STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square
New Britain, Connecticut 06051
Phone: (860) 827-2935
Fax: (860) 827-2950

December 19, 2000

Sandy M. Carter
Verizon Wireless
20 Alexander Drive
P.O. Box 5029
Wallingford, CT 06492

RE: **TS-VER-014-001117** - Cellco Partnership d/b/a Verizon Wireless request for an order to approve tower sharing at an existing telecommunications facility located at 850 West Main Street, Branford, Connecticut.

Dear Ms. Carter:

At a public meeting held December 14, 2000, the Connecticut Siting Council (Council) ruled that the shared use of this existing tower site is technically, legally, environmentally, and economically feasible and meets public safety concerns, and therefore, in compliance with General Statutes § 16-50aa, the Council has ordered the shared use of this facility to avoid the unnecessary proliferation of tower structures with the condition that the equipment building be relocated or the parking lot be modified. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Any additional change to this facility may require an explicit request to this agency pursuant to General Statutes § 16-50aa or notice pursuant to Regulations of Connecticut State Agencies Section 16-50j-73, as applicable. Such request or notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

This decision applies only to this request for tower sharing and is not applicable to any other request or construction.

The proposed shared use is to be implemented as specified in your letter dated November 16, 2000, and additional information received December 12, 2000.

Thank you for your attention and cooperation.

Very truly yours,

Mortimer A. Gelston
Chairman

MAG/FOC/laf

c: Honorable Anthony J. DaRos, First Selectman, Town of Branford
Julie M. Cashin, Esq., Hurwitz & Sagarin LLC

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H. E. Bergeron Engineers
• Civil • Structural • Land Surveying

☒ P.O. Box 440
2605 White Mountain Highway
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Portland, ME 04101
(207) 780-1100
(207) 780-1101 (fax)
www.hebcivil.com

TS-Ver-014-001117
Supplemental

HEB

STRUCTURAL ANALYSIS REPORT OF 120' MONOPOLE TOWER BRANFORD, CONNECTICUT

Prepared for Verizon Wireless
Sprint PCS Site #CT03XC048

November 29, 2000

RECEIVED
DEC 12 2000
CONNECTICUT SITING COUNCIL

STATE OF CONNECTICUT
ROBERT E. ADAIR
No. 20278
LICENSED PROFESSIONAL ENGINEER

Prepared by: H. E. Bergeron Engineers, P.A.
P.O. Box 440, 2605 White Mountain Highway
North Conway, NH 03860
HEB Project No. 2000-210

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HEB

STRUCTURAL ANALYSIS REPORT
of
120' MONOPOLE TOWER
BRANFORD, CONNECTICUT
prepared for
Verizon Wireless
Sprint PCS Site #CT03XC048

EXECUTIVE SUMMARY:

H. E. Bergeron Engineers, P.A. (HEB) performed a structural analysis of this 120-foot Summit monopole tower located in Branford, Connecticut. The analysis was performed with the addition of twelve DB844 panel antennas on a low-profile platform at 110'.

Our analysis indicates the tower and foundation are capable of supporting the proposed antennas.

INTRODUCTION:

A structural analysis of this communications tower was performed by H. E. Bergeron Engineers, P.A. (HEB) for Verizon Wireless. The tower is located at 870 West Main Street in Branford, Connecticut. Robert E. Adair, P.E. visited the site on November 16, 2000 to record information regarding physical and dimensional properties of the structure and its associated appurtenances. Mr. Adair climbed the structure in its entirety to compile data necessary to perform the structural analysis.

The structure is a 120-foot, galvanized steel monopole manufactured by Summit Manufacturing, Inc. The analysis was conducted with the following antenna inventory:

- (12) DB980H90 panel antennas on 16' low-profile platform at 120' (note: there are currently six panels installed)
- (12) DB844H90 panel antennas on a low profile platform 110' (proposed)
- GPS antenna on 3' sidearm at 50'

For the purpose of the analysis, all waveguide cables were assumed to be 1-5/8" diameter installed on the inside of the pole.

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STRUCTURAL ANALYSIS:

Methodology:

The structural analysis was done in accordance with TIA/EIA-222-F (EIA), Structural Standards for Steel Antenna Towers and Antenna Supporting Structures; and the American Institute of Steel Construction (AISC), Manual of Steel Construction, Allowable Stress Design, Ninth Edition.

The analysis was conducted using a wind speed of 85 miles per hour and one-half inch of radial ice over the entire structure and all appurtenances. The TIA/EIA Standard requires a minimum of 85-mph wind load for New Haven County, Connecticut.

Two analytical methods were used to evaluate the structure: a two-dimensional linear computer model developed by HEB, and a P-delta analysis using CSTRAAD finite element software distributed by ECOM Associates. The HEB 2-D model was used to generate dead loads of the tower and all of its appurtenances, radial ice loads and the resultant wind loading. The maximum bending moments and axial loads were used to calculate combined axial and bending stresses at intervals on the monopole, which were compared to allowable stresses according to AISC and TIA/EIA.

Loads generated in the 2-D model were input into the CSTRAAD program to evaluate secondary bending moments induced during deflection of the structure under load and to independently evaluate stresses. Evaluation of secondary bending moments is required by EIA paragraph 3.1.15. Our analysis indicates that the secondary moments exceed those of the linear analysis, and therefore govern in determining the capacity of the structure.

EIA requires two loading conditions to be evaluated to determine the tower's capacity. The higher stresses resulting from the two cases is used to calculate the tower capacity:

- Case 1 = Wind Load (without ice) + Tower Dead Load (controls)
- Case 2 = **0.75** Wind Load (with ice) + Ice Load + Tower Dead Load

EIA permits a one-third increase in allowable stresses for towers less than 700-feet tall. Allowable stresses of tower members were increased by one-third in computing the load capacity values indicated herein.

HEB

ANALYSIS RESULTS:

Our analysis determined the tower will support the proposed antennae in addition to its current loading. Supporting calculations are provided in Appendix C.

The following table summarizes the capacity of the tower based on combined axial and bending stresses:

Section	Capacity
1	54%
2	50%
3	35%

The capability of the existing foundation to support the proposed load was evaluated by comparing design reactions with those imposed by the proposed loading. We calculated the reactions under the proposed loading to be less than design reactions, thus the existing foundation is adequate to support the proposed loads, provided it was constructed in accordance with design drawings.

Base reactions imposed with the proposed antennas were calculated to be as follows:

Compression:	22.2 kips
Shear:	16.7 kips
Overturning Moment:	1246.6 ft-kips

CONCLUSIONS AND SUGGESTIONS:

As detailed above, our analysis indicates that the 120' Summit monopole tower and foundation at 870 West Main Street in Branford, Connecticut are capable of supporting the additional antenna loading proposed by the Verizon Wireless.

LIMITATIONS:

This report is based on the following:

1. Tower is properly installed and maintained.
2. All members are in new condition.
3. All required members are in place.
4. All bolts are in place and are properly tightened.

HEB

5. Tower is in plumb condition.
6. All members are galvanized.
7. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
8. Record drawings accurately reflect tower dimensions and height.

H. E. Bergeron Engineers, P.A. (HEB) is not responsible for any modifications completed prior to or hereafter which HEB is not or was not directly involved. Modifications include but are not limited to:

1. Adding or relocating antennas.
2. Installing antenna mounting gates or side arms.
3. Extending tower.

HEB hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon the information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact HEB. HEB disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

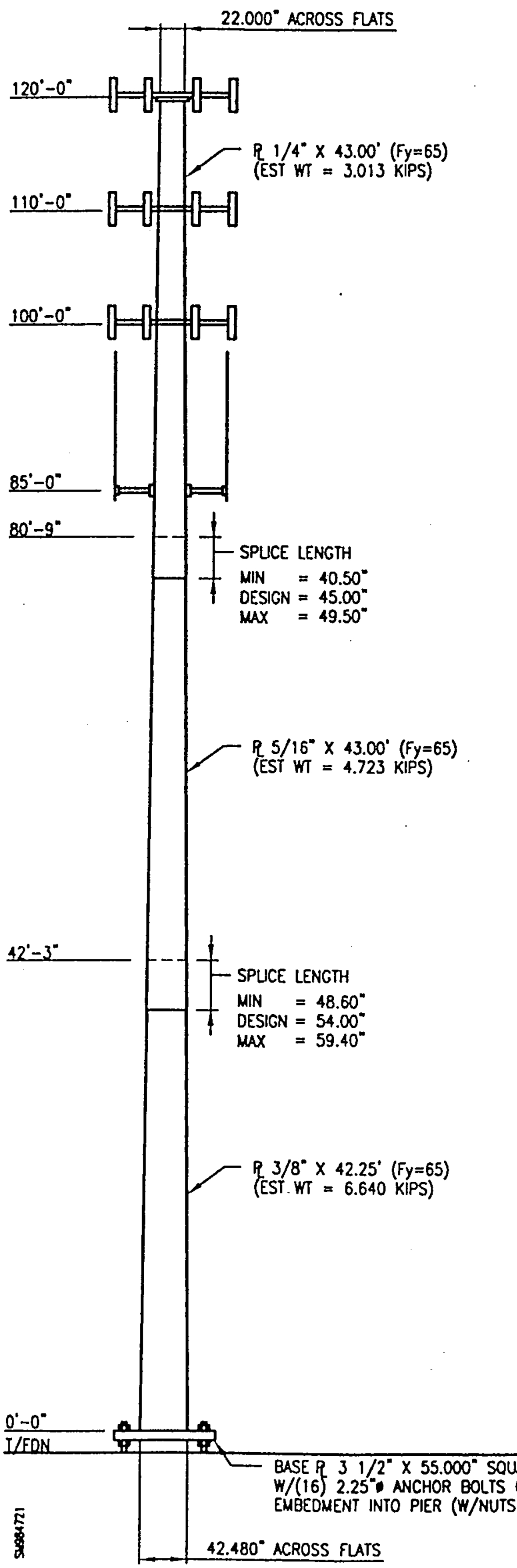
Appendix A

Drawings

SUMMIT MANUFACTURING INC.

225 KIWANIS BOULEVARD, WEST HAZLETON, PA 18201
PHONE: (717) 454-8730 E-MAIL: SUMMITLG@EPIX.NET
FAX: (717) 454-5946 WWW.SUMMITMFGINC.COM

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street, Suite 500, Columbus, Ohio 43215
(614) 221-6679 Fax: (614) 221-0166 www.PJFweb.com



JOB DATA			
Page 1 of 2		Job No.	29298-472
By	RKT	Design No.	SUMMIT JOB #3734
Chk'd By	KJS	Date	06-26-1998
		Rev. No.	Rev. Date
Pole	120 FT POLE		
Site	CT03XC048 – TARTAGLIA PROPERTY; BRANFORD, CT		
Owner	SPRINT SPECTRUM		
Ref. No.			
Design	90 MPH/78 MPH+1/2" ICE ACCORDING TO TIA/EIA-222-F 1996		

LOAD CASES		
CASE 1	90 MPH WITH NO ICE	DESIGN WIND
CASE 2	78 MPH WITH 1/2" RADIAL ICE	REDUCED WIND WITH ICE
CASE 3	50 MPH WITH NO ICE	OPERATIONAL WIND

POLE SPECIFICATIONS	
Pole Shape Type:	12-SIDED POLYGON
Taper:	0.180042 IN/FT
Shaft Steel:	ASTM A572 GRADE 65
Base PL Steel:	ASTM A572 GRADE 50 (50 KSI)
Anchor Bolts:	2 1/4"ø x 8'-0" LONG #18J ASTM A615 GRADE 75

ANTENNA LIST

No.	Elev.	Description
–	TOP	5/8" LIGHTNING ROD
1-12	TOP	(12) DB980H PCS
–	TOP	14' LOW PROFILE PLATFORM
13-24	110.00	(12) PANEL ANTENNA (CaAa=3.9 S.F. EACH)
–	110.00	14' LOW PROFILE PLATFORM (CLAMP ON)
25-36	100.00	(12) PANEL ANTENNA (CaAa=3.9 S.F. EACH)
–	100.00	14' LOW PROFILE PLATFORM (CLAMP ON)
37-38	85.00	(2) 20' X 3" WHIP ANTENNA
–	85.00	(2) 6' CLAMP STIFF ARMS
–	50.00	GPS ANTENNA W/ MOUNT

STEP BOLTS FULL HEIGHT.
ANTENNA FEED LINES RUN INSIDE OF POLE.

