COMPUTERIZED
STRUCTURAL
DESIGN, S.C.

CONSULTING ENGINEERS

8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project _____

Job No. _____ By _____

Date _____ Page ____ of ____

TOWER TRAINING

EXAMPLE #1

120' SELF-SUPPORTING TOWER

PER TIA 222-F STANDARD

ERITOWER MODEL FILES
FALCON120.ERI

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project _____

Job No. _____ By _____

Date _____ Page ____ of ____

FOR ILLUSTRATIVE PURPOSES THE FOLLOWING ITEMS WERE IGNORED:

1. AREA AND WEIGHT OF GUSSET PLATES
2. AREA AND WEIGHT OF REDUNDANT MEMBERS
3. WEIGHT OF PAINT / GALVANIZING
4. CLIMBING LADDERS
5. LIGHTING - FAA
6. LIGHTENING PROTECTION
7. SAFETY CLIMB DEVICES

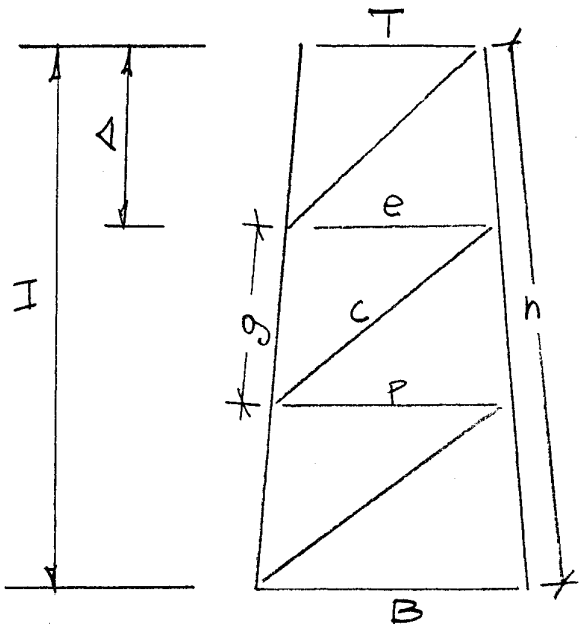
COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project _____

Job No. _____ By _____

Date _____ Page ____ of ____

MAST CALCULATIONS



n = No. PANELS

$A = H/n$

$K = \frac{B-T}{n}$

$e = T + K$

$P = T + K*2$ .... etc.

3 SIDED

$$h = \sqrt{H^2 + \frac{(B-T)^2}{3}}$$

$g = h/n$

$$c = \frac{1}{2}\sqrt{(e+p)^2 + 4A^2 + \frac{K^2}{3}}$$

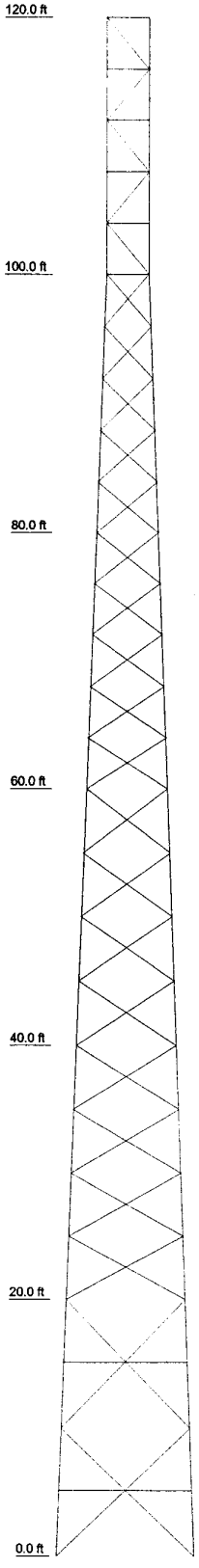
4 SIDED

$$h = \sqrt{H^2 + \frac{(B-T)^2}{2}}$$

$g = h/n$

$$c = \frac{1}{2}\sqrt{(e+p)^2 + 4A^2 + K^2}$$

Section	T5	T4	T3	T2	T1	L1
Legs	SR 3 1/2	SR 3 1/4	SR 3	SR 2 1/2	SR 2	SR 1 3/4
Diagonals	L2 1/2x2 1/2x1/4	L2x2x1/4	L1 3/4x1 3/4x3/16	L1 1/2x1 1/2x3/16		2L1 1/2x1 1/2x3/16x3/8
Top Girts			N.A.			L1 1/2x1 1/2x3/16
Mid Girts			N.A.			
Bottom Girts			N.A.			L1 1/2x1 1/2x3/16
Horizontals			N.A.			L1 1/2x1 1/2x3/16
Sec. Horzs	L1 3/4x1 3/4x3/16		N.A.			
Inner Bracing			N.A.			
Face Width (ft)	9.41666	7.91666	6.41666	4.91666	3.41666	3.41666
# Panels @ Ht (ft)	2 @ 10	8 @ 5		10 @ 4		5 @ 4
Weight (lb)	2788.0	2462.0	1888.0	1378.8	883.4	884.6
10352.8						



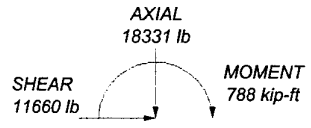
DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(9) FV90-12	120	Pirod 13' Low Profile Platform	120

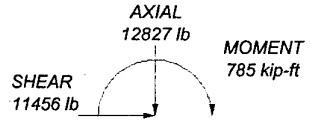
TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.

MAX LEG FORCES:
DOWN: 89434 lb
UPLIFT: -74714 lb
SHEAR: 7220 lb



69 mph WIND - 0.5000 in ICE



REACTIONS - 80 mph WIND

Computerized Structural Design
Consulting Engineers
8989 N. Port Washington Rd.
Milwaukee, WI 53217
Phone: (414) 351-5588
FAX: (414) 351-4617

Job:	***Example 1 - 120' Self-Supporting Tower***		
Project:	***Training Seminar***		
Client: C-Concepts, Inc.	Drawn by: Dan Horn	App'd:	
Code: TIA/EIA-222-F	Date: 11/15/01	Scale: NTS	
Path: H:\Engineer Stuff\DGH\SpectraSite\HandCalcs\Falcon120.eri		Dwg No. E-1	

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' FALCON TOWER
Job No. TRAINING By DGH
Date _____ Page 1 of ____

DETERMINE WIND PRESSURES

$h = 120'$ $V = 80$ MPH 69 MPH + 1/2" ICE ***

$$G_H = \frac{.65 + .60}{(h/33)^{1/7}} = \frac{.65 + .60}{(120/33)^{1/7}} = 1.149 \quad (2.3.4.1)$$

$G_H = 1.149$ >1.00 <1.25 ✓

SECTION	ELEV	z	K_z*	q_z**	q_z ICE
L1	120-100	110	1.411	23.118	17.197
T1	100-80	90	1.332	21.823	16.235
T2	80-60	70	1.240	20.316	15.113
T3	60-40	50	1.126	18.448	13.724
T4	40-20	30	1.00	16.38	12.188
T5	20-0	10	1.00	16.38	12.188

* $K_z = \left(\frac{z}{33}\right)^{2/7}$ (2.3.3) $1.00 < K_z < 2.58$

** $q_z = .00256\, K_z V^2$ (2.3.3)

*** EIA 2.3.16 STATES THAT WIND WITH ICE COMBINES AS $D + .75 W_I + I$ FOR WIND FORCES. ANNEX "A" SUB 2.3.16A STATES THAT THE WIND SPEED WITH ICE CAN BE TAKEN AS 87% TO SATISFY THE .75 REQUIREMENT (NOTE $.866^2 = .75$)

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

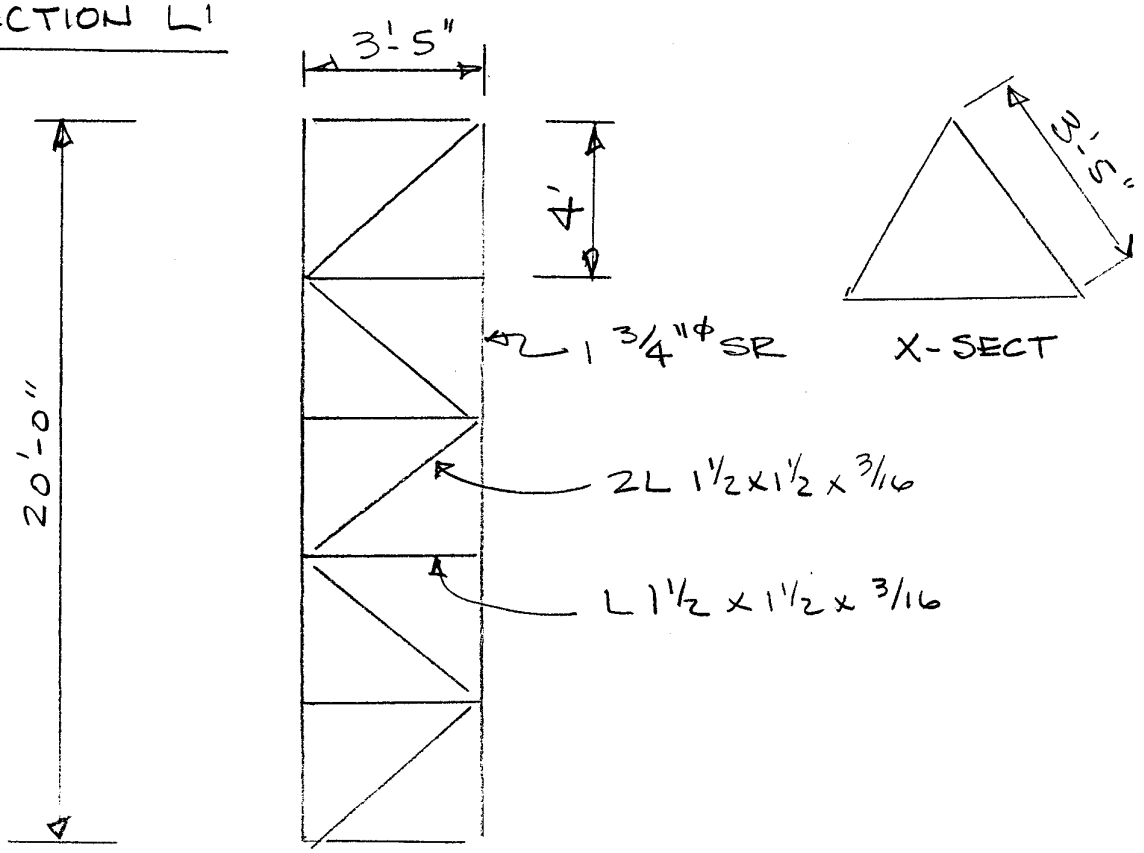
Job No. _____ By _____

Date _____ Page 2 of _____

CALCULATE, A_E

NOTE: FEEDLINES ARE TREATED AS $C_A A_A$

SECTION L1



$A_G = 20' \times (3'\text{-}5" + 1\,3/4") = 20 \times 3.5625 = 71.25\ \square'$

COMPONENT	L	W/	A_F	A_R
LEG	40	.1458		5.833
DIAG	26.3	.125	3.288	
GIRT	20.5	.125	2.563	
			5.851	5.833

$$e = \frac{5.833 + 5.851}{71.25} \qquad (2.3.5.1)$$

$$e = .164$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP. TOWER

Job No. _____ By _____

Date _____ Page 3 of _____

CALCULATE C_F

$C_F = 3.4e^2 - 4.7e + 3.4$

$C_F = 3.4(.164^2) - 4.7(.164) + 3.4$

$C_F = 2.721$ (2.3.5.1)

