79
40%	55	40'	7.20	3.74	50.63	5.60	1.49	44.39
60%	55	40'	7.97	3.97	59.00	6.53	1.55	46.24
70%	55	40'	8.35	4.09	61.94	6.85	1.58	47.18
80%	55	40'	8.73	4.21	64.03	7.09	1.62	48.15
40%	65	40'	8.85	4.65	62.35	7.20	1.72	50.63
60%	65	40'	9.62	4.89	67.59	7.87	1.78	52.90
70%	65	40'	10.00	5.01	70.43	8.23	1.81	54.09
80%	65	40'	10.38	5.13	73.27	8.60	1.84	55.28
40%	75	40'	9.99	5.08	71.14	8.26	1.84	55.02
60%	75	40'	10.86	5.39	77.90	9.12	1.90	57.30
70%	75	40'	11.29	5.55	81.61	9.60	1.93	58.49
80%	75	40'	11.72	5.70	85.31	10.07	1.96	59.68
40%	85	40'	10.01	4.16	81.66	10.53	2.21	69.79
60%	85	40'	12.33	5.86	92.77	11.97	2.30	72.70
70%	85	40'	13.50	6.72	96.65	12.47	2.35	74.18
80%	85	40'	14.66	7.57	99.43	12.83	2.39	75.69
40%	95	40'	12.86	6.32	95.01	11.72	1.90	58.13
60%	95	40'	15.19	8.02	99.13	12.80	2.25	70.18
70%	95	40'	16.35	8.87	101.28	13.39	2.45	77.45
80%	95	40'	17.52	9.73	103.43	13.98	2.66	84.72
40%	105	40'	15.69	8.39	103.07	13.35	2.46	78.67
60%	105	40'	17.37	9.44	108.32	14.30	2.58	82.58
70%	105	40'	18.20	9.97	111.07	14.82	2.65	84.63
80%	105	40'	19.04	10.50	113.83	15.33	2.71	86.69
40%	115	40'	15.05	7.73	110.61	14.47	2.78	89.03
60%	115	40'	18.52	10.12	115.91	15.46	2.89	92.80
70%	115	40'	20.26	11.31	118.69	15.99	2.94	94.76
80%	115	40'	22.00	12.51	121.47	16.52	2.99	96.72
40%	125	40'	21.13	12.34	135.16	14.38	3.66	123.82
60%	125	40'	24.70	15.60	129.97	16.51	4.01	134.53
70%	125	40'	26.48	17.23	127.47	17.73	4.20	140.35
80%	125	40'	28.27	18.87	124.97	18.95	4.39	146.17

Table 1 - Overhead Sign Support (cont.)

Overhead - Service I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate					
			Py, DL (max)	Py, DL (min)	Py, Twind	Hx, Twind	Hx, Lwind	Mz, Lwind
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips-ft)
40%	135	40'	29.69	21.24	110.44	16.70	4.13	137.98
60%	135	40'	30.20	21.20	125.49	18.97	4.31	143.73
70%	135	40'	31.18	21.18	130.76	19.77	4.39	146.67
80%	135	40'	31.44	21.16	134.52	20.34	4.48	149.66
40%	145	40'	32.04	22.67	121.96	18.55	4.72	158.47
60%	145	40'	32.54	22.63	133.63	20.24	4.83	162.85
70%	145	40'	33.52	22.61	140.03	21.16	4.90	165.09
80%	145	40'	33.78	22.59	146.43	22.08	4.96	167.34
40%	155	40'	32.44	23.34	128.59	19.77	4.86	163.64
60%	155	40'	35.93	25.45	141.55	21.67	4.98	168.02
70%	155	40'	37.68	26.50	148.69	22.71	5.04	170.26
80%	155	40'	39.43	27.56	155.82	23.75	5.10	172.51
40%	165	40'	34.52	24.93	134.70	20.66	4.78	160.72
60%	165	40'	39.81	28.65	148.48	22.67	4.91	165.80
70%	165	40'	42.45	30.51	156.07	23.78	4.98	168.42
80%	165	40'	45.10	32.37	163.67	24.89	5.05	171.05