STATE OF CONNECTICUT · KEVIN P. BAUMAN · No. 17891 · LICENSED · PROFESSIONAL ENGINEER

7-7-98

Elevation	90 MPH WIND		50 MPH WIND	
	Lateral Deflection (Inches)	Rotation (sway) (degrees)	Lateral Deflection (Inches)	Rotation (sway) (degrees)
TOP	85.3	5.702	26.3	1.760

SHAFT SECTION DATA

Shaft Section	Section Length (feet)	Plate Thickness (in.)	Lap Splice (in.)	Diameter Across Flats (inches) @ Top	Diameter Across Flats (inches) @ Bottom
1	43.00	0.2500	45.00	22.000	29.742
2	43.00	0.3125	54.00	28.567	36.308
3	42.25	0.3750		34.873	42.480

NOTE: ANCHOR BOLTS AND FOUNDATION HAVE BEEN DESIGNED TO ACCOMMODATE A 150-FT MONOPOLE.

UNFACTORED BASE REACTIONS

MOMENT =	2350 ft-kips	
SHEAR =	28 kips	
AXIAL =	27 kips	

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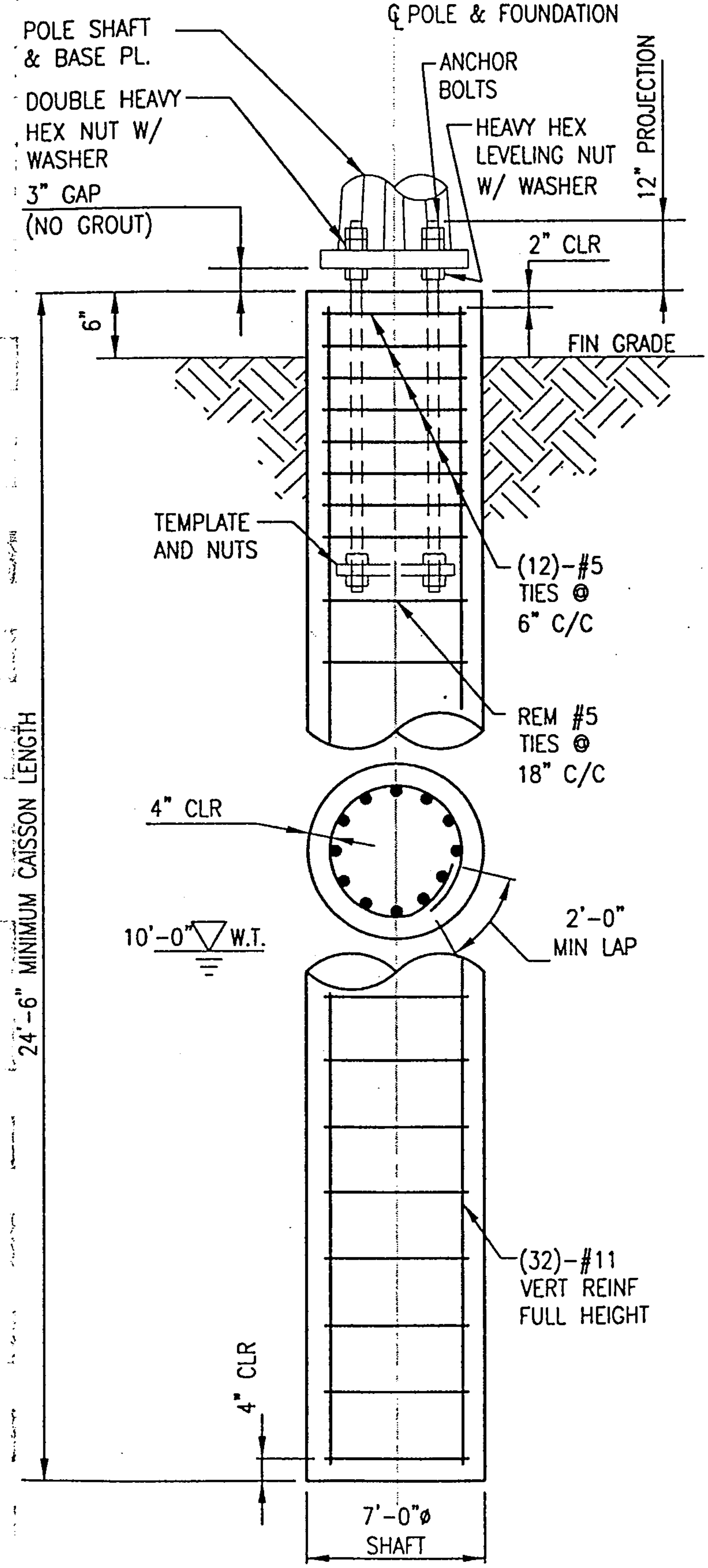

JOB DATA			
Page 2 of 2		Job No.	29298-472
By	SWL	Design No.	SUMMIT JOB #3734
Chk'd By	KJS	Date	06-26-1998
		Rev. No.	Rev. Date
Pole	120 FT POLE		
Site	CT03XC048 – TARTAGLIA PROPERTY; BRANFORD, CT		
Owner	SPRINT SPECTRUM		
Ref. No.			
Design	90 MPH/78 MPH+1/2" ICE ACCORDING TO TIA/EIA-222-F 1996		

THERE ARE TWO NOTCHES ON THE ANCHOR BOLT TEMPLATES LOCATED 180° APART. THE CONTRACTOR SHALL POSITION THE ANCHOR BOLTS AND TEMPLATES IN THE FOUNDATION SUCH THAT A LINE DEFINED BY THESE TWO NOTCHES ARE ALIGNED IN THE DIRECTION OF THE EQUIPMENT SHELTER OR COMPONENTS. THIS IS REQUIRED SO THAT THE POLE SHAFT EXIT PORTS CAN BE ORIENTED PROPERLY.

NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS. CONCRETE SHALL BE AIR ENTRAINED (6±1.5%). CONCRETE SHALL HAVE A MAXIMUM WATER/CEMENT RATIO OF 0.4. SLUMP OF CONCRETE SHALL BE LIMITED TO A MINIMUM OF 2" AND A MAXIMUM OF 6". A SUPERPLASTICIZER MAY BE USED TO INCREASE THE FLOWABILITY OF THE CONCRETE. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH "THE BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", ACI 318, LATEST EDITION.

2. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-615 (GRADE 60) EXCEPT THAT CAISSON TIES MAY BE ASTM A-615 (GRADE 40). ALL REINFORCING DETAILS SHALL CONFORM TO "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES", ACI 315, LATEST EDITION, UNLESS DETAILED OTHERWISE ON THIS DRAWING.

3. SEE PAGE 1 FOR ANCHOR BOLT QUANTITY, SIZE, LENGTH, AND BOLT CIRCLE.

4. TOTAL CONCRETE = 35 CUBIC YARDS.

5. FOUNDATION DESIGN IS BASED UPON GEOTECHNICAL EXPLORATION REPORT
PREPARED BY: GOODKIND &O'DEA, INC.
REPORT NO.: --DATA NOT AVAILABLE--
DATED: JUNE 1998

6. CONTRACTOR SHALL READ THE GEOTECHNICAL REPORT AND CONSULT THE GEOTECHNICAL ENGINEER AS NECESSARY PRIOR TO CONSTRUCTION.

7. GEOTECHNICAL REPORT INDICATES GROUNDWATER WAS ENCOUNTERED AT 10'-0" BELOW GRADE. CONTRACTOR SHOULD BE PREPAIRED TO CONTROL GROUNDWATER INFILTRATION.

8. THE FOUNDATION WAS DESIGNED USING THE FOLLOWING SERVICE LOADS:
MOMENT: 3311 FT-KIPS
SHEAR: 34 KIPS
AXIAL: 35 KIPS

STATE OF CONNECTICUT ★ KEVIN P. BAUMAN ★ No. 17891 LICENSED PROFESSIONAL ENGINEER

CAISSON (DRILLED PIER) FOUNDATION

Appendix B

Photographs

120' SUMMIT MONOPOLE TOWER
BRANFORD, CONNECTICUT
PREPARED FOR VERIZON WIRELESS

HEB

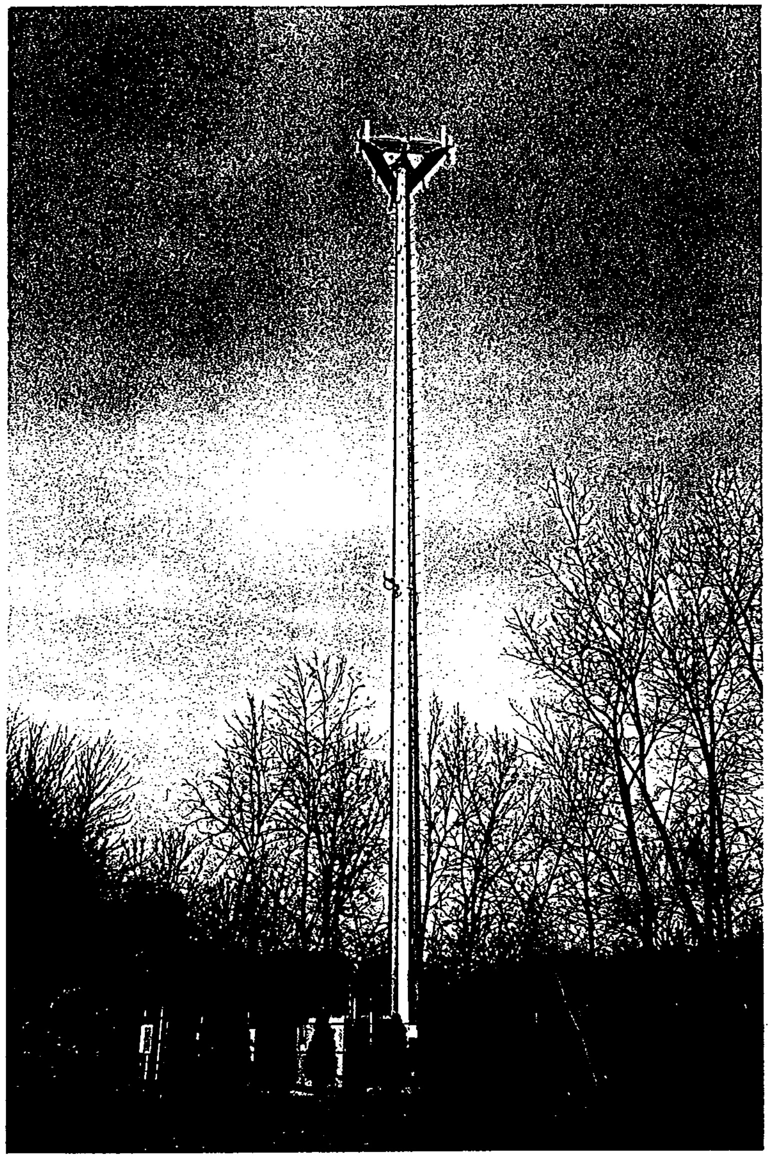

Photo showing overview of 120' Summit monopole tower located at 870 West Main Street in Branford, Connecticut.