CALCULATE R_R

$R_R = .51e^2 + .57 \leq 1.0$

$R_R = .51(.164)^2 + .57$

$R_R = .5837$ (2.3.6.2)

(2.3.6) TABLE 2

WIND DIR	DF	DR	DFAE	DRARRR	A_E
NORMAL	1.0	1.0	5.851	3.405	9.256
60°	.80	1.0	4.680	3.405	8.085
90°	.85	1.0	4.974	3.405	8.379

CALCULATE $C_A A_A$

(9) NEXTEL 1 5/8" COAX (ROUND)

$C_A A_A = 20' \times (.170\ FT^2/FT) \times 9 = 30.6^{\square'}$

CALCULATE $C_F A_E + \Sigma C_A A_A$ ($2A_G = 2 \times 71.25 = 142.5^{\square'}$)

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F* (16)
NORMAL	25.186	30.6	55.786	1482
60	21.999	30.6	52.60	1397
90	22.799	30.6	53.40	1418

$*F = q_z G_H \times (C_F A_E + \Sigma C_A A_A)$ (2.3.2)

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP. TOWER
Job No. _____ By _____
Date _____ Page 4 of _____

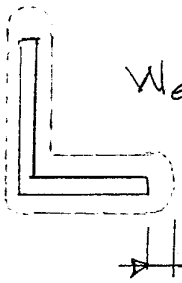
CALCULATE WT OF SECTION

COMPONENT	L	#	WT/FT	WT (lb)
LEG	20'	3	8.18	491.1
DIAG	5.26	15	3.59	283.3
GIRT	3.42	18	1.794	110.4
				884.8
WT OF COAX	9 x .80 PLF x 20			144.0
			TOTAL	1028.0

CALCULATE PROPERTIES FOR 1/2" ICE

$A_G = 20'(3'\text{-}5" + 1\tfrac{3}{4}" + 2\times\tfrac{1}{2}") = 72.917^{\square'}$

COMPONENT	L	W_{EQUIV}	A_F	A_R
LEG	40	.229		9.1667
DIAG*	26.3	.181	4.749	
GIRT*	20.5	.181	3.701	
			8.450	9.167

* 

$W_{EQUIV} = 1.5 + 2 \times \tfrac{2}{3} \times (.5) = 2.1666"$ (.181')

t x 2/3 FOR EQIVALENT A_F

$$e = \frac{(8.450 + 9.167)}{72.917} = .242$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

(2.3.5.1) $C_F = 3.4(.242)^2 - 4.7(.242) + 3.4 = 2.462$

(2.3.6.2) $R_R = .51(.242)^2 + .57 = .600$

(2.3.6)

WIND DIR	TABLE 2 DF	DR	DFAF	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	8.450	5.500	13.950
60	.80	1.0	6.760	5.500	12.260
90	.85	1.0	7.183	5.500	12.682

$C_A A_A$: $20' \times (.270\ FT^2/FT) \times 9 = 48.60\ \square'$

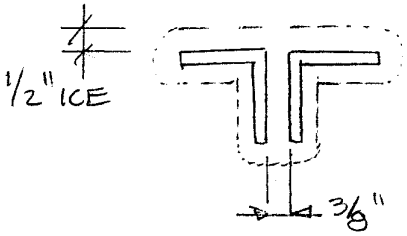
WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	34.345	48.6	82.945	1639
60	30.184	48.6	78.784	1557
90	31.223	48.6	79.823	1577

CALCULATE W/T OF ICE 56 PCF ANNEX H (2.3)

1 3/4" SE. UNIT WT $= \left((2 \times 1/2 + 1\ 3/4)^2 - (1\ 3/4)^2\right) \times \frac{\pi}{4} \times \frac{56}{144}$

$= 1.374\ \#/1$

2L 1 1/2 x 1 1/2 x 3/16 x 3/8"



$\left(\left((2 \times 1\ 1/2 + 4 \times 1\ 1/2) + \frac{6\pi}{4} \times 1/2\right) \times (1/2) + \left(\frac{3}{8}\right) \times 1\ 1/2\right) \times \frac{56}{144}$

$= 2.427\ \#/1$

L 1 1/2 x 1 1/2 x 3/16

$\left(2 \times (1\ 1/2 + 1\ 1/2) + \frac{5\pi}{4} \times 1/2\right) \times (1/2) \times \frac{56}{144}$

$= 1.548\ \#/1$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP. TOWER

Job No. _____ By _____

Date _____ Page 6 of _____

ICE WEIGHT

COMPONENT	L	#	WT/FT	WT ICE (lb)
LEG	20	3	1.374	82.4
DIAG	5.26	15	2.427	191.5
GIRT	3.42	18	1.548	95.2
				369.1

WT OF ICE ON COAX

$9 \times (2.10 - .80) \times 20' =$ 234.0

TOTAL WT ICE 603.1

TOTAL SELF WT OF MAST

$WT_{STL} + WT_{ICE}$ 884.8 + 369.1 = 1253.9

TOTAL ADD. WT OF COAX

$WT_{NOICE} + W_{T\,ICE}$ 144 + 234 = 378.0

TOTAL WT 1631.9

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

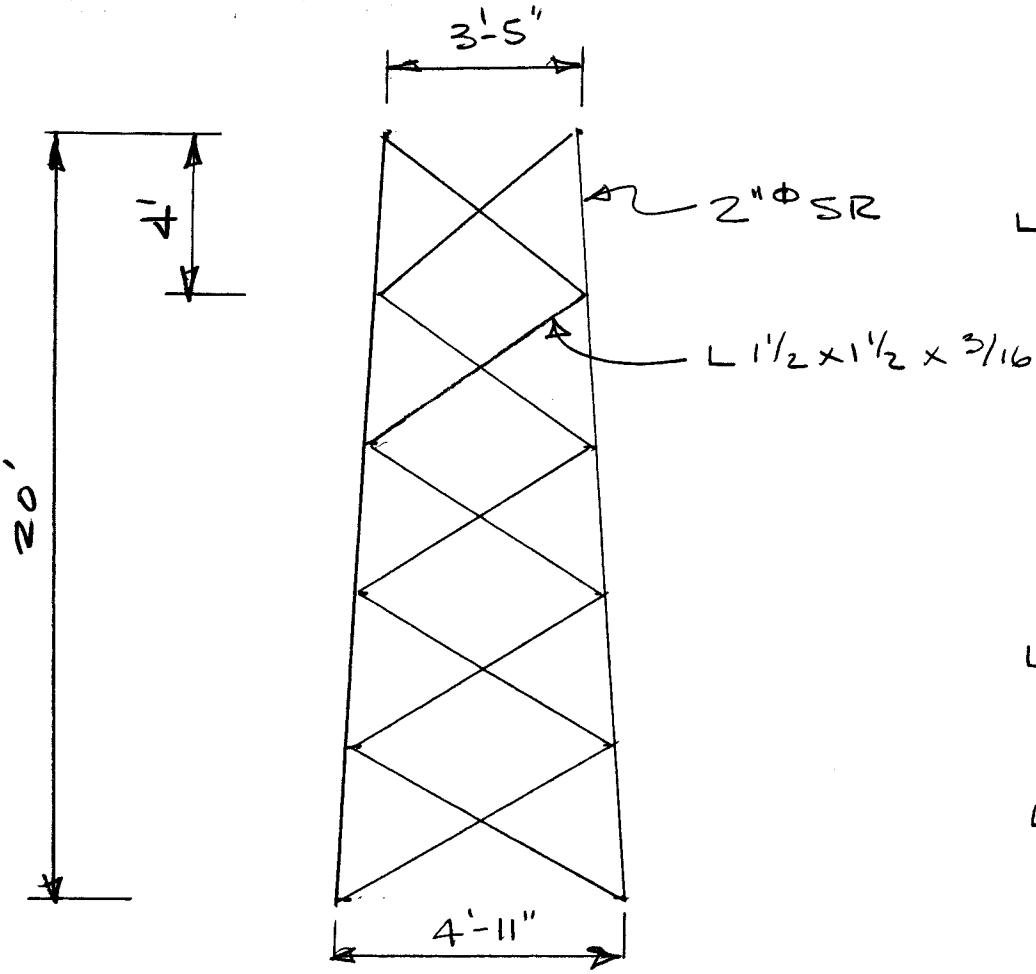
Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 7 of _____

SECTION T1

TAPER = (10.91666 − 3.41666) / 5 = 1.5' / 20' SECTION



FW

3.4166

L_D = 5.3592

3.7166

L_D = 5.5633

4.0166

L_D = 5.7705

4.3016

L_D = 5.9903

4.6166

L_D = 6.2226

4.9166

$$A_G = 20 \times \frac{((3'\text{-}5" + 2") + (4'\text{-}11" + 2"))}{2} = 86.67^{\square'}$$

COMPONENT	L	W	A_F	A_R
LEG	40.02	.1666		6.67
DIAG.	57.812	.1125	7.23	

$$e = \frac{6.67 + 7.23}{86.67} = .160 \quad (2.3.5.1)$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP. TOWER

Job No. _____ By _____

Date _____ Page 8 of _____

CALCULATE C_F (2.3.5.1)

$$C_F = 3.4(.160)^2 - 4.7(.160) + 3.4 = 2.735$$

CALCULATE R_R (2.3.6.2)

$$R_R = .151(.160)^2 + .57 = .583$$

(2.3.6)

WIND DIR	TABLE 2 DF	DR	$D_F A_F$	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	7.23	3.889	11.119
60	.80	1.0	5.784	3.889	9.673
90	.85	1.0	6.145	3.889	10.034

$C_A A_A$ SAME AS L1 = 30.6 □'

CALCULATE $C_F A_E + \Sigma C_A A_A$

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	30,410	30.6	61,010	1529.8
60	26,456	30.6	57.056	1430.7
90	27.443	30.6	58.043	1455.4

CALCULATE WT OF SECTION

COMPONENT	L	#	WT/FT	WT (lb)
LEG	20.01	3	10.69	641.73
DIAG.	57.812	3	1.794	311.14
				952.9
WT OF COAX 9 x .80 x 20				144.0
			TOTAL	1096.9

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER
Job No. _____ By _____
Date _____ Page 9 of _____

CALCULATE PROPERTIES FOR 1/2" ICE

$$A_G = \frac{20 \times \left((3'\text{-}5" + 2" + 2\times 1/2") + (4'\text{-}11" + 2" + 2\times 1/2") \right)}{2} = 88.33^{\square}$$

COMPONENT	L	W	A_F	A_R
LEG	40.02	.250		10.01
DIAG	57.812	.181*	10.464	

*SAME SECT. L1

$$e = \frac{(10.01 + 10.464)}{88.33} = .232$$

(2.3.5.1) $C_F = 3.4(.232)^2 - 4.7(.232) + 3.4 = 2.493$

(2.3.6.2) $R_R = .51(.232)^2 + .57 = .597$

(2.3.6)

WIND DIR	TABLE 2 DF	DR	$D_F A_F$	$D_R A_R R_R$	AE
NORMAL	1.0	1.0	10.464	5.976	16.440
60	.80	1.0	8.371	5.976	14.347
90	.85	1.0	8.894	5.976	14.870