Tower Elevation

LEGEND:

- +Py, Lwind
- └─ Load Type
 - LWind = Caused by Wind in Longitudinal Direction
 - TWind = Caused by Wind in Transverse Direction
 - DL = Dead Load
- └─ Axis
- └─ Force or Moment
 - P = Force in the Vertical Direction
 - H = Force in the Horizontal Directions
 - M = Moment
- └─ Direction

NOTE:
 FOR SCHEMATIC PURPOSES.
 REVERSALS IN WIND LOAD
 DIRECTION MAY OCCUR.

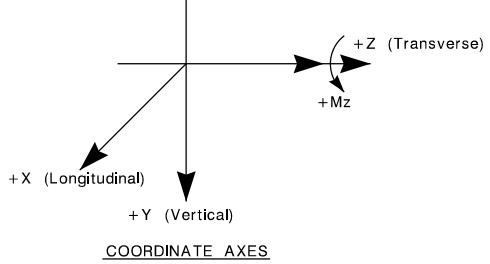


Table 2 - Cantilever Sign Support

Cantilever - Extreme I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate										
			Hx, Lwind	Py, DL (max)	Py, DL (min)	Hx, Twind	Mx, Twind	Mx, DL (max)	Mx, DL (min)	My, Twind	Mz, Lwind	Mz, DL (max)	Mz, DL (min)
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)
40%	20	30	1.85	6.43	5.26	8.85	259.57	2.39	1.96	125.35	46.19	50.64	41.43
50%	20	30	2.19	8.02	6.56	10.48	306.23	3.52	2.88	137.26	53.51	57.66	47.18
60%	20	30	2.54	9.61	7.86	12.11	352.89	4.64	3.80	149.16	60.83	64.69	52.93
70%	20	30	2.76	10.43	8.53	13.71	399.95	5.13	4.20	157.70	65.92	66.56	54.46
80%	20	30	2.98	11.25	9.20	15.30	447.01	5.63	4.60	166.23	71.02	68.44	56.00
40%	30	30	3.37	14.43	11.81	13.59	392.23	5.14	4.20	270.48	80.97	138.00	112.91
50%	30	30	3.47	15.53	12.71	15.86	461.54	5.86	4.80	303.49	83.99	153.78	125.82
60%	30	30	3.57	16.63	13.61	18.13	530.85	6.59	5.39	336.51	87.01	169.55	138.72
70%	30	30	3.68	17.27	14.13	20.83	613.05	7.66	6.26	363.06	90.04	174.01	142.37
80%	30	30	3.78	17.91	14.65	23.52	695.25	8.72	7.13	389.62	93.07	178.46	146.02
40%	40	30	3.71	21.03	17.21	17.71	517.32	7.06	5.78	477.53	90.93	298.73	244.42
50%	40	30	3.93	22.31	18.26	21.26	624.13	8.30	6.79	548.80	96.03	324.22	265.27
60%	40	30	4.15	23.59	19.30	24.81	730.93	9.54	7.81	620.07	101.12	349.70	286.12
70%	40	30	4.35	24.85	20.33	28.53	844.13	11.32	9.26	669.90	107.18	368.63	301.61
80%	40	30	4.55	26.11	21.36	32.24	957.33	13.10	10.72	719.74	113.24	387.56	317.09
40%	20	40	2.71	9.66	7.90	9.70	364.07	3.23	2.64	124.29	80.86	53.52	43.79
50%	20	40	2.71	11.71	9.58	11.32	429.44	3.52	2.88	141.34	80.87	59.18	48.42
60%	20	40	2.97	12.01	9.82	13.03	495.75	4.23	3.46	153.59	88.51	62.54	51.17
70%	20	40	3.23	12.30	10.07	14.73	562.06	4.95	4.05	165.85	96.15	65.90	53.92
80%	20	40	3.62	13.45	11.00	16.43	627.34	5.63	4.60	171.94	108.49	69.66	56.99
40%	30	40	3.94	16.46	13.47	14.58	552.13	5.14	4.20	282.12	121.26	137.96	112.88
50%	30	40	4.04	17.60	14.40	16.95	648.03	5.86	4.80	316.65	125.46	153.81	125.84
60%	30	40	4.15	18.74	15.34	19.32	743.94	6.59	5.39	351.19	129.66	169.65	138.80
70%	30	40	4.36	21.41	17.52	22.15	858.49	8.23	6.73	382.86	138.06	180.35	147.56
80%	30	40	4.67	21.68	17.74	25.24	977.91	8.72	7.14	408.09	144.94	184.08	150.61
40%	40	40	4.30	23.45	19.19	18.86	724.83	7.06	5.78	497.94	135.59	298.73	244.42
50%	40	40	4.56	24.70	20.21	22.59	873.14	8.30	6.79	572.17	143.22	324.22	265.27
60%	40	40	4.82	25.94	21.22	26.33	1021.46	9.54	7.81	646.41	150.86	349.72	286.13
70%	40	40	5.03	28.21	23.08	30.22	1179.12	11.32	9.26	697.72	159.26	368.34	301.37
80%	40	40	5.24	30.49	24.95	34.12	1336.78	13.10	10.72	749.02	167.65	386.97	316.61