Photos taken November 16, 2000 by H. E. Bergeron Engineers, P.A.

120' SUMMIT MONOPOLE TOWER
BRANFORD, CONNECTICUT
PREPARED FOR VERIZON WIRELESS

HEB

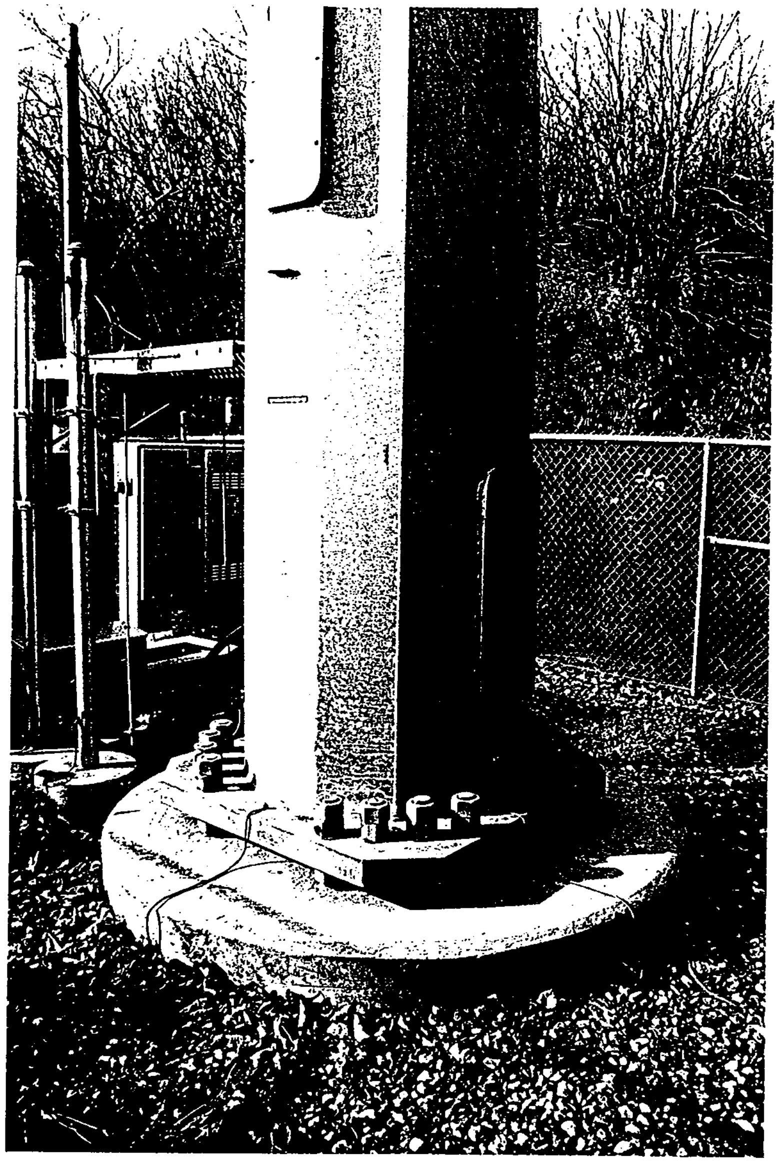

Photo of base of tower showing concrete foundation and anchor bolts.

Photos taken November 16, 2000 by H. E. Bergeron Engineers, P.A.

120' SUMMIT MONOPOLE TOWER
BRANFORD, CONNECTICUT
PREPARED FOR VERIZON WIRELESS

HEB

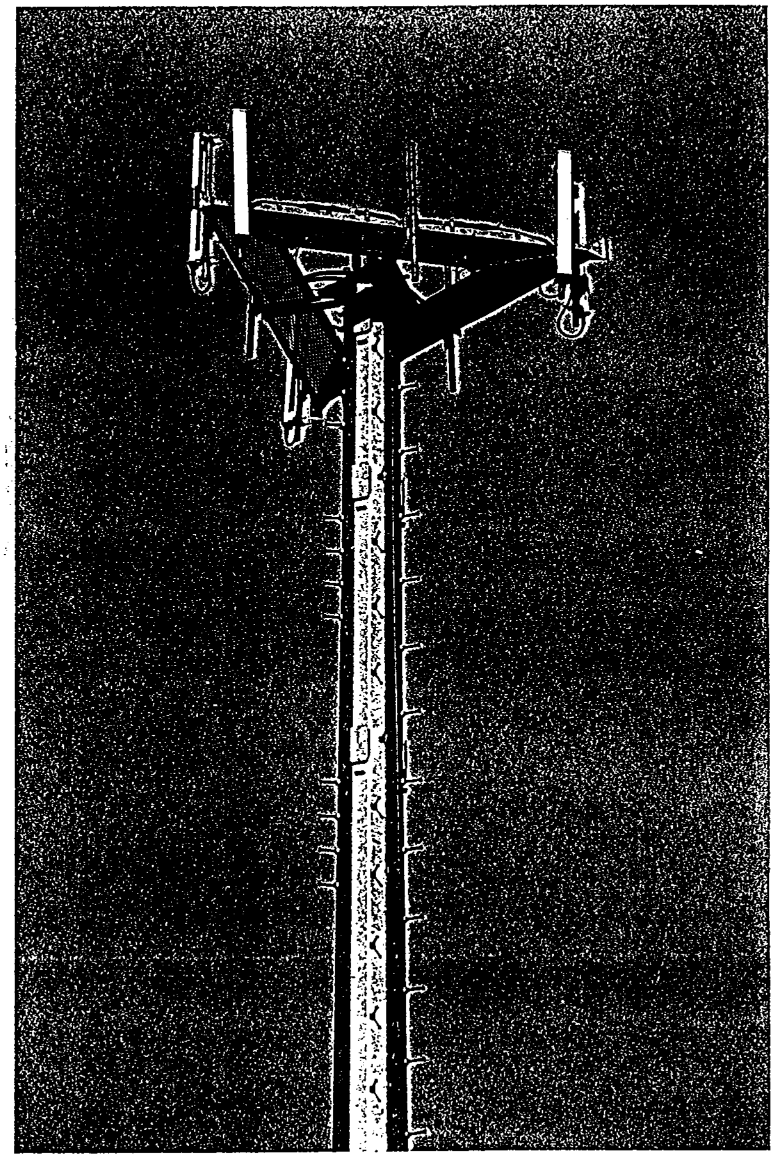

Photo of top of tower showing existing
panel antennas on low-profile platform.

Photos taken November 16, 2000 by H. E. Bergeron Engineers, P.A.

Appendix C

Calculations

H. E. BERGERON ENGINEERS
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client:	Verizon Wireless		
Job:	Branford, CT	Job No.:	2000-210
Calculated By:	J. Klementovich	Date:	22-Nov-00
Checked By:	RA	Date:	11/29

General Information

Tower Manufacturer	Summit	
Tower Type	Monopole	
Total Height of Tower	120	ft.
Wind Speed	85	mph.
Radial Ice	0.5	in.
75% Reduction for ice	yes	(yes or no)
1/3 increase for allowable loads	yes	(yes or no)
Number of faces	12	faces

Calculations based on EIA/TIA-222-F, using the following formulas:

Force on discrete appurtenance: F=Qz*Gh*Ca*A

Force on microwave antennae: F=Cr*A*Gh*Kz*V^2, where Cr=((Ca^2)+(Cs^2))^(1/2)

Gh=1.69 for monopoles Gh= 1.69

V as specified EIA-222-F

E (Modulus of Elasticity)	29000	ksi
Fb	0.6	
K	1	
Min. Width =	22.00	in
Max. Width =	42.48	in
Slope of Tower =	0.0142	in/in

Tower Information

Section	Length (ft.)	Midpt Elev.	Base Width (in.)	Top Width (in.)	Area (sf) w/o Ice	Area (sf) w/ Ice	Wall Thknss	Wt. (lbs) Tower	Wt. (lbs) Ice	
20		0.00	0.00	0.00	0.00	0.00		0.00	0.00	120.00
19		0.00	0.00	0.00	0.00	0.00		0.00	0.00	120.00
18		0.00	0.00	0.00	0.00	0.00		0.00	0.00	120.00
17		0.00	0.00	0.00	0.00	0.00		0.00	0.00	120.00
16		0.00	0.00	0.00	0.00	0.00		0.00	0.00	120.00
15	8.20	115.90	23.40	22.00	15.51	16.19	0.250	639.58	116.21	120.00
14	8.20	107.70	24.80	23.40	16.47	17.15	0.250	679.45	123.22	111.80
13	8.20	99.50	26.20	24.80	17.42	18.11	0.250	719.32	130.23	103.60
12	8.20	91.30	27.60	26.20	18.38	19.06	0.250	759.19	137.24	95.40
11	8.20	83.10	29.00	27.60	19.34	20.02	0.250	799.06	144.25	87.20
10	8.00	75.00	30.36	29.00	19.79	20.45	0.313	1021.93	147.49	79.00
9	8.00	67.00	31.73	30.36	20.70	21.36	0.313	1069.44	154.16	71.00
8	8.00	59.00	33.09	31.73	21.61	22.27	0.313	988.08	160.83	63.00
7	8.00	51.00	34.46	33.09	22.52	23.18	0.313	1030.11	167.50	55.00
6	8.00	43.00	35.82	34.46	23.43	24.09	0.313	1072.13	174.18	47.00
5	7.80	35.10	37.16	35.82	23.72	24.37	0.375	1298.65	176.25	39.00
4	7.80	27.30	38.49	37.16	24.58	25.23	0.375	1346.52	182.59	31.20
3	7.80	19.50	39.82	38.49	25.45	26.10	0.375	1394.38	188.93	23.40
2	7.80	11.70	41.15	39.82	26.31	26.96	0.375	1442.25	195.28	15.60
1	7.80	3.90	42.48	41.15	27.18	27.83	0.375	1490.12	201.62	7.80
	120.00							15750	2400	

H. E. BERGERON ENGINEERS, P.A.
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: **Verizon Wireless**
Job: **Branford, CT** Job No.: **2000-210**

Calculated By: **J. Klementovich** Date: **22-Nov-00**
Checked By: [signature] Date: 11/29