$C_A A_A$ SAME AS SECTION L1 = $48.60^{\square'}$

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	40.985	48.60	89.585	1671
60	35.767	48.60	84.367	1573
90	37.071	48.60	85.671	1598

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 10 of _____

CALCULATE WT OF ICE

$2"\phi$ SR UNIT W = $\left((2\times 1\tfrac{1}{2}"+2)^2-(2)^2\right)\times\frac{\pi}{4}\times\frac{56}{144}$

$= 1.527$ #/1

L1½ SAME AS L1 = 1.548#/1

ICE WEIGHT

COMPONENT	L	#	WT/FT	WTICE
LEG	20.01	3	1.527	91.7
DIAG	57.812	3	1.548	268.5
				360.1

WT OF ICE ON COAX
$9\times(2.10-.80)\times 20$ = 234.0

TOTAL WT OF ICE = 594.1

TOTAL SELF WT OF MAST

9529 + 360. = 13.3

TOTAL ADD WT OF COAX

144.0 + 234.0 = 378

TOTAL WT = 1691

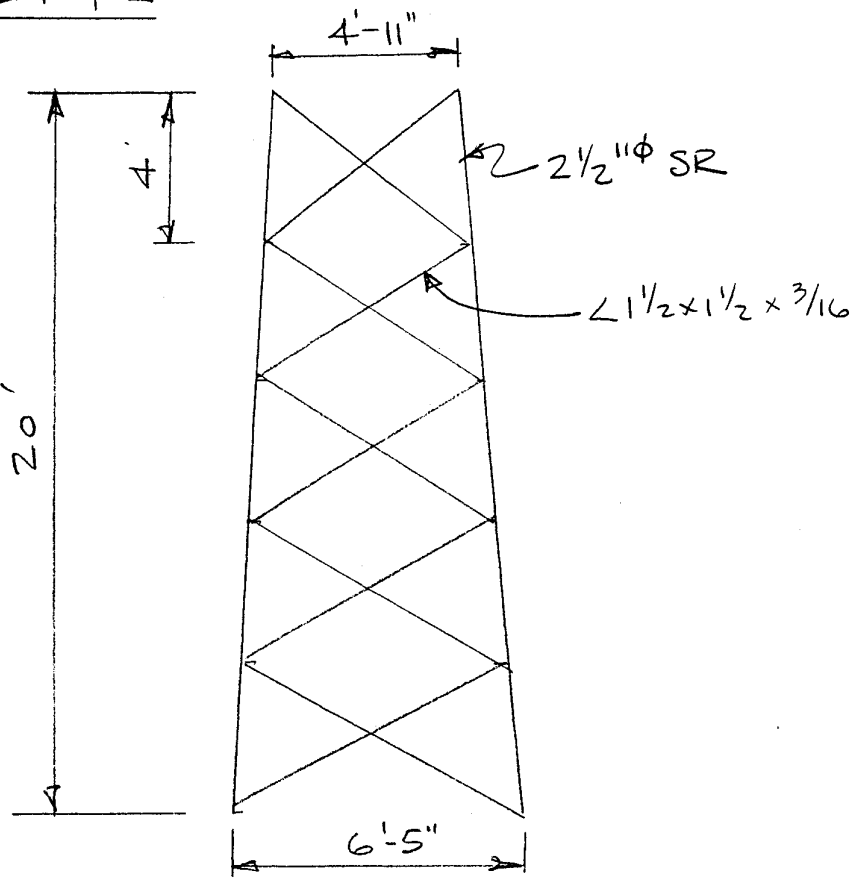
COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 11 of _____

SECTION T2



FW
4.9166
L_D = 6.4553
5.2166
L_D = 6.6933
5.5166
L_D = 6.9362
5.8166
L_D = 7.1833
6.1166
L_D = 7.4343
6.4166

$$A_G = 20 \times \frac{\left((4'\text{-}11'' + 2\tfrac{1}{2}'') + (6'\text{-}5'' + 2\tfrac{1}{2}'')\right)}{2} = 117.50 \text{ ft}^2$$

COMPONENT	L	W	A_F	A_R
LEG	40.02	.2083		8.3375
DIAG	69.4048	.125	8.6756	

$$e = \frac{(8.3375 + 8.6756)}{117.5} = .145 \quad (2.3.5.1)$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 12 of _____

CALCULATE C_F (2.3.5.1)

$$C_F = 3.4(.145)^2 - 4.7(.145) + 3.4 = 2.79$$

CALCULATE R_R (2.3.6.2)

$$R_R = .151(.145)^2 + .57 = .581$$

(2.3.6)

WIND DIR	TABLE 2 D_F	TABLE 2 D_R	$D_F A_F$	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	8.6756	4.8441	13.520
60	.80	1.0	6.9405	4.8441	11.785
90	.85	1.0	7.3743	4.8441	12.218

$C_A A_A$ (COAX) SAME AS L1, T1 = 30.6 #'

CALCULATE $C_F A_E + \Sigma C_A A_A$

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	37.721	30.6	68.321	1594.8
60	32.880	30.6	63.480	1481.8
90	34.088	30.6	64.688	1510.0

CALCULATE WT OF SECTION

COMPONENT	L	#	WT/FT	WT (lb)
LEG	20.01	3	16.703	1002.7
DIAG	69.4048	3	1.794	373.5
				1376.2
WT OF COAX 9x.80x20				144.0
			TOTAL	1520.2

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER
Job No. _____ By _____
Date _____ Page 13 of _____

CALCULATE PROPERTIES FOR ½" ICE

$$A_G = 20 \times \left(\frac{(4'-11" + 2\tfrac{1}{2}" + 2\times\tfrac{1}{2}") + (6'-5" + 2\tfrac{1}{2}" + 2\times\tfrac{1}{2}")}{2} \right) = 119.17$$

COMPONENT	L	W	A_F	A_R
LEG	40.02	.2917		11.674
DIAG	69.4048	.181*	12.562	

* SAME AS SECT L1

$$e = \frac{(11.674 + 12.562)}{119.17} = .203$$

(2.3.5.1) $C_F = 3.4(.203)^2 - 4.7(.203) + 3.4 = 2.586$

(2.3.6.2) $R_R = .51(.203)^2 + .57 = .591$

(2.3.6)

WIND DIR	TABLE 2 D_F	D_R	$D_F A_F$	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	12.562	6.899	19.461
60	.80	1.0	10.050	6.899	16.949
90	.85	1.0	10.678	6.899	17.577

$C_A A_A$ SAME AS L1,T1 = 48.60 D'

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	50.326	48.60	98.926	.718
60	43.839	48.60	92.430	1605
90	45.454	48.60	94.054	1633

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 14 of _____

CALCULATE WT OF ICE

$2\frac{1}{2}$"ϕ SR UNIT WT = $\left(\left(2\frac{1}{2} + 2 \times \frac{1}{2}\right)^2 - (2)^2\right) \times \frac{\pi}{4} \times \frac{56}{144}$

= 1.833 #/'

L1½ SAME AS L1 = 1.548 #/'

ICE WEIGHT

COMPONENT	L	#	WT/FT	WTICE
LEG	20.01	3	1.833	110.0
DIAG	69.4048	3	1.548	322.3
				432.3
WT OF ICE ON COAX 9x(2.10-.80)x20				234.0
TOTAL WT OF ICE				666.3

TOTAL SELF WT OF MAST
1376.2 + 432.3 = 1808.5

TOTAL ADD WT OF COAX
144 + 234 = 378

TOTAL WT 2186.5

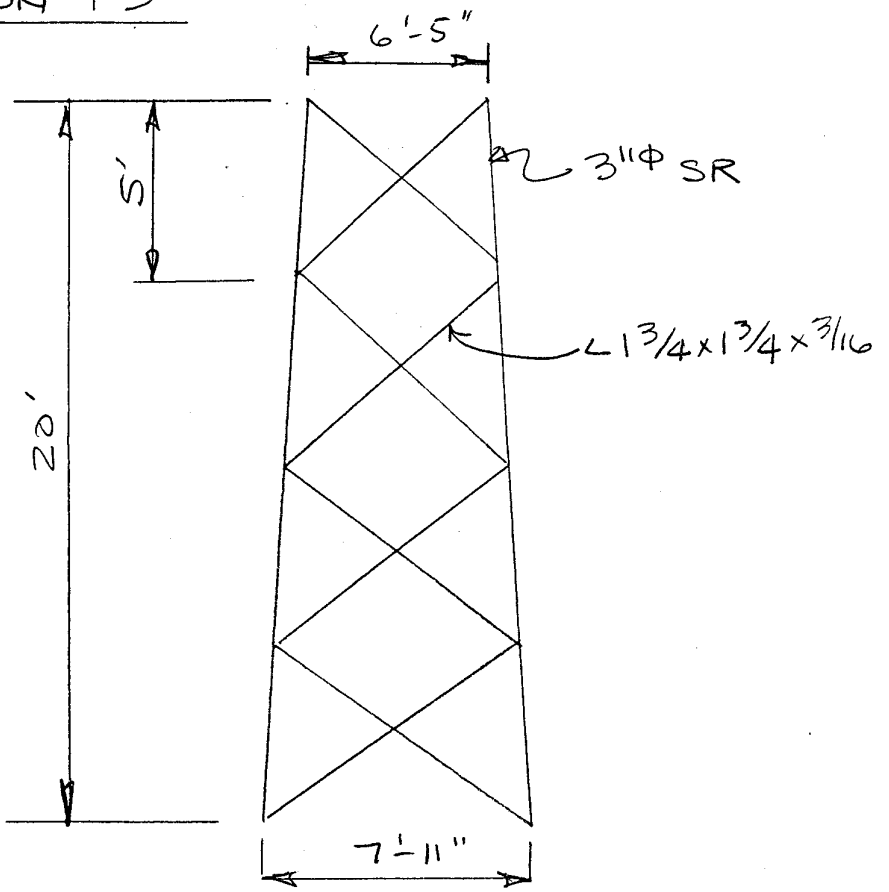
COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 15 of _____

SECTION T3



FW
6.4166
L_D = 8.2834
6.7916
L_D = 8.5853
7.1666
L_D = 8.8929
7.5416
L_D = 9.2054
7.9166

$$A_G = 20 \times \frac{(6'\text{-}5" + 3") + (7'\text{-}11" + 3")}{2} = 148.333 \square'$$

COMPONENT	L	W	A_F	A_R
LEG	40.02	.250		10.005
DIAG	69.934	.14583	10.1987	

$$e = \frac{(10.005 + 10.1987)}{148.333} = .136 \quad (2.3.5.1)$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 16 of _____

CALCULATE C_F (2.3.5.1)

$$C_F = 3.4(.136)^2 - 4.7(.136) + 3.4 = 2.824$$

CALCULATE R_R (2.3.6.2)

$$R_R = .51(.136)^2 + .57 = .579$$

(2.3.6)

WIND DIR	TABLE 2 D_F	D_R	$D_F A_F$	$P_R A_R R_R$	A_E
NORMAL	1.0	1.0	10.1987	5.793	15.992
60	.80	1.0	8.159	5.793	13.952
90	.85	1.0	8.669	5.793	14.462

$C_A A_A$ (COAX) SAME AS L1, T1, T2 = 30.60'

CALCULATE $C_F A_E + \Sigma C_A A_A$

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	45.161	30.6	75.761	1605.9
60	39.40	30.6	70.0	1483.8
90	40.841	30.6	71.441	1514.3