Table 2 - Cantilever Sign Support (cont.)

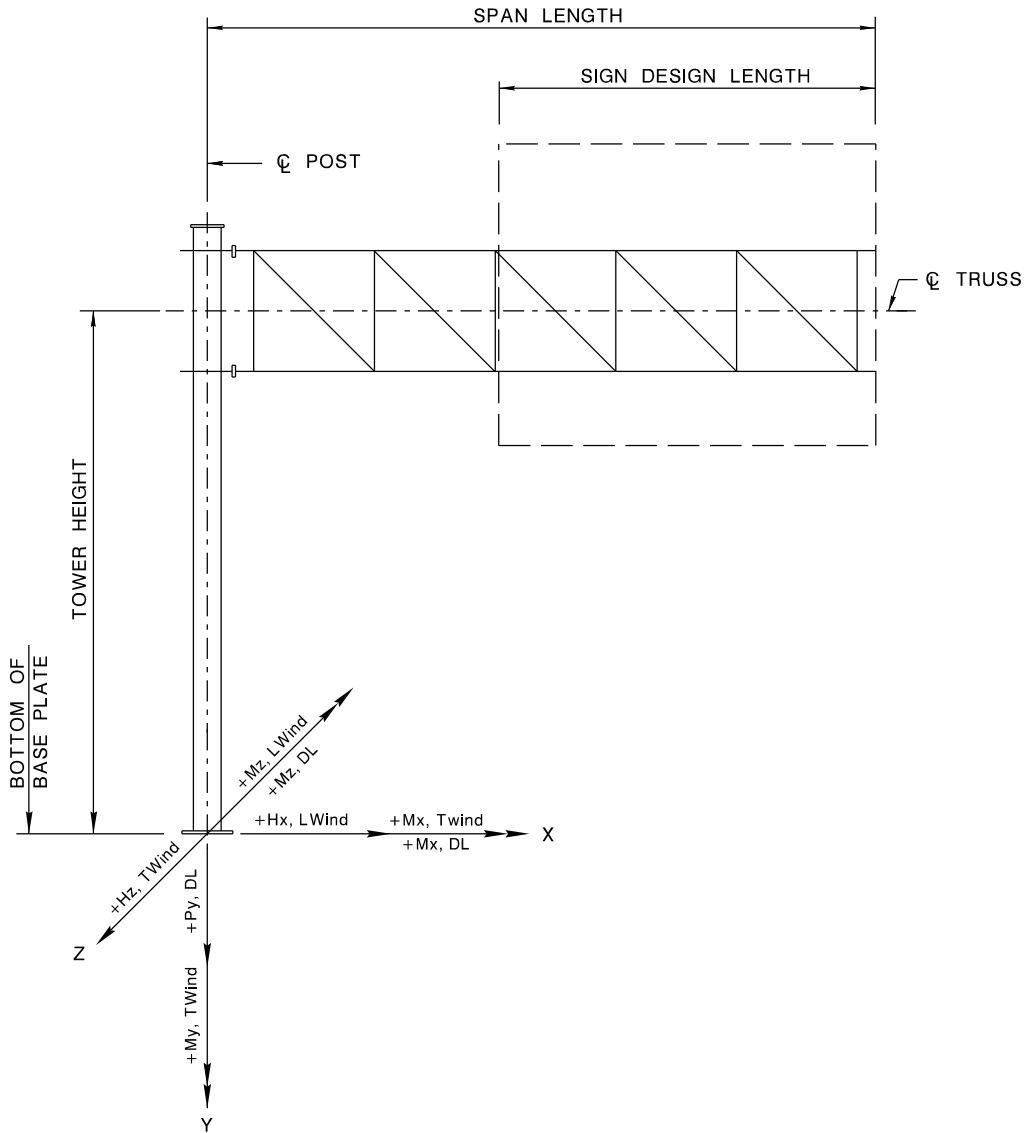
Cantilever - Strength I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate		
			Py, DL (kips)	Mx, DL (kips-ft)	Mz, DL (kips-ft)
40%	20	30	7.30	2.72	57.54
50%	20	30	9.11	4.00	65.53
60%	20	30	10.92	5.27	73.51
70%	20	30	11.85	5.83	75.64
80%	20	30	12.78	6.39	77.77
40%	30	30	16.40	5.84	156.82
50%	30	30	17.65	6.66	174.75
60%	30	30	18.90	7.49	192.67
70%	30	30	19.62	8.70	197.74
80%	30	30	20.35	9.91	202.80
40%	40	30	23.90	8.03	339.47
50%	40	30	25.35	9.43	368.43
60%	40	30	26.81	10.84	397.39
70%	40	30	28.24	12.86	418.90
80%	40	30	29.67	14.88	440.40
40%	20	40	10.98	3.67	60.82
50%	20	40	13.31	4.00	67.25
60%	20	40	13.65	4.81	71.07
70%	20	40	13.98	5.62	74.89
80%	20	40	15.28	6.39	79.16
40%	30	40	18.71	5.84	156.78
50%	30	40	20.00	6.66	174.78
60%	30	40	21.30	7.49	192.78
70%	30	40	24.33	9.35	204.95
80%	30	40	24.63	9.91	209.18
40%	40	40	26.65	8.03	339.47
50%	40	40	28.06	9.43	368.44
60%	40	40	29.48	10.84	397.41
70%	40	40	32.06	12.86	418.57
80%	40	40	34.65	14.88	439.74

Table 2 - Cantilever Sign Support (cont.)