Section Properties

Section	I in⁴	I mid	r in	S in³	Area in²	Area mid	L / side in
Top	1058.74				17.48		
20	0.00	0.0	#DIV/0!	#DIV/0!	0.00	0.0	0.00
19	0.00	0.0	#DIV/0!	#DIV/0!	0.00	0.0	0.00
18	0.00	0.0	#DIV/0!	#DIV/0!	0.00	0.0	0.00
17	0.00	0.0	#DIV/0!	#DIV/0!	0.00	0.0	0.00
16	0.00	0.0	#DIV/0!	#DIV/0!	0.00	0.0	0.00
15	1276.53	1167.6	8.28	109.11	18.61	18.0	6.27
14	1522.30	1399.4	8.78	122.77	19.73	19.2	6.64
13	1797.75	1660.0	9.28	137.24	20.86	20.3	7.02
12	2104.57	1951.2	9.78	152.52	21.98	21.4	7.39
11	2444.45	2274.5	10.29	168.60	23.11	22.5	7.77
10	3495.64	2970.0	10.75	230.26	30.24	26.7	8.14
9	3994.06	3744.8	11.24	251.77	31.62	30.9	8.50
8	4537.74	4265.9	11.73	274.24	32.99	32.3	8.87
7	5128.66	4833.2	12.22	297.67	34.36	33.7	9.23
6	5768.76	5448.7	12.70	322.06	35.74	35.1	9.60
5	7679.53	6724.1	13.16	413.38	44.35	40.0	9.96
4	8543.86	8111.7	13.64	443.99	45.95	45.2	10.31
3	9470.72	9007.3	14.11	475.71	47.56	46.8	10.67
2	10462.31	9966.5	14.59	508.51	49.16	48.4	11.03
1	11520.80	10991.6	15.06	542.41	50.77	50.0	11.38

Tower Dead Load Summary

Elev.	Dead load Tower (lbs)	Dead load Ice (lbs)	
120.0	0	0	
120.0	0	0	
120.0	0	0	
120.0	0	0	
120.0	0	0	
120.0	0	0	
111.8	640	116	15
103.6	1319	239	14
95.4	2038	370	13
87.2	2798	507	12
79.0	3597	651	11
71.0	4619	799	10
63.0	5688	953	9
55.0	6676	1114	8
47.0	7706	1281	7
39.0	8778	1455	6
31.2	10077	1632	5
23.4	11423	1814	4
15.6	12818	2003	3
7.8	14260	2198	2
0.0	15750	2400	1

H. E. BERGERON ENGINEERS
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: Verizon Wireless
Job: Branford, CT — Job No.: 2000-210

Calculated By: J. Klementovich — Date: 22-Nov-00
Checked By: RAH — Date: 11/29

Antennae Summary

Input:
Wind Velocity= 85 mph
Tower Hgt= 120 ft.

ANTENNAS Type	Elev. (z)	Coeff. (C)	Kz	Qz	Area (no ice)	Area (ice)	Force (no ice)	Force (ice)	Weight
GPS	50	1.2	1.13	20.83	1.8		77	0	50
			1.00	18.50			0	0	
(12) DB980H90	120	1.4	1.45	26.75	36.0		2278	0	~~870~~ 1370
on low-profile plat.			1.00	18.50			0	0	
			1.00	18.50			0	0	
(12) DB844H90(E)-XY	110	1.4	1.41	26.09	34.7		2139	0	1120
(proposed)			1.00	18.50			0	0	
			1.00	18.50			0	0	
			1.00	18.50			0	0	
			1.00	18.50			0	0	
DISHES									Orient
		0.00000	1.00	18.50			0	0	
		0.00000	1.00	18.50			0	0	
		0.00000	1.00	18.50			0	0	
		0.00000	1.00	18.50			0	0	
		0.00000	1.00	18.50			0	0	
									2040

CABLES & LINEAR APPURT.

Section	Area w/o Ice	Area w/ Ice	Weight w/o Ice	Weight w/ Ice	
20	0.00	0.00	0	0	
19	0.00	0.00	0	0	
18	0.00	0.00	0	0	
17	0.00	0.00	0	0	
16	0.00	0.00	0	0	
15	0.26	0.94	154	154	120.0
14	0.26	0.94	154	154	111.8
13	0.26	0.94	154	154	103.6
12	0.26	0.94	154	154	95.4
11	0.26	0.94	154	154	87.2
10	0.25	0.92	150	150	79.0
9	0.25	0.92	150	150	71.0
8	0.25	0.92	150	150	63.0
7	0.25	0.92	150	150	55.0
6	0.25	0.92	150	150	47.0
5	0.24	0.89	146	146	39.0
4	0.24	0.89	146	146	31.2
3	0.24	0.89	146	146	23.4
2	0.24	0.89	146	146	15.6
1	0.24	0.89	146	146	7.8

H. E. BERGERON ENGINEERS
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: **Verizon Wireless**
Job: **Branford, CT** Job No.: **2000-210**

Calculated By: **J. Klementovich** Date: **22-Nov-00**
Checked By: [signature] Date: 11/29

Kz = Exposure coefficient = $(z/33)^{2/7}$; 1.00<=Kz<=2.58
Qz = Velocity pressure = .00256*Kz*V^2
Gh = Gust response factor = 1.69
Cf = Structure force coefficient from Table 1 of TIA/EIA
Aa and Ai = Areas of linear apputenances, w/o & with ice
Ae = Effective area = Avg. width*section length
Force = Qz*Gh*(Cf*Ae+Ca*Aa)

Wind Load Summary

Wind Velocity = 85 mph
Height of Tower = 120 feet

Wind Load Without Ice

Section	Midpoint Height	Areas Ae	Areas Aa	Kz	Qz	Gh	Cf	Wind Load	Wind Load
20	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
19	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
18	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
17	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
16	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
15	115.90	15.5	0.26	1.43	26.48	1.69	1.03	729 lbs.	89 plf.
14	107.70	16.5	0.26	1.40	25.93	1.69	1.03	757 lbs.	92 plf.
13	99.50	17.4	0.26	1.37	25.35	1.69	1.03	782 lbs.	95 plf.
12	91.30	18.4	0.26	1.34	24.74	1.69	1.03	804 lbs.	98 plf.
11	83.10	19.3	0.26	1.30	24.08	1.69	1.03	823 lbs.	100 plf.
10	75.00	19.8	0.25	1.26	23.39	1.69	1.03	817 lbs.	102 plf.
9	67.00	20.7	0.25	1.22	22.64	1.69	1.03	827 lbs.	103 plf.
8	59.00	21.6	0.25	1.18	21.84	1.69	1.03	832 lbs.	104 plf.
7	51.00	22.5	0.25	1.13	20.95	1.69	1.03	832 lbs.	104 plf.
6	43.00	23.4	0.25	1.08	19.95	1.69	1.03	824 lbs.	103 plf.
5	35.10	23.7	0.24	1.02	18.82	1.69	1.03	787 lbs.	101 plf.
4	27.30	24.6	0.24	1.00	18.50	1.69	1.03	801 lbs.	103 plf.
3	19.50	25.4	0.24	1.00	18.50	1.69	1.03	828 lbs.	106 plf.
2	11.70	26.3	0.24	1.00	18.50	1.69	1.03	856 lbs.	110 plf.
1	3.90	27.2	0.24	1.00	18.50	1.69	1.03	884 lbs.	113 plf.

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Client: **Verizon Wireless**
Job: **Branford, CT** Job No.: **2000-210**

Calculated By: **J. Klementovich** Date: **22-Nov-00**
Checked By: [signature] Date: 11/29

Wind Load With Ice

Section	Midpoint Height	Areas Ae	Ai	Kz	Qz	Gh	Cf	Wind Load	75% Wind Load
20	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
19	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
18	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
17	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
16	0.00	0.0	0.00	1.00	18.50	1.69	1.03	0 lbs.	##### plf.
15	115.90	16.2	0.94	1.43	26.48	1.69	1.03	797 lbs.	73 plf.
14	107.70	17.2	0.94	1.40	25.93	1.69	1.03	824 lbs.	75 plf.
13	99.50	18.1	0.94	1.37	25.35	1.69	1.03	847 lbs.	78 plf.
12	91.30	19.1	0.94	1.34	24.74	1.69	1.03	868 lbs.	79 plf.
11	83.10	20.0	0.94	1.30	24.08	1.69	1.03	885 lbs.	81 plf.
10	75.00	20.5	0.92	1.26	23.39	1.69	1.03	876 lbs.	82 plf.
9	67.00	21.4	0.92	1.22	22.64	1.69	1.03	884 lbs.	83 plf.
8	59.00	22.3	0.92	1.18	21.84	1.69	1.03	887 lbs.	83 plf.
7	51.00	23.2	0.92	1.13	20.95	1.69	1.03	884 lbs.	83 plf.
6	43.00	24.1	0.92	1.08	19.95	1.69	1.03	874 lbs.	82 plf.
5	35.10	24.4	0.89	1.02	18.82	1.69	1.03	833 lbs.	80 plf.
4	27.30	25.2	0.89	1.00	18.50	1.69	1.03	846 lbs.	81 plf.
3	19.50	26.1	0.89	1.00	18.50	1.69	1.03	874 lbs.	84 plf.
2	11.70	27.0	0.89	1.00	18.50	1.69	1.03	902 lbs.	87 plf.
1	3.90	27.8	0.89	1.00	18.50	1.69	1.03	930 lbs.	89 plf.

NODAL COORDINATES / BOUNDARY CONDITIONS (F=FIX, S=SUP, M=MASTER/SLAVE)

NODE NO	REBAND NO	X	Y	Z	NODE TEMP	ALPHA	BETA	GAMMA	DIR	DDDOOO XYZXYZ	STIFFNESS
Units:		Ft	Ft	Ft	F	Deg	Deg	Deg			K /In /Deg
1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00		FFFFFF	
2	2	0.00	7.80	0.00	0.00	0.00	0.00	0.00			
3	3	0.00	15.60	0.00	0.00	0.00	0.00	0.00			
4	4	0.00	23.40	0.00	0.00	0.00	0.00	0.00			
5	5	0.00	31.20	0.00	0.00	0.00	0.00	0.00			
6	6	0.00	39.00	0.00	0.00	0.00	0.00	0.00			
7	7	0.00	47.00	0.00	0.00	0.00	0.00	0.00			
8	8	0.00	55.00	0.00	0.00	0.00	0.00	0.00			
9	9	0.00	63.00	0.00	0.00	0.00	0.00	0.00			
10	10	0.00	71.00	0.00	0.00	0.00	0.00	0.00			
11	11	0.00	79.00	0.00	0.00	0.00	0.00	0.00			
12	12	0.00	87.20	0.00	0.00	0.00	0.00	0.00			
13	13	0.00	95.40	0.00	0.00	0.00	0.00	0.00			
14	14	0.00	103.60	0.00	0.00	0.00	0.00	0.00			
15	15	0.00	111.80	0.00	0.00	0.00	0.00	0.00			
16	16	0.00	120.00	0.00	0.00	0.00	0.00	0.00			

TOTAL NUMBER OF ACTIVE NODES = 16
TOTAL NUMBER OF EQUATIONS = 90

2 NODE PRISMATIC BEAM ELEMENT

ELEM NO	NE NO	PE NO	ALPHA	BETA	GAMMA	LENGTH	MAT TYPE	PROP TYPE	RELEASE NE	RELEASE PE	REF TEMP	OFFSET DIR	OFFSET NE	OFFSET PE	STIFFNESS NE	STIFFNESS PE
Units:			Deg	Deg	Deg	Ft					F		Ft	Ft	K /In /Deg	K /In /Deg
1	1	2	90.00	-90.00	0.00	7.80	1	1								
2	2	3	90.00	-90.00	0.00	7.80	1	2								
3	3	4	90.00	-90.00	0.00	7.80	1	3								
4	4	5	90.00	-90.00	0.00	7.80	1	4								
5	5	6	90.00	-90.00	0.00	7.80	1	5								
6	6	7	90.00	-90.00	0.00	8.00	1	6								
7	7	8	90.00	-90.00	0.00	8.00	1	7								
8	8	9	90.00	-90.00	0.00	8.00	1	8								
9	9	10	90.00	-90.00	0.00	8.00	1	9								
10	10	11	90.00	-90.00	0.00	8.00	1	10								
11	11	12	90.00	-90.00	0.00	8.20	1	11								
12	12	13	90.00	-90.00	0.00	8.20	1	12								
13	13	14	90.00	-90.00	0.00	8.20	1	13								
14	14	15	90.00	-90.00	0.00	8.20	1	14								
15	15	16	90.00	-90.00	0.00	8.20	1	15								