CALCULATE WT OF SECTION

COMPONENT	L	#	WT/FT	WT (LB)
LEG	20.01	3	24.05	1443.9
DIAG	69.934	3	2.12	444.8
				1888.7
			WT OF COAX 9x.80x20'	144.0
			TOTAL	2032.7

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 17 of _____

CALCULATE PROPERTIES FOR 1/2" ICE

$$A_G = 20' \times \left(\frac{(6'-5" + 3" + 2\times 1/2") + (7'-11" + 3" + 2\times 1/2")}{2} \right) = 150.0$$

COMPONENT	L	W	A_F	A_R
LEG	40.02	.333		13.333
DIAG	69.934	.201 *	14.083	

*(13/4 + 2x 1/2" x 2/3) /12 = .201'

$$e = \frac{(13.333 + 14.083)}{150.0} = .183$$

(2.3.5.1) $C_F = 3.4(.183)^2 - 4.7(.183) + 3.4 = 2.654$

(2.3.6.2) $R_R = .151(.183)^2 + .57 = .587$

(2.3.6)

TABLE 2

WIND DIR	D_F	D_R	$D_F A_F$	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	14.083	7.827	21.91
60	.80	1.0	11.266	7.827	19.09
90	.85	1.0	11.971	7.827	19.80

$C_A A_S$ SAME AS L1,T1,T2 = 48.6 □'

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	58.149	48.6	106.75	1683.3
60	50.665	48.6	99.27	1565.3
90	52.549	48.6	101.15	1595.0

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 18 of _____

CALULATE WT OF ICE

$3"\Phi$ SR UNIT WT $\left((3+2\times 1/2)^2-(3)^2\right)\times\frac{\pi}{4}\times\frac{56}{144}$

$= 2.138\#/1$

$L\,1\,3/4\times 1\,3/4\times 3/16$

$\left(2\times(1\,3/4+1\,3/4)+\frac{5\pi}{4}\times 1/2\right)(1/2)\times\frac{56}{144}$

$= 1.743\#/1$

ICE WEIGHT

COMPONENT	L	#	WT/FT	WTICE
LEG	20.01	3	2.138	128.34
DIAG	69.934	3	1.743	365.68
				494.0

WT OF ICE ON COAX
$9\times(2.10-.80)\times 20$ 234.0

TOTAL WT OF ICE 728.0

TOTAL SELF WT OF MAST
1888.7 + 494.0 2382.7

TOTAL ADD WT OF COAX
144.0 + 234.0 378.0

TOTAL WT 2760.7

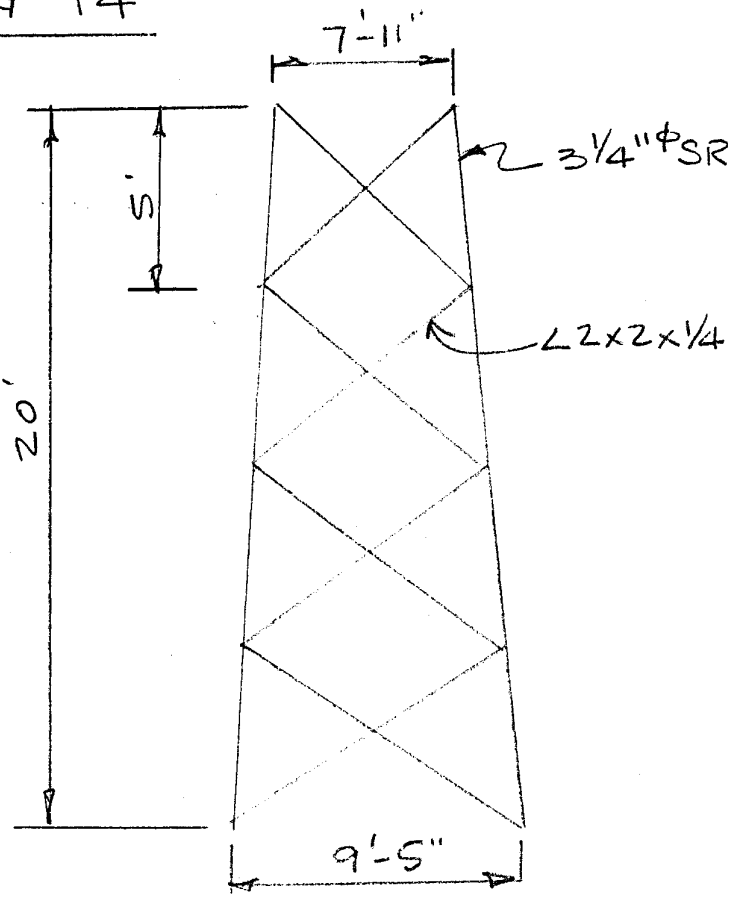
COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 19 of _____

SECTION T4



FW
7.9166
L_D = 9.5224
8.2916
L_D = 9.8435
8.6666
L_D = 10.1683
9.0416
L_D = 10.4965
9.4166

$$A_G = 20' \times \frac{\left((7'-11" + 3\frac{1}{4}") + (9'-5" + 3\frac{1}{4}")\right)}{2} = 178.75$$

COMPONENT	L	W	A_F	A_R
LEG	40.04	.2708		10.844
DIAG	80.06	.1666	13.338	

$$e = \frac{(10.844 + 13.338)}{178.75} = .135 \quad (2.3.5.1)$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 20 of _____

CALCULATE C_F (2.3.5.1)

$$C_F = 3.4(.135)^2 - 4.7(.135) + 3.4 = 2.827$$

CALCULATE R_R (2.3.6.2)

$$R_R = .151(.135)^2 + .57 = .579$$

(2.3.6)

WIND DIR	TABLE 2 D_F	D_R	$D_F A_F$	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	13.338	6.279	19.617
60	.80	1.0	10.670	6.279	16.949
90	.85	1.0	11.337	6.279	17.616

$C_A A_A$ (COAX) $= 30.6^{\square 2}$

CALCULATE $C_F A_E + \Sigma C_A A_A$

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	55,457	30.6	86.657	1620
60	47.915	30.6	78.515	1478
90	49.800	30.6	80 400	1513

CALCULATE WT OF SECTION

COMPONENT	L	#	WT/FT	WT (LB)
LEG	20.02	3	28.23	1695.4
DIAG	80.06	3	3.19	766.2
				2461.6
			WT OF COAX 9x.80x20	144.0
			TOTAL	2605.6

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 21 of _____

CALCULATE PROPERTIES FOR 1/2" ICE

$$A_G = 20' \times \left(\frac{(7'-11" + 3\frac{1}{4} + 2\times\frac{1}{2}") + (9'-5" + 3\frac{1}{4}" + 2\times\frac{1}{2}")}{2} \right) = 180.4$$

COMPONENT	L	W	A_F	A_R
LEG	40.04	.354		14.18
DIAG	80.06	.222*	17.791	

$$* \left(2" + 2\times\tfrac{1}{2}" \times \tfrac{2}{3}\right)/12 = .222$$

$$e = \frac{(14.18 + 17.791)}{180.4} = .177$$

(2.3.5.1) $C_F = 3.4(.177)^2 - 4.7(.177) + 3.4 = 2.675$

(2.3.6.2) $R_R = .51(.177)^2 + .57 = .586$

(2.3.6)

WIND DIR — TABLE 2

WIND DIR	D_F	D_R	$D_F A_F$	$D_R A_R R_R$	A_E
NORMAL	1.0	1.0	17.791	8.309	26.10
60	.80	1.0	14.233	8.309	22.54
90	.85	1.0	15.122	8.309	23.431

$C_A A_A = 48.6$ #'

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	69.818	48.6	118.418	1658.3
60	60.295	48.6	108.895	1525.0
90	62.678	48.6	111.278	1558.3

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 22 of _____

CALCULATE WT OF ICE

$3\frac{1}{4}$"ϕ SR $\left((3\frac{1}{4}+2\times\frac{1}{2})^2-(3\frac{1}{4})^2\right)\frac{\pi}{4}\times\frac{56}{144}=2.291$ #/'

L 2x2x1/4

$$\left(2\times(2+2)+\frac{5\pi}{4}\times\frac{1}{2}\right)\left(\frac{1}{2}\right)\frac{56}{144}=1.937\ \#/'$$

ICE WEIGHT

COMPONENT	L	#	WT/FT	WT ICE
LEG	20.02	3	2.291	137.60
DIAG	80.06	3	1.937	465.23
				602.83
WT OF ICE ON COAX 9x(2.1-.8)x20				234.0
				836.83
TOTAL SELF WT OF MAST 2461.6 + 602.83				3064.4
TOTAL ADD. WT OF COAX 144 + 234				378
TOTAL WT				3442

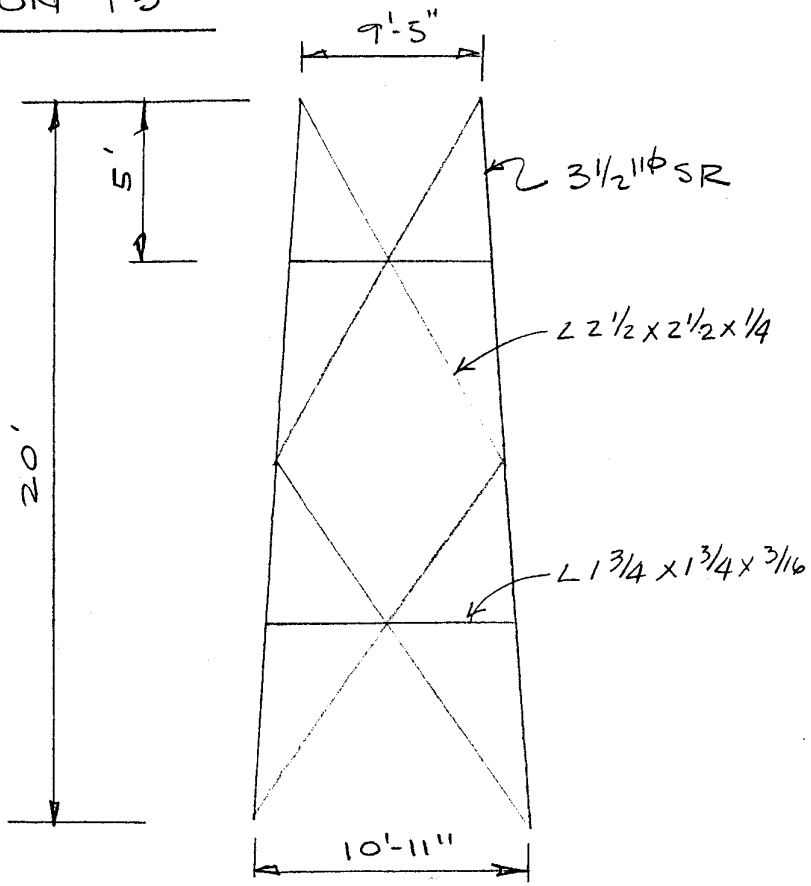
COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project '20' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 23 of _____

SECTION T5



FW

9.41666

9.7916

L_D = 14'

10.1666

10.5416

L_D = 14.53

10.9166

$$A_G = 20' \times \frac{((9'\text{-}5" + 3\tfrac{1}{2}") + (10'\text{-}11" + 3\tfrac{1}{2}"))}{2} = 209.17$$