Cantilever - Service I Loading

Sign Coverage	Span	Tower Height	Loads at Bottom of Base Plate							
			Hx, Lwind	Py, DL	Hz, Twind	Mx, Twind	Mx, DL	My, Twind	Mz, Lwind	Mz, DL
(%)	(ft)	(ft)	(kips)	(kips)	(kips)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)
40%	20	30	0.75	5.84	3.51	102.58	2.18	48.71	18.55	46.03
50%	20	30	0.85	7.29	4.09	119.49	3.20	53.07	20.57	52.42
60%	20	30	0.94	8.73	4.68	136.41	4.22	57.44	22.59	58.81
70%	20	30	1.03	9.48	5.29	154.36	4.67	60.68	24.61	60.51
80%	20	30	1.12	10.23	5.90	172.31	5.11	63.93	26.64	62.22
40%	30	30	1.27	13.12	5.16	149.14	4.67	102.84	30.53	125.46
50%	30	30	1.34	14.12	6.06	176.57	5.33	116.01	32.79	139.80
60%	30	30	1.42	15.12	6.96	203.99	5.99	129.17	35.06	154.14
70%	30	30	1.46	15.70	7.95	234.39	6.96	138.86	36.20	158.19
80%	30	30	1.49	16.28	8.95	264.80	7.93	148.55	37.33	162.24
40%	40	30	1.71	19.12	7.04	206.15	6.42	188.37	43.69	271.58
50%	40	30	1.79	20.28	8.39	246.68	7.55	215.35	45.71	294.74
60%	40	30	1.88	21.45	9.74	287.20	8.67	242.32	47.73	317.91
70%	40	30	1.96	22.59	11.15	329.97	10.29	261.15	50.01	335.12
80%	40	30	2.04	23.74	12.55	372.75	11.91	279.97	52.29	352.32
40%	20	40	1.01	8.78	3.77	141.68	2.93	48.08	30.11	48.66
50%	20	40	1.01	10.65	4.37	166.36	3.20	54.51	30.11	53.80
60%	20	40	1.12	10.92	5.03	191.71	3.85	59.17	33.19	56.86
70%	20	40	1.22	11.19	5.69	217.06	4.50	63.83	36.27	59.91
80%	20	40	1.35	12.22	6.30	241.16	5.11	66.10	40.45	63.33
40%	30	40	1.53	14.97	5.56	210.90	4.67	107.76	47.68	125.42
50%	30	40	1.57	16.00	6.46	247.21	5.33	120.84	49.28	139.82
60%	30	40	1.61	17.04	7.35	283.52	5.99	133.91	50.88	154.23
70%	30	40	1.69	19.46	8.44	327.67	7.48	146.21	54.08	163.96
80%	30	40	1.82	19.71	9.63	373.15	7.93	155.73	57.03	167.35
40%	40	40	1.90	21.32	7.41	285.50	6.42	194.77	62.39	271.57
50%	40	40	2.00	22.45	8.83	341.88	7.55	222.92	65.46	294.75
60%	40	40	2.11	23.58	10.25	398.26	8.67	251.08	68.53	317.93
70%	40	40	2.19	25.65	11.71	457.15	10.29	270.09	71.73	334.86
80%	40	40	2.27	27.72	13.16	516.03	11.91	289.11	74.93	351.79



Cantilever Sign (Front)

LEGEND:

$+P_y, DL$

Load Type

- TWind = Caused by Wind in Transverse Direction
- DL = Dead Load

Axis

Force or Moment

- P = Force in the Vertical Direction
- H = Force in the Horizontal Directions
- M = Moment