TOTAL NUMBER OF ACTIVE PRISMATIC BEAM ELEMENTS = 15

MATERIAL PROPERTIES

MATL NO	DESIGNATION	YOUNG'S MODULUS	POISSON'S RATIO	THERMAL COEFF	MASS DENSITY	WEIGHT DENSITY
Units:		K /In ^2		F	Slug/Ft^3	Lb/Ft ^3
1	mast steel	2.9e+004	0.250	6.5e-006	15.2	490

2 NODE PRISMATIC BEAM ELEMENT PROPERTIES

PROP	DESIGNATION	A	IXX	IYY	J	IXY	SFY	SFX	CW
Units:		In^2	In^4	In^4	In^4	In^4			In^6
1	sec 1	50	1.1e+004	1.1e+004	2.2e+004	0	1.000	1.000	0
2	sec 2	48.4	9.97e+003	9.97e+003	1.99e+004	0	1.000	1.000	0
3	sec 3	46.8	9.01e+003	9.01e+003	1.8e+004	0	1.000	1.000	0
4	sec	45.2	8.11e+003	8.11e+003	1.62e+004	0	1.000	1.000	0
5	sec 5	40	6.72e+003	6.72e+003	1.34e+004	0	1.000	1.000	0
6	sec 6	35.1	5.45e+003	5.45e+003	1.09e+004	0	1.000	1.000	0
7	sec 7	33.7	4.83e+003	4.83e+003	9.67e+003	0	1.000	1.000	0
8	sec 8	32.3	4.27e+003	4.27e+003	8.53e+003	0	1.000	1.000	0
9	sec	30.9	3.74e+003	3.74e+003	7.49e+003	0	1.000	1.000	0
10	sec 10	26.7	2.97e+003	2.97e+003	5.94e+003	0	1.000	1.000	0
11	sec 11	22.5	2.27e+003	2.27e+003	4.55e+003	0	1.000	1.000	0
12	sec 12	21.4	1.95e+003	1.95e+003	3.9e+003	0	1.000	1.000	0
13	sec 13	20.3	1.66e+003	1.66e+003	3.32e+003	0	1.000	1.000	0
14	sec 14	19.2	1.4e+003	1.4e+003	2.8e+003	0	1.000	1.000	0
15	sec 15	18	1.17e+003	1.17e+003	2.34e+003	0	1.000	1.000	0

GRAVITY LOAD MULTIPLIERS

REC NO	PX	PY	PZ
DESCRIPTION : deadl load Multi LOAD CASES : 1 ELEMENT LIST : 1-15			
1	0.000	-1.300	0.000

2 NODE PRISMATIC BEAM ELEMENT LOAD INFORMATION

REC NO	LOAD TYPE	LOAD SYS	DIST SPEC		DIST	PX	PY	PZ	MX	MY	MZ
Units:					Ft	K	K	K	Ft-K	Ft-K	Ft-K
DESCRIPTION : wind 1 LOAD CASES : 1 ELEMENT LIST : 1											
1	UNIF	GLO	FRAC	B	0.000	0.113	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.113	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 2 LOAD CASES : 1 ELEMENT LIST : 2											
2	UNIF	GLO	FRAC	B	0.000	0.110	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.110	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 3 LOAD CASES : 1 ELEMENT LIST : 3											
3	UNIF	GLO	FRAC	B	0.000	0.106	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.106	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 4 LOAD CASES : 1 ELEMENT LIST : 4											
4	UNIF	GLO	FRAC	B	0.000	0.103	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.103	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 5 LOAD CASES : 1 ELEMENT LIST : 5											
5	UNIF	GLO	FRAC	B	0.000	0.101	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.101	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 6 LOAD CASES : 1 ELEMENT LIST : 6											
6	UNIF	GLO	FRAC	B	0.000	0.103	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.103	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 7 LOAD CASES : 1 ELEMENT LIST : 7											
7	UNIF	GLO	FRAC	B	0.000	0.104	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.104	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 8 LOAD CASES : 1 ELEMENT LIST : 8											
8	UNIF	GLO	FRAC	B	0.000	0.104	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.104	0.000	0.000	0.000	0.000	0.000
DESCRIPTION : wind 9 LOAD CASES : 1 ELEMENT LIST : 9											
9	UNIF	GLO	FRAC	B	0.000	0.103	0.000	0.000	0.000	0.000	0.000
				E	1.000	0.103	0.000	0.000	0.000	0.000	0.000

```
DESCRIPTION  : wind 10
LOAD CASES   : 1
ELEMENT LIST : 10

  10   UNIF  GLO  FRAC   B    0.000    0.102    0.000    0.000    0.000    0.000    0.000
                         E    1.000    0.102    0.000    0.000    0.000    0.000    0.000

DESCRIPTION  : wind 11
LOAD CASES   : 1
ELEMENT LIST : 11

  11   UNIF  GLO  FRAC   B    0.000    0.100    0.000    0.000    0.000    0.000    0.000
                         E    1.000    0.100    0.000    0.000    0.000    0.000    0.000

DESCRIPTION  : wind 12
LOAD CASES   : 1
ELEMENT LIST : 12

  12   UNIF  GLO  FRAC   B    0.000    0.098    0.000    0.000    0.000    0.000    0.000
                         E    1.000    0.098    0.000    0.000    0.000    0.000    0.000

DESCRIPTION  : wind 13
LOAD CASES   : 1
ELEMENT LIST : 13

  13   UNIF  GLO  FRAC   B    0.000    0.095    0.000    0.000    0.000    0.000    0.000
                         E    1.000    0.095    0.000    0.000    0.000    0.000    0.000

DESCRIPTION  : wind 14
LOAD CASES   : 1
ELEMENT LIST : 14

  14   UNIF  GLO  FRAC   B    0.000    0.092    0.000    0.000    0.000    0.000    0.000
                         E    1.000    0.092    0.000    0.000    0.000    0.000    0.000

DESCRIPTION  : wind 15
LOAD CASES   : 1
ELEMENT LIST : 15

  15   UNIF  GLO  FRAC   B    0.000    0.089    0.000    0.000    0.000    0.000    0.000
                         E    1.000    0.089    0.000    0.000    0.000    0.000    0.000

DESCRIPTION  : GPS @ 50'
LOAD CASES   : 1
ELEMENT LIST : 7
DISTANCES    : 3

 101   CONC  GLO  DIST             0.077   -0.050    0.000    0.000    0.000    0.000

DESCRIPTION  : (12) DB980H90 at 120'
LOAD CASES   : 1
ELEMENT LIST : 15
DISTANCES    : 8.2

 102   CONC  GLO  DIST             2.278   -1.370    0.000    0.000    0.000    0.000

DESCRIPTION  : (proposed) (12) DB844H90 @ 110'
LOAD CASES   : 1
ELEMENT LIST : 14
DISTANCES    : 6.4

 103   CONC  GLO  DIST             2.139   -1.120    0.000    0.000    0.000    0.000
```

NODAL LOADS

REC NO	ALPHA	BETA	GAMMA	PX	PY	PZ	MX	MY	MZ
Units:	Deg	Deg	Deg	K	K	K	Ft-K	Ft-K	Ft-K

DESCRIPTION : cables
LOAD CASES : 1
NODE LIST : 11-16

1	0.00	0.00	0.00	0.000	-0.154	0.000	0.000	0.000	0.000

DESCRIPTION : cables
LOAD CASES : 1
NODE LIST : 6-10

2	0.00	0.00	0.00	0.000	-0.150	0.000	0.000	0.000	0.000

DESCRIPTION : cables
LOAD CASES : 1
NODE LIST : 1-5

3	0.00	0.00	0.00	0.000	-0.146	0.000	0.000	0.000	0.000

L I N E A R   A N A L Y S I S   R E S U L T S

S T R U C T U R E   L O A D   C O M B I N A T I O N S

COMB   LIST OF FACTORS * CASES

LOAD COMBINATIONS:

COMB 1 () : 1.00 X CASE 1

N O D A L   D I S P L A C E M E N T S
(* Indicates Displacements Occur in Nodal Local System)

NODE NO	LOAD COMB	DX	DY	DZ	OX	OY	OZ
Units:		In	In	In	Deg	Deg	Deg
1	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1	0.1967	-0.0014	0.0000	0.0000	0.0000	-0.2334
3	1	0.7721	-0.0027	0.0000	0.0000	0.0000	-0.4634
4	1	1.7198	-0.0039	0.0000	0.0000	0.0000	-0.6892
5	1	3.0322	-0.0050	0.0000	0.0000	0.0000	-0.9098
6	1	4.7150	-0.0061	0.0000	0.0000	0.0000	-1.1417
7	1	6.8477	-0.0073	0.0000	0.0000	0.0000	-1.3939
8	1	9.3934	-0.0085	0.0000	0.0000	0.0000	-1.6344
9	1	12.3303	-0.0095	0.0000	0.0000	0.0000	-1.8608
10	1	15.6327	-0.0104	0.0000	0.0000	0.0000	-2.0703
11	1	19.2862	-0.0114	0.0000	0.0000	0.0000	-2.2786
12	1	23.3922	-0.0123	0.0000	0.0000	0.0000	-2.4885
13	1	27.8257	-0.0132	0.0000	0.0000	0.0000	-2.6597
14	1	32.5131	-0.0140	0.0000	0.0000	0.0000	-2.7839
15	1	37.3644	-0.0146	0.0000	0.0000	0.0000	-2.8512
16	1	42.2863	-0.0150	0.0000	0.0000	0.0000	-2.8718