COMPONENT	L	W	A_F	A_R
LEG	40.04	.292		11.678
DIAG	57.06	.208	11.868	
HORZ	20.33	.146	2.965	
			14.833	

$$e = \frac{(11.678 + 14.833)}{209.17} = .127$$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 24 of _____

CALCULATE C_F (2.3.5.1)

$$C_F = 3.4(.127)^2 - 4.7(.127) + 3.4 = 2.858$$

CALCULATE R_R (2.3.6.2)

$$R_R = .51(.127)^2 + .57 = .578$$

(2.3.6)

WIND DIR	TABLE 2 D_F	D_R	$D_F A_F$	$D_R A_R A_R$	A_E
NORMAL	1.0	1.0	14.833	6.75	21.583
60	.80	1.0	11.866	6.75	18.616
90	.85	1.0	12.609	6.75	19.359

$C_A A_A$ COAX = 30.6 #'

CALCULATE $C_F A_E + \Sigma C_A A_A$

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	61.68	30.6	92.28	1737
60	53.20	30.6	83.80	1577
90	55.33	30.6	85.93	1617

CALCULATE WT OF SECTION

COMPONENT	L	#	WT/FT	WT (LB)
LEG	20.02	3	32.738	1966
DIAG	57.06	3	4.05	693
HORZ	20.33	3	2.12	129
				2788

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 25 of ____

CALCULATE PROPERTIES FOR 1/2" ICE

$$A_G = 20' \times \frac{((9'-5"+3\frac{1}{2}"+2\times\frac{1}{2}")+(10'-11"+3\frac{1}{2}"+2\times\frac{1}{2}"))}{2} = 210.8$$

COMPONENT	L	W	A_F	A_R
LEG	40.04	.375		15.02
DIAG	57.06*	.264	15.06	
HORZ	20.33**	.201	4.09	
			19.15	

* $(2\frac{1}{2}"+2\times\frac{1}{2}"\times\frac{2}{3})/12 = .264$

** $(1\frac{3}{4}"+2\times\frac{1}{2}"\times\frac{2}{3})\,12 = .201$

$$e = \frac{(15.02+19.15)}{210.8} = .162$$

(2.3.5.1) $C_F = 3.4(.162)^2 - 4.7(.162) + 3.4 = 2.728$

(2.3.6.2) $R_R = .51(.162)^2 + .57 = .583$

(2.3.6)

TABLE 2

WIND DIR	D_F	D_R	$D_F A_F$	$D_R A_R R_A$	A_E
NORMAL	1.0	1.0	19.15	8.76	27.91
60	.80	1.0	15.32	8.76	24.08
90	.185	1.0	16.28	8.76	25.04

$C_A A_A = 48.6$ □²

WIND DIR	$C_F A_E$	$\Sigma C_A A_A$	TOTAL	F (2.3.2)
NORMAL	76.138	48.6	124.738	1746.8
60	65.690	48.6	114.290	1600.5
90	68.309	48.6	116.909	1637.2

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 26 of _____

CALCULATE WT OF ICE

$3\frac{1}{2}"\phi$ SR $\left((3\frac{1}{2}+2\times\frac{1}{2})^2-(3\frac{1}{2})^2\right)\frac{\pi}{4}\times\frac{56}{144}=2.443\ \#/'$

$\angle 2\frac{1}{2}\times 2\frac{1}{2}\times\frac{1}{4}$

$\left(2\times(2\frac{1}{2}+2\frac{1}{2})+\frac{5\pi}{4}\times\frac{1}{2}\right)\left(\frac{1}{2}\right)\frac{56}{144}=2.326\ \#/'$

$\angle 1\frac{3}{4}\times 1\frac{3}{4}\times\frac{3}{16}$

$\left(2\times(1\frac{3}{4}+1\frac{3}{4})+\frac{5\pi}{4}\times\frac{1}{2}\right)\left(\frac{1}{2}\right)\frac{56}{144}=1.743\ \#/'$

ICE WEIGHT

COMPONENT	L	#	WT/FT	WTICE
LEG	20.02	3	2.443	146.73
DIAG	57.06	3	2.326	398.16
HORZ	20.33	3	1.743	106.31
				651.20
WT OF ICE ON COAX 9"(2.1-.8)×20				234.00
				885.2
TOTAL SELF WT OF MAST 2788 + 651.2				3439.2
TOTAL ADD. WT OF COAX 144 + 234				378
			TOTAL WT	3817.2

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 27 of _____

CALCULATE MAST SHEAR & MOMENT

WIND NORMAL

SECT	Z	ADD WT	SELF WT	F	OTM (FxZ)
L1	110	144	884.8	1482	163,020
T1	90	144	952.9	1529.8	137,682
T2	70	144	1376.2	1594.8	111,636
T3	50	144	1888.7	1605.9	80,295
T4	30	144	2461.6	1620	48,600
T5	10	144	2788	1737	17,370
		864	10352	9570	558,603

WIND 60

L1	110	144	884.8	1397	153,670
T1	90	144	952.9	1430.7	128,763
T2	70	144	1376.2	1481.8	103,726
T3	50	144	1888.7	1483.8	74,190
T4	30	144	2461.6	1478	44,340
T5	10	144	2788	1577	15,770
		864	10352	8848	520,459

WIND 90

L1	110	144	884.8	1418	155,980
T1	90	144	952.9	1455.4	130,986
T2	70	144	1376.2	1510.0	105,700
T3	50	144	1888.7	1514.3	75,715
T4	30	144	2461.6	1513	45,390
T5	10	144	2788	1617	16,170
		864	10352	9028	529,941

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

APPURTENANCE LOADINGS

PIROD 13' LO-PROFILE PLATFORM

$C_A A_A = 15.30^{D'}$ $z = 120'$ $K_z = 1.446$ $q = 23.69$ PSF

(2.3.10) $F_C = (23.69)(1.149)(15.30) = 416.5^{\#}$

$OTM = (416.5)(120) = 49,976^{\#}$

$WT = 1340^{\#}$

1/2" ICE

$C_A A_A = 17.0^{D'}$ $z = 120'$ $K_z = 1.446$ $q = 17.624$ PSF

$F_C = (17.624)(1.149)(17) = 344.3^{\#}$

$OTM = (344.3)(120) = 41310^{\#}$

WT W/ICE $= 2080^{\#}$

FV90-12 ANTENNA (9)

$C_A A_A = (9)(6.0) = 54^{D'}$ $z = 120'$ $K_z = 1.446$ $q = 23.69$ PSF

(2.3.10) $F_C = (23.69)(1.149)(54) = 1469.9^{\#}$

$OTM = (1469.9)(120) = 176,384^{\#}$

$WT = (9)(30) = 270^{\#}$

1/2" ICE

$C_A A_A = (9)(6.60) = 59.4^{D'}$ $z = 120$ $K_z = 1.446$ $q = 17.624$

$F_C = (17.624)(1.149)(59.4) = 1202.8^{\#}$

$OTM = (1202.8)(120) = 144342^{\#}$

$WT = (9)(80) = 720^{\#}$

COMPUTERIZED
STRUCTURAL
DESIGN, S.C.
CONSULTING ENGINEERS
8989 N. Port Washington Rd.
Milwaukee, WI 53217-1633
414-351-5588 FAX 414-351-4617

Project 120' SELF-SUP TOWER

Job No. _____ By _____

Date _____ Page 30 of _____

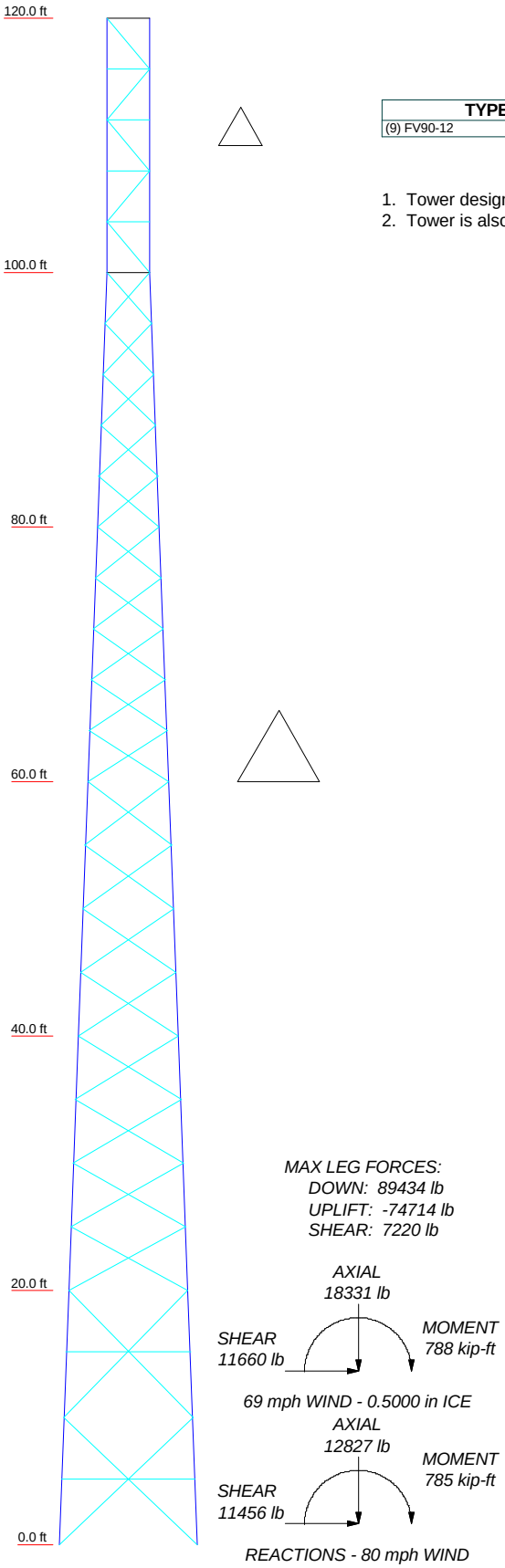
SUMMARY

CONDITION	ADD WT	SELF WT	APPURT WT	F+F$_c$	ΣOTM
NORMAL	864	10352	1610	11456#	784,963 IK
60				10734	746,819
90				10914	756,301
		12826#			
1/2" ICE					
NORMAL	2268	13262	2800	11663#	787,989 IK
60				10973	750,862
90				11145	760,123
		18,330			

ERITOWER RESULTS

NORMAL	864	10352.79	1610	11456.32#	784.87 IK
60				10735.82	746.78
90				10915.95	756.30
		12826.79			
1/2" ICE					
NORMAL	2268	13263.02	2800	11660.41#	787.75 IK
60				10971.10	750.73 IK
90				11143.43	759.99 IK
		18331.02			

Section	T5	T4	T3	T2	T1	L1
Legs	SR 3 1/2	SR 3 1/4	SR 3	SR 2 1/2	SR 2	SR 1 3/4
Diagonals	L2 1/2x2 1/2x1/4	L2x2x1/4	L1 3/4x1 3/4x3/16	L1 1/2x1 1/2x3/16		2L1 1/2x1 1/2x3/16x3/8
Top Girts			N.A.			L1 1/2x1 1/2x3/16
Mid Girts			N.A.			
Bottom Girts			N.A.			L1 1/2x1 1/2x3/16
Horizontals			N.A.			L1 1/2x1 1/2x3/16
Sec. Horzs		L1 3/4x1 3/4x3/16		N.A.		
Inner Bracing			N.A.			
Face Width (ft) 10.9167	9.41666	7.91666	6.41666	4.91666	3.41666	3.41666
# Panels @ Ht (ft)	2 @ 10	8 @ 5		10 @ 4		5 @ 4
Weight (lb) 10352.8	2788.0	2462.0	1888.0	1376.8	953.4	884.6



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(9) FV90-12	120	Pirod 13' Low Profile Platform	120

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.