Direction

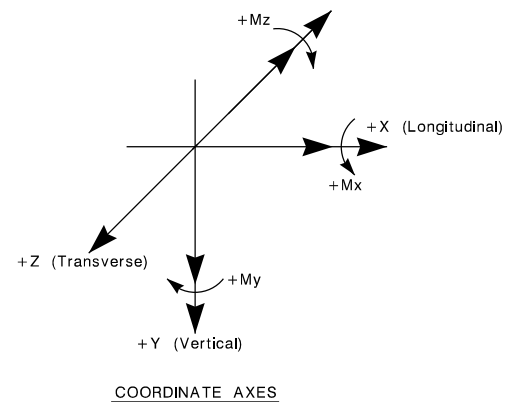


Table 3 - Cantilever DMS Support

Cantilever DMS - Extreme I Loading

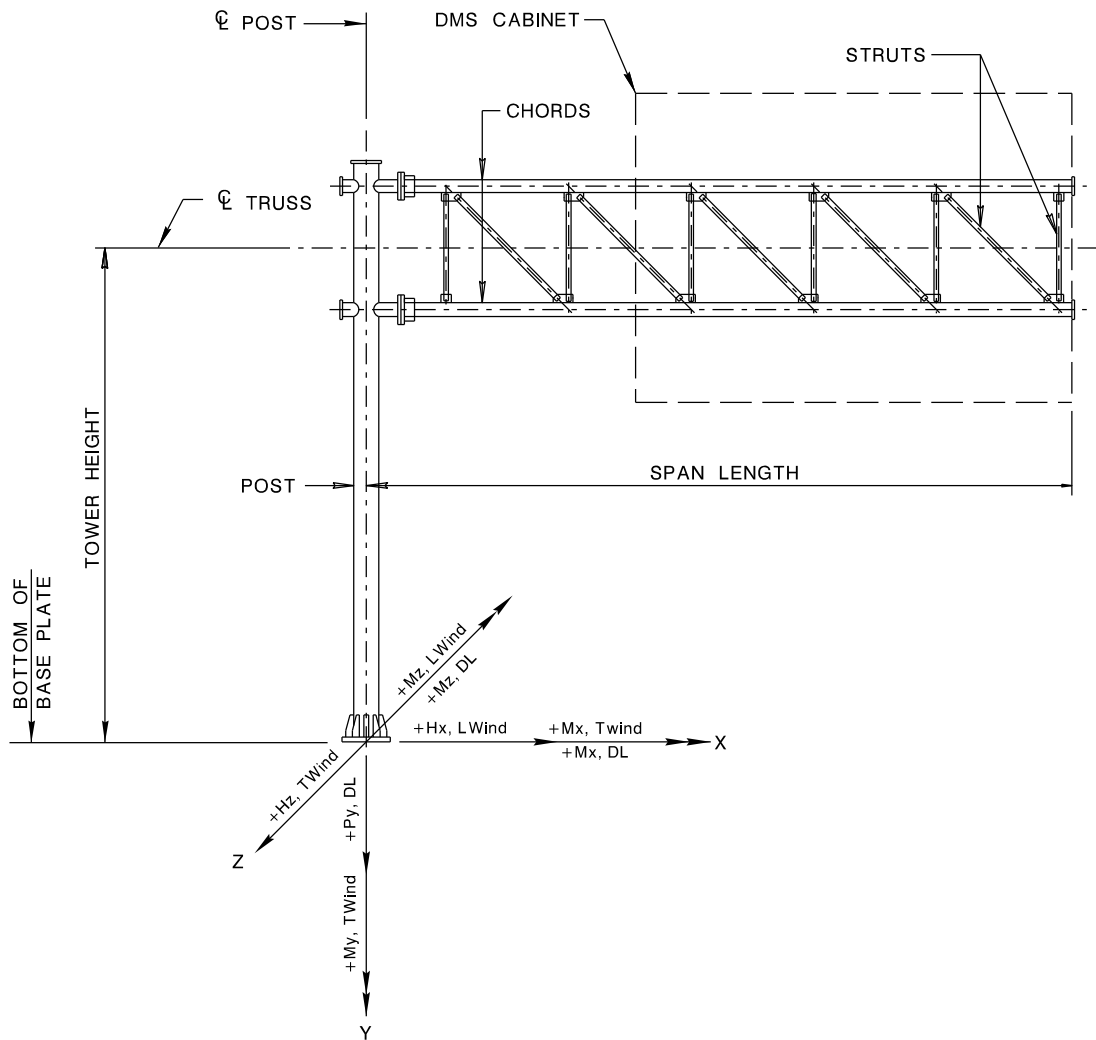
Span	Tower Height	Loads at Bottom of Base Plate										
		Hx, Lwind	Py, DL (max)	Py, DL (min)	Hx, Twind	Mx, Twind	Mx, DL (max)	Mx, DL (min)	My, Twind	Mz, Lwind	Mz, DL (max)	Mz, DL (min)
(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)
25	30	3.58	16.31	13.34	16.11	461.99	15.52	12.70	208.38	87.11	141.18	115.51
30	30	3.70	17.90	14.65	19.39	561.71	15.53	12.70	300.86	90.98	197.74	161.79
40	30	4.98	26.08	21.34	22.09	642.50	19.08	15.61	504.68	129.30	386.15	315.94
25	40	4.11	21.00	17.18	17.06	645.87	15.52	12.70	216.38	127.87	141.17	115.51
30	40	4.24	23.05	18.86	20.53	785.27	15.53	12.70	312.41	133.55	197.74	161.78
40	40	5.93	27.59	22.57	23.65	904.18	19.06	15.59	525.94	195.27	374.69	306.56