2 NODE PRISMATIC BEAM ELEMENT -- FORCES AND MOMENTS

SIGN CONVENTION : BEAM DESIGNERS

ELEM NO	LOAD COMB	NODE NO	AXIAL	SHEAR X	SHEAR Y	MOMENT X	MOMENT Y	TORSION
Units:			K	K	K	K -Ft	K -Ft	K -Ft
1	1	1	-22.0421	0.0000	16.6662	-1219.8971	0.0000	0.0000
		2	-20.3169	0.0000	15.7848	-1093.3382	0.0000	0.0000
2	1	2	-20.1709	0.0000	15.7848	-1093.3382	0.0000	0.0000
		3	-18.5009	0.0000	14.9268	-973.5630	0.0000	0.0000
3	1	3	-18.3549	0.0000	14.9268	-973.5630	0.0000	0.0000
		4	-16.7401	0.0000	14.1000	-860.3585	0.0000	0.0000
4	1	4	-16.5941	0.0000	14.1000	-860.3585	0.0000	0.0000
		5	-15.0345	0.0000	13.2966	-753.5117	0.0000	0.0000
5	1	5	-14.8885	0.0000	13.2966	-753.5117	0.0000	0.0000
		6	-13.5084	0.0000	12.5088	-652.8707	0.0000	0.0000
6	1	6	-13.3584	0.0000	12.5088	-652.8707	0.0000	0.0000
		7	-12.1162	0.0000	11.6848	-556.0963	0.0000	0.0000
7	1	7	-11.9662	0.0000	11.6848	-556.0963	0.0000	0.0000
		8	-10.7236	0.0000	10.7758	-466.3309	0.0000	0.0000
8	1	8	-10.5736	0.0000	10.7758	-466.3309	0.0000	0.0000
		9	-9.4305	0.0000	9.9438	-383.4525	0.0000	0.0000
9	1	9	-9.2805	0.0000	9.9438	-383.4525	0.0000	0.0000
		10	-8.1870	0.0000	9.1198	-307.1981	0.0000	0.0000
10	1	10	-8.0370	0.0000	9.1198	-307.1981	0.0000	0.0000
		11	-7.0921	0.0000	8.3038	-237.5037	0.0000	0.0000
11	1	11	-6.9381	0.0000	8.3038	-237.5037	0.0000	0.0000
		12	-6.1220	0.0000	7.4838	-172.7745	0.0000	0.0000
12	1	12	-5.9680	0.0000	7.4838	-172.7745	0.0000	0.0000
		13	-5.1917	0.0000	6.6802	-114.7021	0.0000	0.0000
13	1	13	-5.0377	0.0000	6.6802	-114.7021	0.0000	0.0000
		14	-4.3014	0.0000	5.9012	-63.1184	0.0000	0.0000
14	1	14	-4.1474	0.0000	5.9012	-63.1184	0.0000	0.0000
		15	-2.3309	0.0000	3.0078	-21.6718	0.0000	0.0000
15	1	15	-2.1769	0.0000	3.0078	-21.6718	0.0000	0.0000
		16	-1.5240	0.0000	2.2780	0.0000	0.0000	0.0000

REACTIONS

(* Indicates Reactions Occur in Nodal Local System)

NODE NO	LOAD COMB	PX	PY	PZ	MX	MY	MZ
Units:		K	K	K	K -Ft	K -Ft	K -Ft
1	1	-16.6662	22.1881	0.0000	0.0000	0.0000	1219.8971

P-DELTA ANALYSIS RESULTS

STRUCTURE LOAD COMBINATIONS

COMB LIST OF FACTORS * CASES

LOAD COMBINATIONS:

COMB 1 () : 1.00 X CASE 1

NODAL DISPLACEMENTS

(* Indicates Displacements Occur in Nodal Local System)

NODE NO	LOAD COMB	DX	DY	DZ	OX	OY	OZ
Units:		In	In	In	Deg	Deg	Deg
1	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1	0.2011	-0.0016	0.0000	0.0000	0.0000	-0.2388
3	1	0.7900	-0.0047	0.0000	0.0000	0.0000	-0.4745
4	1	1.7609	-0.0110	0.0000	0.0000	0.0000	-0.7064
5	1	3.1067	-0.0217	0.0000	0.0000	0.0000	-0.9333
6	1	4.8338	-0.0388	0.0000	0.0000	0.0000	-1.1723
7	1	7.0244	-0.0650	0.0000	0.0000	0.0000	-1.4325
8	1	9.6412	-0.1017	0.0000	0.0000	0.0000	-1.6808
9	1	12.6620	-0.1503	0.0000	0.0000	0.0000	-1.9148
10	1	16.0605	-0.2113	0.0000	0.0000	0.0000	-2.1316
11	1	19.8220	-0.2860	0.0000	0.0000	0.0000	-2.3471
12	1	24.0509	-0.3778	0.0000	0.0000	0.0000	-2.5643
13	1	28.6184	-0.4847	0.0000	0.0000	0.0000	-2.7414
14	1	33.4484	-0.6040	0.0000	0.0000	0.0000	-2.8699
15	1	38.4479	-0.7317	0.0000	0.0000	0.0000	-2.9396
16	1	43.5201	-0.8628	0.0000	0.0000	0.0000	-2.9610

2 NODE PRISMATIC BEAM ELEMENT -- FORCES AND MOMENTS

SIGN CONVENTION : BEAM DESIGNERS

ELEM NO	LOAD COMB	NODE NO	AXIAL	SHEAR X	SHEAR Y	MOMENT X	MOMENT Y	TORSION
Units:			K	K	K	K -Ft	K -Ft	K -Ft
1	1	1	-22.0063	0.0000	16.7135	-1246.6403	0.0000	0.0000
		2	-20.2830	0.0000	15.8284	-1119.7270	0.0000	0.0000
2	1	2	-20.0713	0.0000	15.9113	-1119.7269	0.0000	0.0000
		3	-18.4067	0.0000	15.0428	-999.0060	0.0000	0.0000
3	1	3	-18.1992	0.0000	15.1161	-999.0053	0.0000	0.0000
		4	-16.5930	0.0000	14.2726	-884.3890	0.0000	0.0000
4	1	4	-16.3897	0.0000	14.3369	-884.3882	0.0000	0.0000
		5	-14.8419	0.0000	13.5112	-775.7806	0.0000	0.0000
5	1	5	-14.6407	0.0000	13.5692	-775.7820	0.0000	0.0000
		6	-13.2753	0.0000	12.7561	-673.1133	0.0000	0.0000
6	1	6	-13.0695	0.0000	12.8099	-673.1132	0.0000	0.0000
		7	-11.8465	0.0000	11.9578	-574.0425	0.0000	0.0000
7	1	7	-11.6432	0.0000	12.0066	-574.0424	0.0000	0.0000
		8	-10.4259	0.0000	11.0641	-481.8380	0.0000	0.0000
8	1	8	-10.2293	0.0000	11.1031	-481.8397	0.0000	0.0000
		9	-9.1130	0.0000	10.2355	-396.4852	0.0000	0.0000
9	1	9	-8.9229	0.0000	10.2646	-396.4807	0.0000	0.0000
		10	-7.8592	0.0000	9.4024	-317.8126	0.0000	0.0000
10	1	10	-7.6727	0.0000	9.4292	-317.8142	0.0000	0.0000
		11	-6.7605	0.0000	8.5768	-245.7903	0.0000	0.0000
11	1	11	-6.5752	0.0000	8.5935	-245.7944	0.0000	0.0000
		12	-5.7950	0.0000	7.7391	-178.8307	0.0000	0.0000
12	1	12	-5.6143	0.0000	7.7522	-178.8270	0.0000	0.0000
		13	-4.8762	0.0000	6.9134	-118.6981	0.0000	0.0000
13	1	13	-4.7039	0.0000	6.9185	-118.6930	0.0000	0.0000
		14	-4.0066	0.0000	6.1043	-65.2997	0.0000	0.0000
14	1	14	-3.8414	0.0000	6.1051	-65.3008	0.0000	0.0000
		15	-2.1743	0.0000	3.1231	-22.4210	0.0000	0.0000
15	1	15	-2.0190	0.0000	3.1156	-22.4231	0.0000	0.0000
		16	-1.5238	0.0000	2.2856	-0.0012	0.0000	0.0000

REACTIONS

(* Indicates Reactions Occur in Nodal Local System)

NODE NO	LOAD COMB	PX	PY	PZ	MX	MY	MZ
Units:		K	K	K	K -Ft	K -Ft	K -Ft
1	1	-16.6662	22.1881	0.0000	0.0000	0.0000	1246.6403

H. E. BERGERON ENGINEERS

2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: **Verizon Wireless**
Job: **Branford, CT** Job No.: **2000-210**

Calculated By: **J. Klementovich** Date: **22-Nov-00**
Checked By: [handwritten initials] Date: 11/29

Total Moment (Tower & Antennas) *Axial Loads (kips)* *Shear*

Elevation	Mom. w/o Ice	75% Mom w/ Ice	100% Mom w/ Ice	Secondary	D+A Force	D+A+I Force	Secondary	Tower (lbs.)	Antenna (lbs)	Total (kips)	Secondary
0	1221.0	571.3	761.7	1246.6	17.9	20.3	22.0	13010	4495	17.50	16.7
8	1094.3	497.9	663.8	1119.7	16.4	18.6	20.1	12081	4495	16.58	15.9
16	974.5	429.8	573.1	999	15.0	17.0	18.2	11179	4495	15.67	15.1
23	861.2	367.0	489.3	884.4	13.6	15.4	16.4	10305	4495	14.80	14.3
31	754.2	309.2	412.3	775.8	12.3	13.9	14.6	9459	4495	13.95	13.6
39	653.5	256.3	341.7	673.1	11.0	12.4	13.1	8627	4495	13.12	12.8
47	556.6	207.1	276.2	574	9.9	11.2	11.6	7753	4495	12.25	12.0
55	466.8	163.3	217.7	481.8	8.8	9.9	10.2	6869	4418	11.29	11.1
63	383.8	124.7	166.3	396.5	7.8	8.8	8.9	5981	4418	10.40	10.3
71	307.4	91.5	122.0	317.8	6.8	7.6	7.7	5097	4418	9.51	9.4
79	237.6	63.5	84.7	245.8	5.7	6.4	6.6	4221	4418	8.64	8.6
87	172.9	40.3	53.7	178.8	4.9	5.4	5.6	3336	4418	7.75	7.8
95	114.7	22.5	29.9	118.7	4.2	4.6	4.7	2468	4418	6.89	6.9
104	63.1	9.9	13.2	65.3	3.5	3.7	3.8	1621	4418	6.04	6.1
112	21.7	2.5	3.3	22.4	1.7	1.8	2.0	797	2278	3.08	3.1
120	0.0	0.0	0.0		0.9	0.9		0	0	0.00	
120	0.0	0.0	0.0		0.9	0.9		0	0	0.00	
120	0.0	0.0	0.0		0.9	0.9		0	0	0.00	
120	0.0	0.0	0.0		0.9	0.9		0	0	0.00	
120	0.0	0.0	0.0		0.9	0.9		0	0	0.00	
					139.5		165.5				

H. E. BERGERON ENGINEERS
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: Verizon Wireless
Job: Branford, CT — Job No.: 2000-210

Calculated By: J. Klementovich — Date: 22-Nov-00
Checked By: [handwritten initials] — Date: 11/29

Axial Force

				Stress Ratio
Elev.	w/o ice	Area	Fy	w/o ice
0	22.0	50.77	65	0.43
8	20.1	49.16	65	0.41
16	18.2	47.56	65	0.38
23	16.4	45.95	65	0.36
31	14.6	44.35	65	0.33
39	13.1	35.74	65	0.37
47	11.6	34.36	65	0.34
55	10.2	32.99	65	0.31
63	8.9	31.62	65	0.28
71	7.7	30.24	65	0.25
79	6.6	23.11	65	0.29
87	5.6	21.98	65	0.25
95	4.7	20.86	65	0.23
104	3.8	19.73	65	0.19
112	2.0	18.61	65	0.11
120	0.0	0.00	65	#DIV/0!
120	0.0	0.00	65	#DIV/0!
120	0.0	0.00	65	#DIV/0!
120	0.0	0.00	65	#DIV/0!
120	0.0	0.00	65	#DIV/0!