MAX LEG FORCES:
DOWN: 89434 lb
UPLIFT: -74714 lb
SHEAR: 7220 lb

69 mph WIND - 0.5000 in ICE

REACTIONS - 80 mph WIND

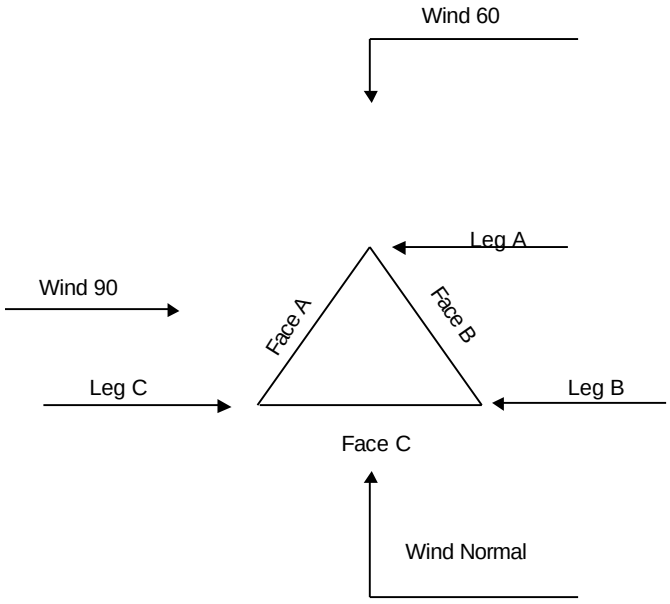
Computerized Structural Design
Consulting Engineers
8989 N. Port Washington Rd.
Milwaukee, WI 53217
Phone: (414) 351-5588
FAX: (414) 351-4617

Job: ***Example 1 - 120' Self-Supporting Tower***		
Project: ***Training Seminar***		
Client: C-Concepts, Inc.	Drawn by: Dan Horn	App'd:
Code: TIA/EIA-222-F	Date: 11/15/01	Scale: NTS
Path: H:\Engineer Stuff\DGH\SpectraSite\HandCalcs\Falcon120.eri		Dwg No. E-1

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 120.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 3.42 ft at the top and 10.92 ft at the base.
There is a 3 sided latticed pole with a face width of 3.42 ft.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 80 mph .
Nominal ice thickness of 0.5000 in .
Ice density of 56 pcf .
A wind speed of 69 mph is used in combination with ice.
Pressures are calculated at each section .
Stress ratio used in latticed pole member design is 1.333 .
Stress ratio used in tower member design is 1.333



Triangular Tower

3 Sided Latticed Pole Section Geometry

Tower Section	*Tower Elevation* ft	*Section Width* ft	*Number of Sections*	*Section Length* ft	*Diagonal Spacing* ft	*Bracing Type*	*Has K Brace End Panels*	*Has Horizontals*
L1	120-100	3.42	1	20.00	4.00	K Brace Right	No	Yes

3 Sided Latticed Pole Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg F_y ksi	Diagonal Type	Diagonal Size	Diagonal F_y ksi
L1 120-100	Solid Round	1 3/4	50	Double Angle	2L1 1/2x1 1/2x3/16x3/8	36

3 Sided Latticed Pole Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt F_y ksi	Bottom Girt Type	Bottom Girt Size	Bottom Girt F_y ksi
L1 120-100	Single Angle	L1 1/2x1 1/2x3/16	36	Single Angle	L1 1/2x1 1/2x3/16	36

3 Sided Latticed Pole Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt F_y ksi	Horizontal Type	Horizontal Size	Horizontal F_y ksi
L1 120-100	None	Flat Bar		36	Single Angle	L1 1/2x1 1/2x3/16	36

3 Sided Latticed Pole Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	K Factors[1]: Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Inner Brace X Y	Truss Leg X Brace	Truss Leg Z Brace
L1 120-100	0.00	0.0000	1	1	1	1	1 1	1 1	1 1	1 1	1 1	1 1	0.5	0.85

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

3 Sided Latticed Pole Section Geometry *(cont'd)*

Tower Elevation ft	Tension Area Factors: Legs Net Width Deduct in	Legs U	Inner Members: Single Angle Net Width Deduct in	Single Angle U	Inner Members: Double Angle Net Width Deduct in	Double Angle U	Connection Offsets: Diagonals Vert. Top in	Diagonals Horiz. Top in	Diagonals Vert. Bot. in	Diagonals Horiz. Bot. in	K-Bracing Vert. Top in	K-Bracing Horiz. Top in	K-Bracing Vert. Bot. in	K-Bracing Horiz. Bot. in
L1 120-100	0.5625	0.75	0.0000	0.75	0.5625	0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Tower Section Geometry

Tower Section	Tower Elevation ft	Section Width ft	Number of Sections	Section Length ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals
T1	100-80	3.42	1	20.00	4.00	X Brace	No	No
T2	80-60	4.92	1	20.00	4.00	X Brace	No	No
T3	60-40	6.42	1	20.00	5.00	X Brace	No	No
T4	40-20	7.92	1	20.00	5.00	X Brace	No	No
T5	20-0	9.42	1	20.00	10.00	X Brace	No	Yes

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg F_y ksi	Diagonal Type	Diagonal Size	Diagonal F_y ksi
T1 100-80	Solid Round	2	50	Single Angle	L1 1/2x1 1/2x3/16	36
T2 80-60	Solid Round	2 1/2	50	Single Angle	L1 1/2x1 1/2x3/16	36
T3 60-40	Solid Round	3	50	Single Angle	L1 3/4x1 3/4x3/16	36
T4 40-20	Solid Round	3 1/4	50	Single Angle	L2x2x1/4	36
T5 20-0	Solid Round	3 1/2	50	Single Angle	L2 1/2x2 1/2x1/4	36

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal F_y ksi	Inner Bracing Type	Inner Bracing Size	Inner Bracing F_y ksi
T1 100-80	Solid Round		36	Solid Round		36
T2 80-60	Solid Round		36	Solid Round		36
T3 60-40	Solid Round		36	Solid Round		36
T4 40-20	Solid Round		36	Solid Round		36
T5 20-0	Single Angle	L1 3/4x1 3/4x3/16	36	Solid Round		36

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Inner Brace X Y	Truss Leg X Brace	Truss Leg Z Brace
T1 100-80	0.00	0.0000	1	1	1	1	1	1	1	1	1	1	0.5	0.85
							1	1	1	1	1	1		
T2 80-60	0.00	0.0000	1	1	1	1	1	1	1	1	1	1	0.5	0.85
							1	1	1	1	1	1		
T3 60-40	0.00	0.0000	1	1	1	1	1	1	1	1	1	1	0.5	0.85
							1	1	1	1	1	1		
T4 40-20	0.00	0.0000	1	1	1	1	1	1	1	1	1	1	0.5	0.85
							1	1	1	1	1	1		
T5 20-0	0.00	0.0000	1	1	1	1	1	1	1	1	1	1	0.5	0.85
							1	1	1	1	1	1		

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation	Tension Area Factors						Connection Offsets							
	Legs		Inner Members				Diagonals				K-Bracing			
			Single Angle		Double Angle									
	Net Width Deduct	U	Net Width Deduct	U	Net Width Deduct	U	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in		in		in		in	in	in	in	in	in	in	in
T1 100-80	0.5625	0.75	0.0000	0.75	0.5625	0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T2 80-60	0.5625	0.75	0.0000	0.75	0.5625	0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T3 60-40	0.5625	0.75	0.0000	0.75	0.5625	0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T4 40-20	0.5625	0.75	0.0000	0.75	0.5625	0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
T5 20-0	0.5625	0.75	0.0000	0.75	0.5625	0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Feed Line/Linear Appurtenances - Non-Structural

Description	Face	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
Nextel 1 5/8	C	CaAa (In Face)	100.00 - 0.00	9	No Ice	0.17	0.80
					1/2" Ice	0.27	2.10
					1" Ice	0.37	3.40
					2" Ice	0.57	6.00
					4" Ice	0.97	11.20
Nextel 1 5/8	C	CaAa (In Face)	120.00 - 100.00	9	No Ice	0.17	0.80
					1/2" Ice	0.27	2.10
					1" Ice	0.37	3.40
					2" Ice	0.57	6.00
					4" Ice	0.97	11.20

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	120-100	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	30.601	0.000	144.00
T1	100-80	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	30.601	0.000	144.00
T2	80-60	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	30.601	0.000	144.00
T3	60-40	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	30.601	0.000	144.00
T4	40-20	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	30.601	0.000	144.00
T5	20-0	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	30.601	0.000	144.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	120-100	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	48.600	0.000	378.00
T1	100-80	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	48.600	0.000	378.00
T2	80-60	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	48.600	0.000	378.00
T3	60-40	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	48.600	0.000	378.00
T4	40-20	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	48.600	0.000	378.00
T5	20-0	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	48.600	0.000	378.00

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment deg	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
(9) FV90-12	C	None		0.0000	120.00	No Ice	6.00	6.00	30.00
						1/2" Ice	6.60	6.60	80.00
						1" Ice	7.20	7.20	130.00
						2" Ice	8.40	8.40	230.00
						4" Ice	10.80	10.80	430.00
Pirod 13' Low Profile Platform	C	None		0.0000	120.00	No Ice	15.30	15.30	1340.00
						1/2" Ice	17.00	17.00	2080.00
						1" Ice	18.70	18.70	2820.00
						2" Ice	22.10	22.10	4300.00
						4" Ice	28.90	28.90	7260.00

Tower Pressures - No Ice

$G_H = 1.149$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 120-100	110.00	1.411	23	71.250	A	5.850	5.833	5.833	49.93	30.601	0.000

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
					B	5.850	5.833		49.93		
					C	5.850	5.833		49.93		
T1 100-80	90.00	1.332	22	86.669	A	7.230	6.673	6.673	48.00	30.601	0.000
					B	7.230	6.673		48.00		
					C	7.230	6.673		48.00		
T2 80-60	70.00	1.24	20	117.503	A	8.676	8.341	8.341	49.02	30.601	0.000
					B	8.676	8.341		49.02		
					C	8.676	8.341		49.02		
T3 60-40	50.00	1.126	18	148.337	A	10.200	10.009	10.009	49.53	30.601	0.000
					B	10.200	10.009		49.53		
					C	10.200	10.009		49.53		
T4 40-20	30.00	1	16	178.754	A	13.344	10.843	10.843	44.83	30.601	0.000
					B	13.344	10.843		44.83		
					C	13.344	10.843		44.83		
T5 20-0	10.00	1	16	209.171	A	14.848	11.678	11.678	44.02	30.601	0.000
					B	14.848	11.678		44.02		
					C	14.848	11.678		44.02		