Cantilever DMS - Service I Loading

Span	Tower Height	Loads at Bottom of Base Plate							
		Hx, Lwind	Py, DL	Hx, Twind	Mx, Twind	Mx, DL	My, Twind	Mz, Lwind	Mz, DL
(ft)	(ft)	(kips)	(kips)	(kips)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)	(kips-ft)
25	30	1.53	14.83	6.26	180.09	14.11	81.48	38.34	128.34
30	30	1.66	16.27	7.61	220.59	14.11	118.32	42.33	179.77
40	30	2.21	23.71	8.69	252.98	17.35	198.12	58.63	351.04
25	40	1.73	19.09	6.63	251.68	14.11	84.60	55.68	128.34
30	40	1.88	20.95	8.05	308.28	14.11	122.86	61.48	179.76
40	40	2.53	25.08	9.23	353.59	17.32	205.27	85.33	340.63

Cantilever DMS - Strength I Loading

Span	Tower Height	Loads at the Bottom of Base Plate		
		Py, DL	Mx, DL	Mz, DL
(ft)	(ft)	(kips)	(kips-ft)	(kips-ft)
25	30	18.53	17.64	160.43
30	30	20.34	17.64	224.71
40	30	29.63	21.69	438.80
25	40	23.86	17.64	160.42
30	40	26.19	17.64	224.70
40	40	31.35	21.65	425.78



Cantilever DMS (Front)

LEGEND:

+Py, DL

Load Type

- TWind = Caused by Wind in Transverse Direction
- DL = Dead Load

Axis

Force or Moment

- P = Force in the Vertical Direction
- H = Force in the Horizontal Directions
- M = Moment