Bending Force

fb= Moment/Section Modulus				Bending Stress		
				Allowable		Actual
Elev.	w/o ice	S	(FY)^.5 w/t	Fb	1.33 Fb	w/o ice
0	1246.6	542.41	244.7	38.70	51.47	27.58
8	1119.7	508.51	240.0	39.04	51.93	26.42
16	999.0	475.71	240.0	39.04	51.93	25.20
23	884.4	443.99	240.0	39.04	51.93	23.90
31	775.8	413.38	240.0	39.04	51.93	22.52
39	673.1	322.06	247.3	38.51	51.22	25.08
47	574.0	297.67	240.0	39.04	51.93	23.14
55	481.8	274.24	240.0	39.04	51.93	21.08
63	396.5	251.77	240.0	39.04	51.93	18.90
71	317.8	230.26	240.0	39.04	51.93	16.56
79	245.8	168.60	250.6	38.27	50.90	17.49
87	178.8	152.52	240.0	39.04	51.93	14.07
95	118.7	137.24	240.0	39.04	51.93	10.38
104	65.3	122.77	240.0	39.04	51.93	6.38
112	22.4	109.11	240.0	39.04	51.93	2.46
120	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
120	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
120	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
120	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
120	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

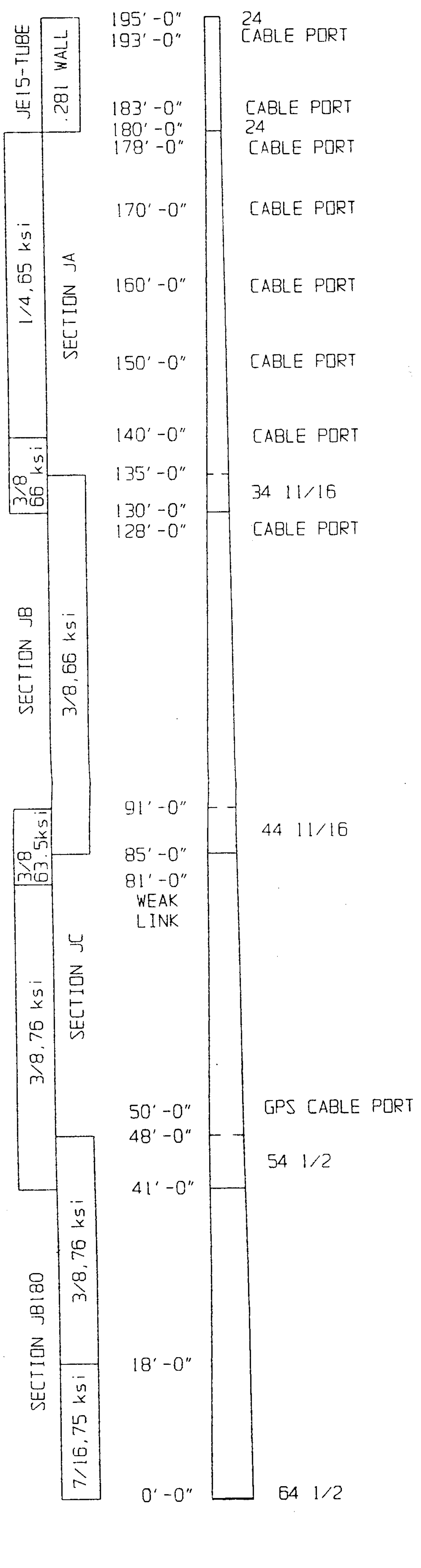
H. E. BERGERON ENGINEERS
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: Verizon Wireless
Job: Branford, CT
Job No.: 2000-210

Calculated By: J. Klementovich
Date: 22-Nov-00
Checked By: [signature]
Date: 11/29

Combined Axial and Bending

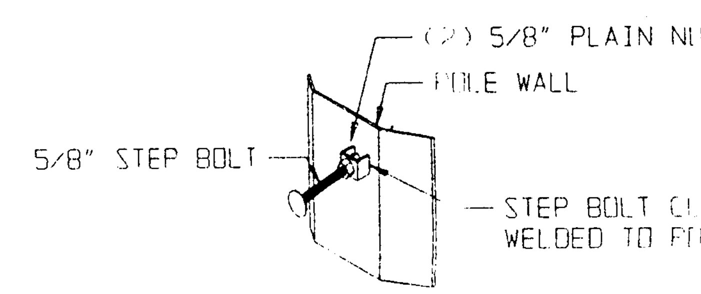
Elev.	Comb. Loads	Capacity
0	0.544	54%
8	0.517	52%
16	0.493	49%
23	0.467	47%
31	0.440	44%
39	0.497	50%
47	0.452	45%
55	0.412	41%
63	0.369	37%
71	0.324	32%
79	0.349	35%
87	0.276	28%
95	0.204	20%
104	0.127	13%
112	0.050	5%
120	#DIV/0!	#DIV/0!
120	#DIV/0!	#DIV/0!
120	#DIV/0!	#DIV/0!
120	#DIV/0!	#DIV/0!
120	#DIV/0!	#DIV/0!



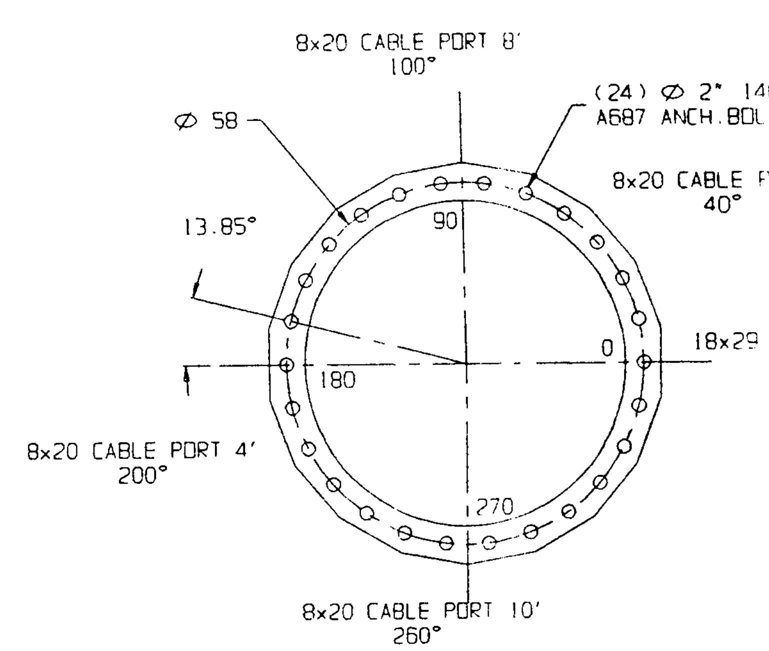
TOWER DESIGN CONDITIONS
This tower was designed to withstand 85 mph wi
1/2" radial ice and the wind/ice reduction, per
222-F reconnended standard.
Worst case load condition is wind without ice.
Allowable steel stresses per AISC ASD 9th Editi
Allowable concrete stresses per ACI 318-89.

MATERIAL SPECIFICATIONS

Monopole Plate:	ASTM A572, ASTM A36
Anchor Bolts:	ASTM A687, Fu > 140 ksi
Flange plate:	ASTM A36 Modified, Fy > 50 ksi
	9/16" WELD on Base Flange
All other steel:	ASTM A36, Fy > 36 ksi
Hardware:	A325 Hot Dipped Galvanized Bo
	with Anco Nuts
Galvanizing:	ASTM A123



STEP BOLT INSTALLATION



JB180 BASE FLANGE
1 3/4" PLATE

speed with
ANSI/EIA/TIA

n.

s

TOWER LOADING CONDITIONS

QTY	Antenna	Elevation
12	DB896	195'
1	14' Nudd Low-profile Platform	195'
12	DB896	185'
1	14' Nudd Low-profile Platform	185'
12	DB896	175'
1	14' Nudd Low-profile Platform	175'
12	DB896	165'
1	14' Nudd Low-profile Platform	165'
12	DB896	155'
1	14' Nudd Low-profile Platform	155'

QTY	Antenna	Elevation Start	Elevation Stop
12	LDF7-50A 1-5/8"	2	195'
12	LDF7-50A 1-5/8"	4	185'
12	LDF7-50A 1-5/8"	6	175'
12	LDF7-50A 1-5/8"	8	165'
12	LDF7-50A 1-5/8"	10	155'

All transmission lines to be supported on the inside of pole thus adding no additional wind load.

NOTE: Any deviation from the proposed design antenna loading will require a tower analysis for verification of structural integrity.

INSTALLATION GENERAL NOTES

1. Installation of tower must be performed by a qualified tower erector.
2. Install sections such that climbing device is aligned.
3. Install safety climb per manufacturer's recommendations.
4. Slip-joint jacking force: Minimum 6000 lb.
5. Tighten all structural and anchor bolts per AISC specifications.
6. Sections are numbered at the bottom, near the climbing face.
7. Installer must grind outside/top and inside/bottom of each section and at the weld locations of the squaring bracing to facilitate slip joint fit. Cover grind area with spray galvanizing.

si

6'

Pole section weights:

Section JB180:	12100 +/-
Section JC:	10600 +/-
Section JB:	6900 +/-
Section JA:	4350 +/-
Section JE15:	1380 +/-

LE PORT 2'
0°

STATE OF CONNECTICUT
GEORGE R. UNDERHILL
No. 15005
LICENSED
PROFESSIONAL ENGINEER

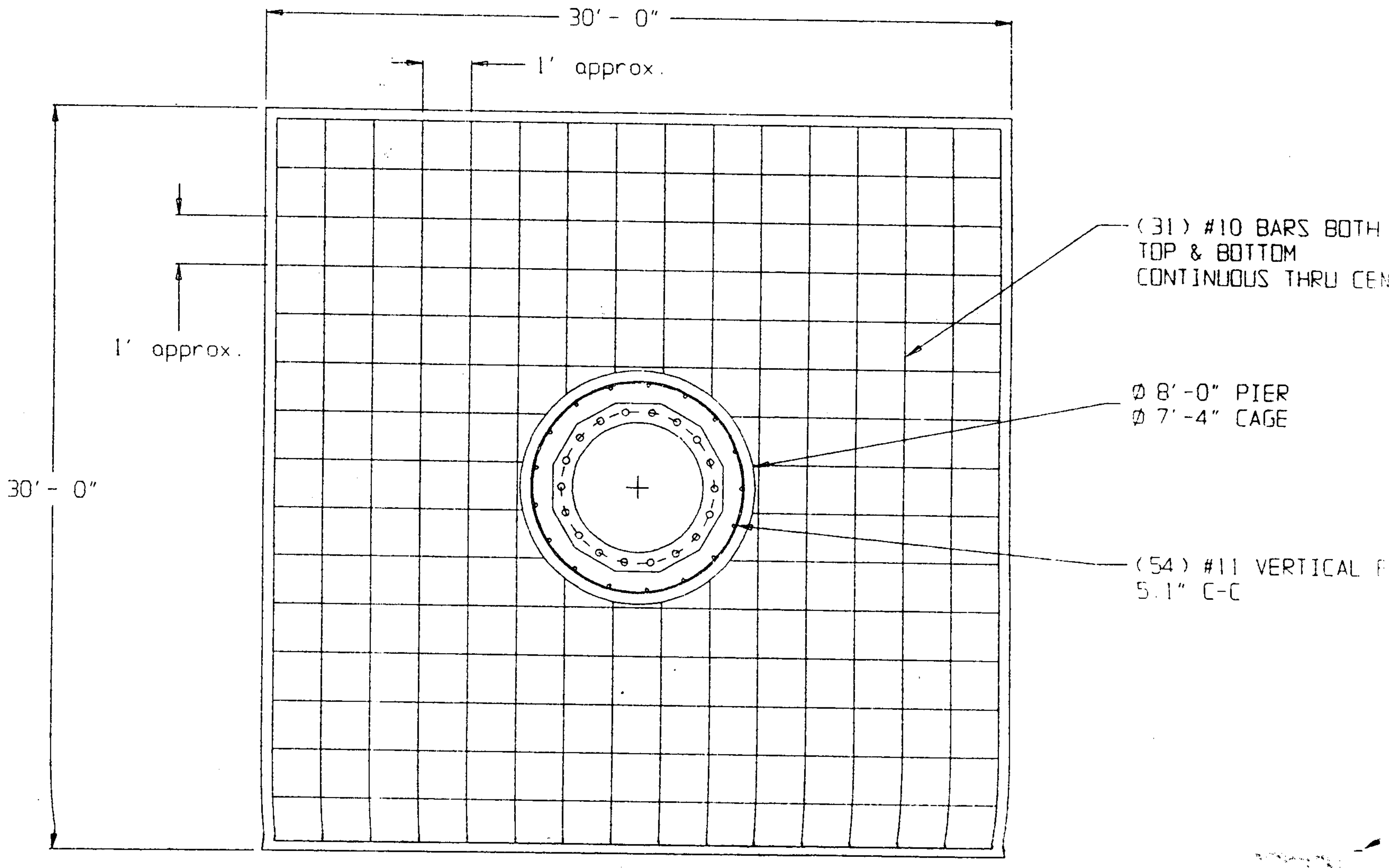
FRED A. NUDD CORPORATION
Route 104 • Ontario, New York 14519 • 315 / 524-2531