Tower Pressure - With Ice

G_H = 1.149

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
L1 120-100	110.00	1.411	17	72.917	A	8.451	9.167	9.167	52.03	48.600	0.000
					B	8.451	9.167		52.03		
					C	8.451	9.167		52.03		
T1 100-80	90.00	1.332	16	88.337	A	10.443	10.009	10.009	48.94	48.600	0.000
					B	10.443	10.009		48.94		
					C	10.443	10.009		48.94		
T2 80-60	70.00	1.24	15	119.171	A	12.533	11.678	11.678	48.23	48.600	0.000
					B	12.533	11.678		48.23		
					C	12.533	11.678		48.23		
T3 60-40	50.00	1.126	14	150.005	A	14.085	13.346	13.346	48.65	48.600	0.000
					B	14.085	13.346		48.65		
					C	14.085	13.346		48.65		
T4 40-20	30.00	1	12	180.422	A	17.793	14.180	14.180	44.35	48.600	0.000
					B	17.793	14.180		44.35		
					C	17.793	14.180		44.35		
T5 20-0	10.00	1	12	210.838	A	19.146	15.014	15.014	43.95	48.600	0.000
					B	19.146	15.014		43.95		
					C	19.146	15.014		43.95		

Tower Forces - No Ice - Wind Normal (180)

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L1 120-100	144.00	884.63	A	0.164	2.721	0.584	1	1	9.255	1481.18	74.06	C
			B	0.164	2.721	0.584	1	1	9.255			
			C	0.164	2.721	0.584	1	1	9.255			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 100-80	144.00	953.38	A	0.16	2.734	0.583	1	1	11.121	1529.51	76.48	C
			B	0.16	2.734	0.583	1	1	11.121			
			C	0.16	2.734	0.583	1	1	11.121			
T2 80-60	144.00	1376.80	A	0.145	2.791	0.581	1	1	13.520	1594.57	79.73	C
			B	0.145	2.791	0.581	1	1	13.520			
			C	0.145	2.791	0.581	1	1	13.520			
T3 60-40	144.00	1887.96	A	0.136	2.823	0.579	1	1	16.000	1606.00	80.30	C
			B	0.136	2.823	0.579	1	1	16.000			
			C	0.136	2.823	0.579	1	1	16.000			
T4 40-20	144.00	2461.98	A	0.135	2.826	0.579	1	1	19.626	1620.23	81.01	C
			B	0.135	2.826	0.579	1	1	19.626			
			C	0.135	2.826	0.579	1	1	19.626			
T5 20-0	144.00	2788.04	A	0.127	2.859	0.578	1	1	21.600	1738.40	86.92	C
			B	0.127	2.859	0.578	1	1	21.600			
			C	0.127	2.859	0.578	1	1	21.600			
Sum Weight:	864.00	10352.79						OTM	558.50 kip-ft	9569.88		

Tower Forces - No Ice - Wind 60 (0)

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 120-100	144.00	884.63	A	0.164	2.721	0.584	0.8	1	8.085	1396.65	69.83	C
			B	0.164	2.721	0.584	0.8	1	8.085			
			C	0.164	2.721	0.584	0.8	1	8.085			
T1 100-80	144.00	953.38	A	0.16	2.734	0.583	0.8	1	9.675	1430.40	71.52	C
			B	0.16	2.734	0.583	0.8	1	9.675			
			C	0.16	2.734	0.583	0.8	1	9.675			
T2 80-60	144.00	1376.80	A	0.145	2.791	0.581	0.8	1	11.785	1481.56	74.08	C
			B	0.145	2.791	0.581	0.8	1	11.785			
			C	0.145	2.791	0.581	0.8	1	11.785			
T3 60-40	144.00	1887.96	A	0.136	2.823	0.579	0.8	1	13.960	1483.94	74.20	C
			B	0.136	2.823	0.579	0.8	1	13.960			
			C	0.136	2.823	0.579	0.8	1	13.960			
T4 40-20	144.00	2461.98	A	0.135	2.826	0.579	0.8	1	16.958	1478.23	73.91	C
			B	0.135	2.826	0.579	0.8	1	16.958			
			C	0.135	2.826	0.579	0.8	1	16.958			
T5 20-0	144.00	2788.04	A	0.127	2.859	0.578	0.8	1	18.631	1578.60	78.93	C
			B	0.127	2.859	0.578	0.8	1	18.631			
			C	0.127	2.859	0.578	0.8	1	18.631			
Sum Weight:	864.00	10352.79						OTM	520.41 kip-ft	8849.38		

Tower Forces - No Ice - Wind 90

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120-100	144.00	884.63	A	0.164	2.721	0.584	0.85	1	8.378	1417.78	70.89	C
			B	0.164	2.721	0.584	0.85	1	8.378			
			C	0.164	2.721	0.584	0.85	1	8.378			
T1 100-80	144.00	953.38	A	0.16	2.734	0.583	0.85	1	10.037	1455.17	72.76	C
			B	0.16	2.734	0.583	0.85	1	10.037			
			C	0.16	2.734	0.583	0.85	1	10.037			
T2 80-60	144.00	1376.80	A	0.145	2.791	0.581	0.85	1	12.219	1509.81	75.49	C
			B	0.145	2.791	0.581	0.85	1	12.219			
			C	0.145	2.791	0.581	0.85	1	12.219			
T3 60-40	144.00	1887.96	A	0.136	2.823	0.579	0.85	1	14.470	1514.45	75.72	C
			B	0.136	2.823	0.579	0.85	1	14.470			
			C	0.136	2.823	0.579	0.85	1	14.470			
T4 40-20	144.00	2461.98	A	0.135	2.826	0.579	0.85	1	17.625	1513.73	75.69	C
			B	0.135	2.826	0.579	0.85	1	17.625			
			C	0.135	2.826	0.579	0.85	1	17.625			
T5 20-0	144.00	2788.04	A	0.127	2.859	0.578	0.85	1	19.373	1618.55	80.93	C
			B	0.127	2.859	0.578	0.85	1	19.373			
			C	0.127	2.859	0.578	0.85	1	19.373			
Sum Weight:	864.00	10352.79						OTM	529.93 kip-ft	9029.50		

Tower Forces - With Ice - Wind Normal (180)

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120-100	378.00	1253.83	A	0.242	2.463	0.6	1	1	13.948	1638.58	81.93	C
			B	0.242	2.463	0.6	1	1	13.948			
			C	0.242	2.463	0.6	1	1	13.948			
T1 100-80	378.00	1313.79	A	0.232	2.494	0.597	1	1	16.422	1670.47	83.52	C
			B	0.232	2.494	0.597	1	1	16.422			
			C	0.232	2.494	0.597	1	1	16.422			
T2 80-60	378.00	1809.30	A	0.203	2.585	0.591	1	1	19.435	1716.00	85.80	C
			B	0.203	2.585	0.591	1	1	19.435			
			C	0.203	2.585	0.591	1	1	19.435			
T3 60-40	378.00	2382.06	A	0.183	2.654	0.587	1	1	21.920	1683.79	84.19	C
			B	0.183	2.654	0.587	1	1	21.920			
			C	0.183	2.654	0.587	1	1	21.920			
T4 40-20	378.00	3064.90	A	0.177	2.674	0.586	1	1	26.102	1657.94	82.90	C
			B	0.177	2.674	0.586	1	1	26.102			
			C	0.177	2.674	0.586	1	1	26.102			
T5 20-0	378.00	3439.15	A	0.162	2.728	0.583	1	1	27.905	1746.51	87.33	C
			B	0.162	2.728	0.583	1	1	27.905			
			C	0.162	2.728	0.583	1	1	27.905			
Sum Weight:	2268.00	13263.02						OTM	602.10 kip-ft	10113.30		

Tower Forces - With Ice - Wind 60 (0)

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120-100	378.00	1253.83	A	0.242	2.463	0.6	0.8	1	12.258	1556.36	77.82	C
			B	0.242	2.463	0.6	0.8	1	12.258			
			C	0.242	2.463	0.6	0.8	1	12.258			
T1 100-80	378.00	1313.79	A	0.232	2.494	0.597	0.8	1	14.334	1573.31	78.67	C
			B	0.232	2.494	0.597	0.8	1	14.334			
			C	0.232	2.494	0.597	0.8	1	14.334			
T2 80-60	378.00	1809.30	A	0.203	2.585	0.591	0.8	1	16.928	1603.49	80.17	C
			B	0.203	2.585	0.591	0.8	1	16.928			
			C	0.203	2.585	0.591	0.8	1	16.928			
T3 60-40	378.00	2382.06	A	0.183	2.654	0.587	0.8	1	19.103	1565.89	78.29	C
			B	0.183	2.654	0.587	0.8	1	19.103			
			C	0.183	2.654	0.587	0.8	1	19.103			
T4 40-20	378.00	3064.90	A	0.177	2.674	0.586	0.8	1	22.544	1524.70	76.23	C
			B	0.177	2.674	0.586	0.8	1	22.544			
			C	0.177	2.674	0.586	0.8	1	22.544			
T5 20-0	378.00	3439.15	A	0.162	2.728	0.583	0.8	1	24.076	1600.24	80.01	C
			B	0.162	2.728	0.583	0.8	1	24.076			
			C	0.162	2.728	0.583	0.8	1	24.076			
Sum Weight:	2268.00	13263.02						OTM	565.08 kip-ft	9423.99		

Tower Forces - With Ice - Wind 90

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120-100	378.00	1253.83	A	0.242	2.463	0.6	0.85	1	12.681	1576.92	78.85	C
			B	0.242	2.463	0.6	0.85	1	12.681			
			C	0.242	2.463	0.6	0.85	1	12.681			
T1 100-80	378.00	1313.79	A	0.232	2.494	0.597	0.85	1	14.856	1597.60	79.88	C
			B	0.232	2.494	0.597	0.85	1	14.856			
			C	0.232	2.494	0.597	0.85	1	14.856			
T2 80-60	378.00	1809.30	A	0.203	2.585	0.591	0.85	1	17.555	1631.62	81.58	C
			B	0.203	2.585	0.591	0.85	1	17.555			
			C	0.203	2.585	0.591	0.85	1	17.555			
T3 60-40	378.00	2382.06	A	0.183	2.654	0.587	0.85	1	19.807	1595.36	79.77	C
			B	0.183	2.654	0.587	0.85	1	19.807			
			C	0.183	2.654	0.587	0.85	1	19.807			
T4 40-20	378.00	3064.90	A	0.177	2.674	0.586	0.85	1	23.433	1558.01	77.90	C
			B	0.177	2.674	0.586	0.85	1	23.433			
			C	0.177	2.674	0.586	0.85	1	23.433			
T5 20-0	378.00	3439.15	A	0.162	2.728	0.583	0.85	1	25.033	1636.81	81.84	C
			B	0.162	2.728	0.583	0.85	1	25.033			
			C	0.162	2.728	0.583	0.85	1	25.033			
Sum Weight:	2268.00	13263.02						OTM	574.33 kip-ft	9596.31		

Discrete Forces - No Ice

Section Elevation ft	Add Weight lb	z ft	K_z	q_z psf	G_H	C_AA_C ft^2	t_z in	F_C lb
120	270.00	120.00	1.446	24	1.149	54.00		1469.96
120	1340.00	120.00	1.446	24	1.149	15.30		416.49
Sum Weight:	1610.00					OTM	226.37 kip-ft	1886.45

Discrete Forces - With Ice

Section Elevation ft	Add Weight lb	z ft	K_z	q_z psf	G_H	C_AA_C ft^2	t_z in	F_C lb
120	720.00	120.00	1.446	18	1.149	59.40	0.5000	1202.86
120	2080.00	120.00	1.446	18	1.149	17.00	0.5000	344.25
Sum Weight:	2800.00					OTM	185.65 kip-ft	1547.12