Direction

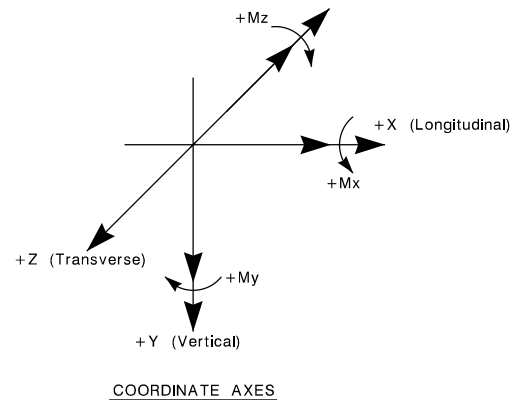


Table 4 - Butterfly DMS Support

Butterfly DMS - Extreme I Loading

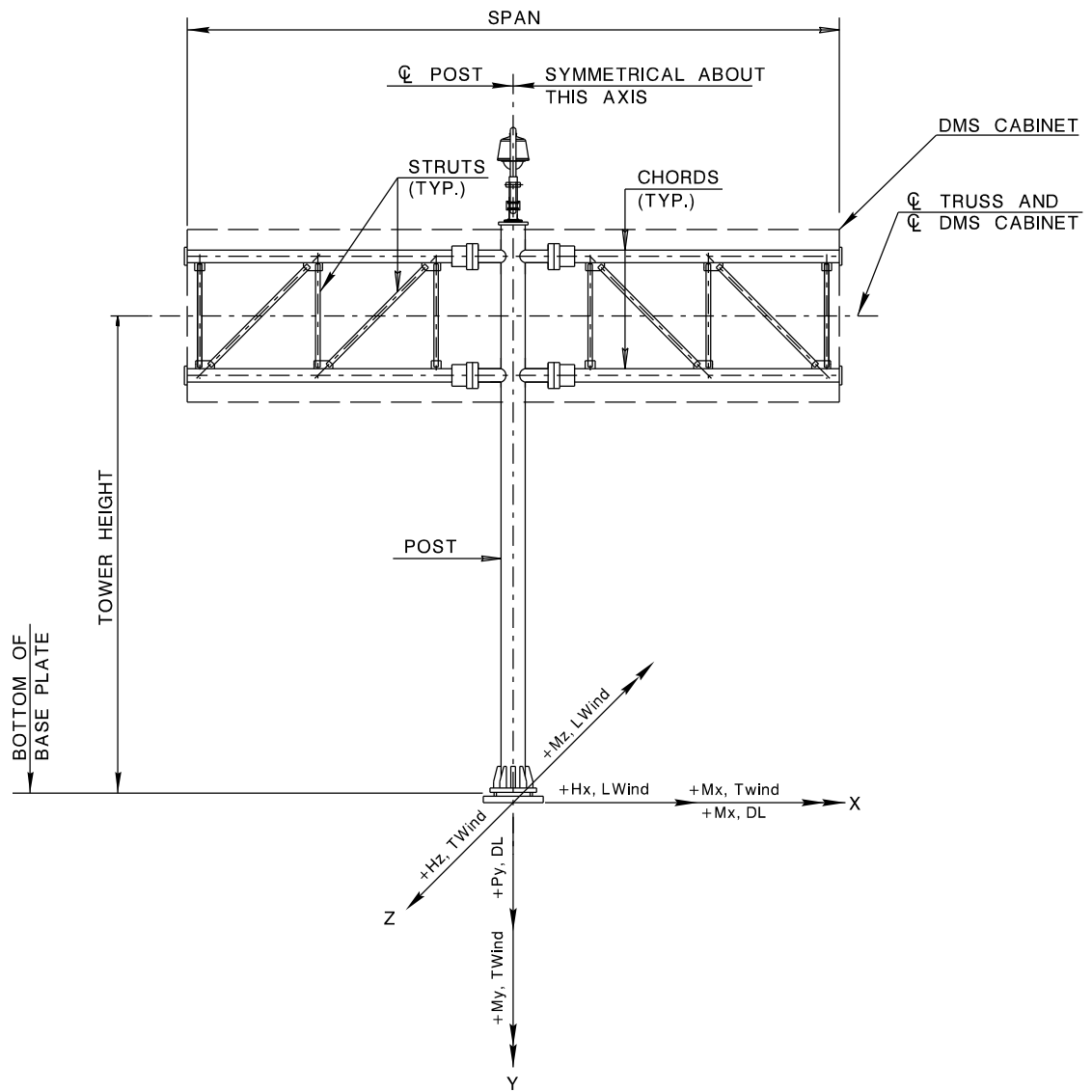
Span	Tower Height	Loads at Bottom of Base Plate								
		Hx, LWind	Py, DL (max)	Py, DL (min)	Hz, TWind	Mx, TWind	Mx, DL (max)	Mx, DL (min)	My, TWind	Mz, LWind
(ft)	(ft)	(kips)	(kips)	(kips)	(kips)	(kip-ft)	(kips-ft)	(kips-ft)	(kip-ft)	(kip-ft)
26.1	30	4.66	15.63	12.79	14.34	411.71	16.44	13.45	52.36	121.21
26.1	40	5.41	17.71	14.49	15.51	584.06	16.44	13.45	55.10	180.24

Butterfly DMS - Service I Loading

Span	Tower Height	Loads at Bottom of Base Plate						
		Hx, LWind	Py, DL	Hz, TWind	Mx, TWind	Mx, DL	My, TWind	Mz, LWind
(ft)	(ft)	(kips)	(kips)	(kips)	(kip-ft)	(kip-ft)	(kip-ft)	(kip-ft)
26.1	30	1.99	14.21	5.68	163.35	14.95	20.82	52.55
26.1	40	2.23	16.10	6.05	228.62	14.95	21.67	75.61

Butterfly DMS - Strength I Loading

Span	Tower Height	Loads at Bottom of Base Plate	
		Py, DL	Mx, DL
(ft)	(ft)	(kips)	(kip-ft)
26.1	30	17.76	18.68
26.1	40	20.12	18.68



Butterfly DMS (Front)

LEGEND:

+Py, DL

Load Type

- TWind = Caused by Wind in Transverse Direction
- DL = Dead Load

Axis

Force or Moment

- P = Force in the Vertical Direction
- H = Force in the Horizontal Directions
- M = Moment

Direction