Force Totals

Load Case	Sum of Forces lb	Total Weight lb	Sum of Torques kip-ft	Sum of Offset Weight Overturning Moments, M_x kip-ft	Sum of Offset Weight Overturning Moments, M_z kip-ft	Sum of Wind Overturning Moments kip-ft
Leg Weight		7242.21				
Bracing Weight		3110.58				
Total Member Self-Weight		10352.79				
Wind Normal	11456.32	12826.79	0.00	0.00	0.00	784.87
Wind 60	10735.82	12826.79	0.00	0.00	0.00	746.78
Wind 90	10915.95	12826.79	0.00	0.00	0.00	756.30
Member Ice		2910.23				
Wind Normal - Ice	11660.41	18331.02	0.00	0.00	0.00	787.75
Wind 60 - Ice	10971.10	18331.02	0.00	0.00	0.00	750.73
Wind 90 - Ice	11143.43	18331.02	0.00	0.00	0.00	759.99

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind Normal
3	Dead+Wind 60
4	Dead+Wind 90
5	Dead+Ice+Temp
6	Dead+Wind Normal+Ice+Temp
7	Dead+Wind 60+Ice+Temp
8	Dead+Wind 90+Ice+Temp

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	120 - 100	Leg	Max Tension	3	14473.27	-0.01	-0.04
			Max. Compression	2	-16384.50	-0.02	0.06
			Max. Mx	4	13056.69	-0.05	-0.01
			Max. My	6	-15331.05	-0.02	0.06
			Max. Vy	4	-666.19	0.00	0.00
			Max. Vx	2	667.97	0.00	0.00
		Diagonal	Max Tension	4	2957.94	0.00	0.00
			Max. Compression	4	-3250.62	0.00	0.00
			Max. Mx	6	-1481.11	0.01	0.00
			Max. Vy	6	10.28	0.00	0.00
		Horizontal	Max Tension	7	138.11	0.00	0.00
			Max. Compression	6	-139.25	0.00	0.00
			Max. Vx	8	-5.71	0.00	0.00
		Top Girt	Max Tension	3	768.08	0.00	0.00
			Max. Compression	2	-769.61	0.00	0.00
			Max. Vx	8	-5.71	0.00	0.00
		Bottom Girt	Max Tension	4	967.61	0.00	0.00
			Max. Compression	2	-928.16	0.00	0.00
			Max. Vx	8	-5.71	0.00	0.00
T1	100 - 80	Leg	Max Tension	3	28383.47	-0.05	-0.00
			Max. Compression	2	-31551.38	0.05	-0.00
			Max. Mx	6	-21998.01	0.06	0.01
			Max. My	4	-1019.27	-0.00	0.07
			Max. Vy	6	-59.45	0.06	0.01
			Max. Vx	8	61.03	-0.01	0.07
		Diagonal	Max Tension	8	1204.68	0.00	0.00
			Max. Compression	8	-1203.15	0.00	0.00
			Max. My	6	1087.76	-0.00	-0.01
			Max. Vy	7	-0.89	0.00	0.00
			Max. Vx	6	6.87	0.00	-0.01
T2	80 - 60	Leg	Max Tension	3	40419.61	-0.06	0.00
			Max. Compression	2	-45251.61	0.09	0.00
			Max. Mx	6	-44922.30	0.09	0.00
			Max. My	8	-2733.81	-0.00	0.08
			Max. Vy	6	-62.76	0.09	0.00
			Max. Vx	8	-59.53	-0.00	0.07
		Diagonal	Max Tension	8	1400.05	0.00	0.00
			Max. Compression	8	-1405.32	0.00	0.00
			Max. My	6	1241.82	0.00	-0.01
			Max. Vy	6	0.43	-0.00	-0.01
			Max. Vx	7	-7.47	0.00	-0.01
T3	60 - 40	Leg	Max Tension	3	51548.81	-0.09	0.00
			Max. Compression	6	-58867.51	0.13	0.00
			Max. Mx	6	-58867.51	0.13	0.00
			Max. My	8	-3633.04	0.00	0.12
			Max. Vy	6	-76.39	0.13	0.00
			Max. Vx	8	-71.97	-0.00	0.11
		Diagonal	Max Tension	8	1702.98	0.00	0.00
			Max. Compression	8	-1720.68	0.00	0.00
			Max. My	6	1503.00	0.00	-0.01
			Max. Vy	6	0.54	-0.00	-0.01
			Max. Vx	7	-10.28	0.00	-0.01
T4	40 - 20	Leg	Max Tension	3	62591.20	-0.13	0.00
			Max. Compression	6	-73262.34	0.02	0.00
			Max. Mx	6	-62319.62	0.13	0.00
			Max. My	8	-4764.80	-0.01	0.14
			Max. Vy	6	87.93	0.13	-0.00
			Max. Vx	8	-69.90	-0.01	0.14
		Diagonal	Max Tension	8	1939.42	0.00	0.00
			Max. Compression	8	-1955.99	0.00	0.00
			Max. My	6	1729.06	0.00	-0.02

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	6	0.80	-0.00	-0.02
			Max. Vx	7	-16.06	0.00	-0.02
T5	20 - 0	Leg	Max Tension	3	71900.14	0.16	0.00
			Max. Compression	6	-85627.28	0.00	-0.00
			Max. Mx	6	-78336.60	0.42	0.00
			Max. My	8	-5320.95	-0.05	0.45
			Max. Vy	6	-204.79	0.41	0.00
			Max. Vx	8	-168.61	-0.05	0.45
		Diagonal	Max Tension	8	2707.52	0.01	-0.04
			Max. Compression	8	-2869.97	0.00	0.00
			Max. Mx	6	2139.93	-0.01	-0.05
			Max. My	6	2140.01	0.01	-0.05
			Max. Vy	6	2.15	-0.01	-0.05
			Max. Vx	8	-23.34	0.01	-0.04
		Secondary Horiz	Max Tension	6	205.13	-0.00	-0.01
			Max. Compression	3	-180.20	0.00	0.00
			Max. My	8	-32.25	0.00	-0.02
			Max. Vy	7	-0.96	0.00	0.00
			Max. Vx	8	13.27	0.00	-0.02

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	7	45814.45	2744.91	-2427.90
	Max. H_x	7	45814.45	2744.91	-2427.90
	Max. H_z	4	-65004.04	-4833.27	2312.98
	Min. Vert	4	-65004.04	-4833.27	2312.98
	Min. H_x	8	-63506.98	-4833.98	2294.63
	Min. H_z	7	45814.45	2744.91	-2427.90
Leg B	Max. Vert	8	75727.66	-5449.94	-2650.24
	Max. H_x	2	-37233.84	2334.58	2227.05
	Max. H_z	2	-37233.84	2334.58	2227.05
	Min. Vert	2	-37233.84	2334.58	2227.05
	Min. H_x	8	75727.66	-5449.94	-2650.24
	Min. H_z	8	75727.66	-5449.94	-2650.24
Leg A	Max. Vert	6	89434.31	0.03	7220.38
	Max. H_x	6	89434.31	0.03	7220.38
	Max. H_z	6	89434.31	0.03	7220.38
	Min. Vert	3	-74714.43	0.01	-6103.68
	Min. H_x	8	6110.34	-859.50	355.61
	Min. H_z	7	-73297.89	0.02	-6115.36

Tower Mast Reaction Summary

Load Combination	Torsion kip-ft	Shear lb	Vertical lb	Overturning kip-ft
Dead Only	0.00	0.00	12826.79	0.00
Dead+Wind Normal	0.00	11456.32	12826.79	784.87
Dead+Wind 60	0.00	10735.82	12826.79	746.78
Dead+Wind 90	0.00	10915.95	12826.79	756.30
Dead+Ice+Temp	0.00	0.00	18331.02	0.00
Dead+Wind Normal+Ice+Temp	0.00	11660.41	18331.02	787.75

Load Combination	Torsion kip-ft	Shear lb	Vertical lb	Overturning kip-ft
Dead+Wind 60+Ice+Temp	0.00	10971.10	18331.02	750.73
Dead+Wind 90+Ice+Temp	0.00	11143.43	18331.02	759.99

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-12826.79	0.00	0.00	12826.79	0.00	0.000%
2	0.00	-12826.79	-11456.32	0.00	12826.79	11456.32	0.000%
3	0.00	-12826.79	10735.82	0.00	12826.79	-10735.82	0.000%
4	10915.95	-12826.79	0.00	-10915.95	12826.79	0.00	0.000%
5	0.00	-18331.02	0.00	0.00	18331.02	0.00	0.000%
6	0.00	-18331.02	-11660.41	0.00	18331.02	11660.41	0.000%
7	0.00	-18331.02	10971.10	0.00	18331.02	-10971.10	0.000%
8	11143.43	-18331.02	0.00	-11143.43	18331.02	0.00	0.000%

Maximum Tower Deflections

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt deg	Twist deg
L1	120 - 100	5.504	2	0.4634	0.0048
T1	100 - 80	3.606	2	0.3964	0.0000
T2	80 - 60	2.164	2	0.2701	0.0000
T3	60 - 40	1.178	2	0.1787	0.0000
T4	40 - 20	0.526	6	0.1117	0.0000
T5	20 - 0	0.145	6	0.0523	0.0000

Critical Deflections and Radius of Curvature

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt deg	Twist deg	Radius of Curvature ft
120.00	(9) FV90-12	2	5.504	0.4634	0.0048	Inf
120.00	Pirod 13' Low Profile Platform	2	5.504	0.4634	0.0048	Inf

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Controlling Element	% Capacity	Pass Fail
L1	120 - 100	Leg	1 3/4	3	41.2	Pass
		Diagonal	2L1 1/2x1 1/2x3/16x3/8	10	33.5	Pass
		Horizontal	L1 1/2x1 1/2x3/16	32	2.6	Pass
		Top Girt	L1 1/2x1 1/2x3/16	6	14.3	Pass
		Bottom Girt	L1 1/2x1 1/2x3/16	9	17.3	Pass
T1	100 - 80	Leg	2	39	48.3	Pass
		Diagonal	L1 1/2x1 1/2x3/16	41	19.8	Pass
T2	80 - 60	Leg	2 1/2	72	35.2	Pass

Section No.	Elevation ft	Component Type	Size	Controlling Element	% Capacity	Pass Fail
		Diagonal	L1 1/2x1 1/2x3/16	74	32.5	Pass
T3	60 - 40	Leg	3	105	32.9	Pass
		Diagonal	L1 3/4x1 3/4x3/16	107	37.8	Pass
T4	40 - 20	Leg	3 1/4	132	32.8	Pass
		Diagonal	L2x2x1/4	134	28.3	Pass
T5	20 - 0	Leg	3 1/2	159	32.3	Pass
		Diagonal	L2 1/2x2 1/2x1/4	161	41.0	Pass
		Secondary Horiz	L1 3/4x1 3/4x3/16	168	4.9	Pass
					Summary	
				Latticed Pole Leg	41.2	Pass
				Latticed Pole Diagonal	33.5	Pass
				Latticed Pole Horizontal	2.6	Pass
				Latticed Pole Top Girt	14.3	Pass
				Latticed Pole Bottom Girt	17.3	Pass
				Leg	48.3	Pass
				Diagonal	41.0	Pass
				Secondary Horiz	4.9	Pass
				RATING =	**48.3**	**Pass**