SCALE: N/S	DRAWN BY: ELR	THIS DRAWING IS THE PROPERTY OF THE FRED A. NUDD CORPORATION AND IS NOT TO BE REPRODUCED IN WHOLE OR IN PART BY ANY MEANS WITHOUT PRIOR WRITTEN PERMISSION BY THE FRED A. NUDD CORPORATION.
DATE: 03/29/99		

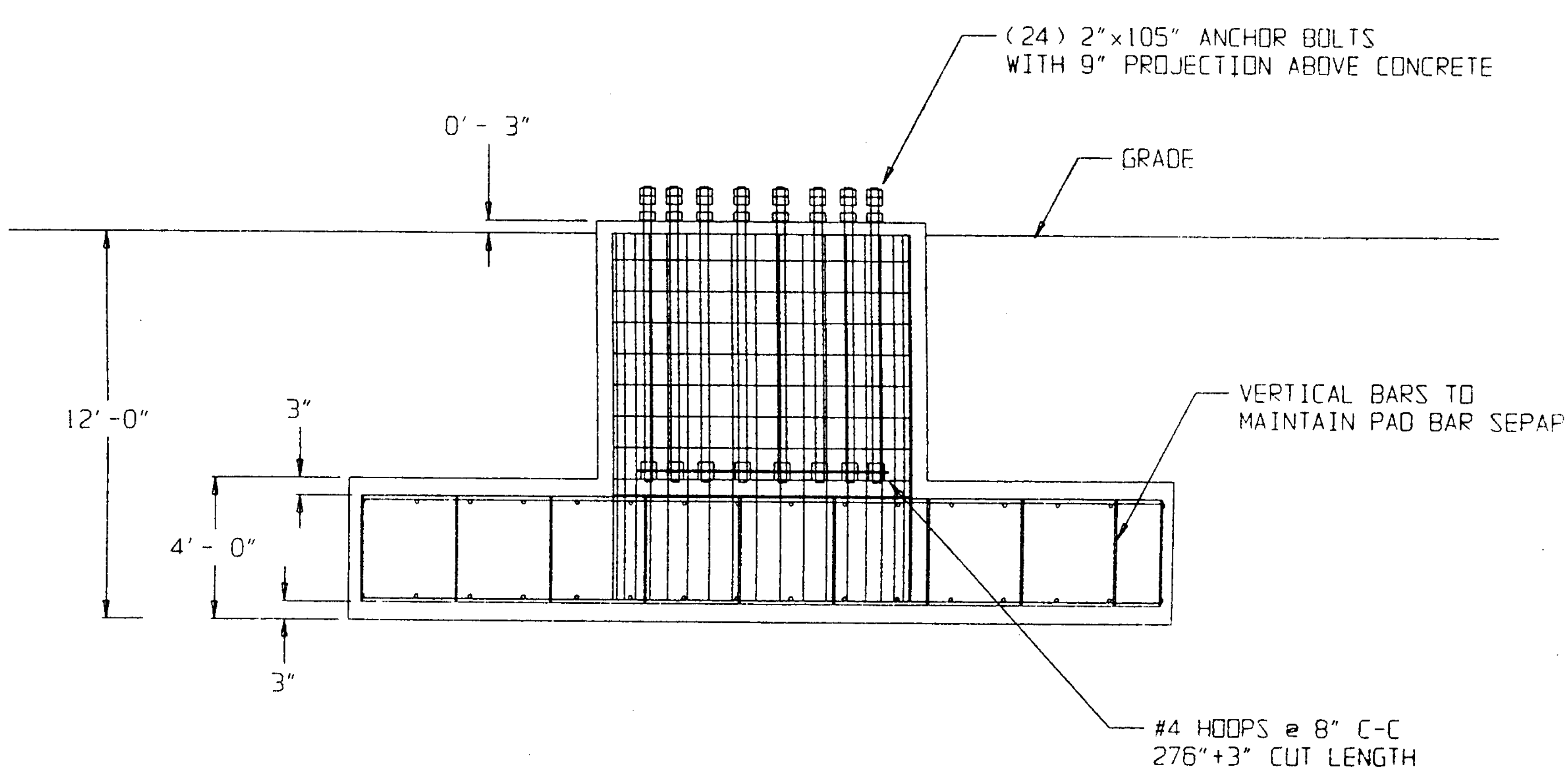
DESIGN OF 195' MJ-180

SBA - 8622 / LISBON, CT
NEW LONDON COUNTY

DRAWING NUMBER 99-6531-1



30' - 0"
1' approx.
1' approx.
30' - 0"
(31) #10 BARS BOTH
TOP & BOTTOM
CONTINUOUS THRU CEN
Ø 8'-0" PIER
Ø 7'-4" CAGE
(54) #11 VERTICAL
5.1" C-C



(24) 2"x105" ANCHOR BOLTS
WITH 9" PROJECTION ABOVE CONCRETE
0' - 3"
GRADE
12'-0"
3"
4' - 0"
3"
VERTICAL BARS TO
MAINTAIN PAD BAR SEPAR
#4 HOOPS @ 8" C-C
276"+3" CUT LENGTH

CONCRETE SPECIFICATIONS

1. Concrete shall have a minimum compressive strength of at least 3000 psi at 28 days. It is our recommendation that 4000 psi concrete be installed to account for any unknown installation variables that could degrade the concrete.
2. Concrete installation shall meet ACI 318-89 installation requirements for reinforced concrete.
3. All concrete shall be placed against undisturbed soil free of free standing water and all foreign objects and materials. If this is not possible, special pouring procedures will be required.
4. Minimum concrete cover shall be 3" over all reinforcing bars.
6. Reinforcing bars shall be ASTM A-615 Grade 60 deformed bars.
7. Assemble bars with tie wires or weld. Welding of bars must conform to AWS D1.4 specifications.
8. Proportion pouring:
   80% 1's and 2's,
   20% 1's only for finishing.

SOIL SPECIFICATIONS

Soil is assumed to be per boring logs by JGI, INC dated 08/05/98.
(JGI Project# 98343G)

1. Per observation of boring logs, down to bondable rock soil consist of medium dense to very dense coarse to fine sand, some silt, frequent cobbles and boulders.
2. All foundations shall be free of free standing water as far as possible prior to pouring concrete and shall be kept thus until backfill is in place. If not possible, special pouring procedures must be followed.
3. Rock, non-cohesive, saturated or submerged soils are not to be considered as normal soil. See EIA 7.2.2.
4. Backfill shall be compacted to 100 pcf in 6" lifts using excavated material.
5. Backfill shall be placed so as to prevent accumulation of water around foundations or anchors.

Total Concrete: 150 cuyd
Tower Reactions: OTM = 5953 kip*ft
Shear = 45.1 kips

STATE OF CONNECTICUT
GEORGE R. UNDERHILL
No. 15005
LICENSED
PROFESSIONAL ENGINEER

FRED A. NUDD CORPORATION
Route 104 • Ontario, New York 14519 • 315 / 524-2531

SCALE: N/S	DRAWN BY: ELR	THIS DRAWING IS THE PROPERTY OF THE FRED A. NUDD CORPORATION AND IS NOT TO BE REPRODUCED IN WHOLE OR IN PART BY ANY MEANS WITHOUT PRIOR WRITTEN PERMISSION BY THE FRED A. NUDD CORPORATION.
DATE: 03/29/99		

FOUNDATION DETAILS

SBA, SITE# 8622
26 MELL ROAD, LISBON, CT

DRAWING NUMBER
99-6531-2

TS-VER-073-001117 Supplemental

FRED A. NUDD CORPORATION

1743 ROUTE 104, BOX 577
ONTARIO, NY 14519
(315) 524-2531 FAX (315) 524-4249

www.nuddtowers.com

RECEIVED
DEC 12 2000
CONNECTICUT
SITING COUNCIL

Design of 195'
Monopole

MODEL#: MJ-180

PROJECT#: 6531; SITE #: 8622/Lisbon

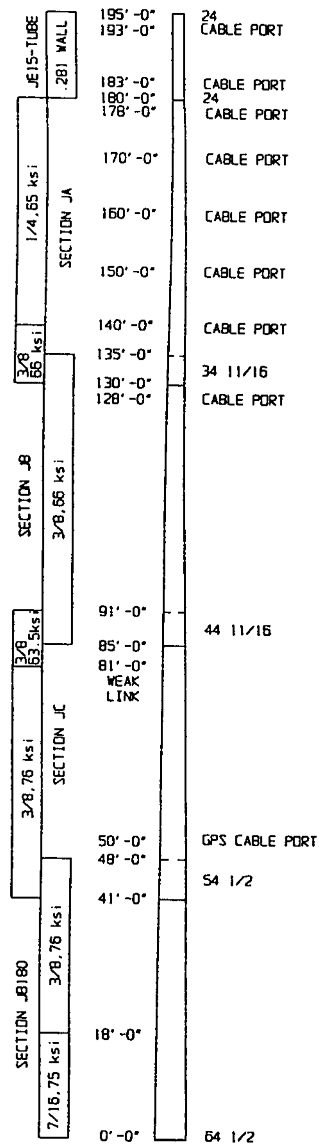
LOCATION: 26 Mell Rd, Lisbon, CT

for

SBA INC.
125 Shaw Street, Suite 116
New London, CT 06320

March, 1999

STATE OF CONNECTICUT
GEORGE R. UNDERHILL
LICENSED
PROFESSIONAL ENGINEER



TOWER DESIGN CONDITIONS
This tower was designed to withstand 85 mph wind speed with 1/2" radial ice and the wind/ice reduction, per ANSI/EIA/TIA 222-F recommended standard.
Worst case load condition is wind without ice.
Allowable steel stresses per AISC ASD 9th Edition.
Allowable concrete stresses per ACI 318-89.

MATERIAL SPECIFICATIONS

Monopole Plate:	ASTM A572, ASTM A36
Anchor Bolts:	ASTM A687, Fu > 140 ksi
Flange plate:	ASTM A36 Modified, Fy > 50 ksi 9/16" WELD on Base Flange
All other steel:	ASTM A36, Fy > 36 ksi
Hardware:	A325 Hot Dipped Galvanized Bolts with Anco Nuts
Galvanizing:	ASTM A123

TOWER LOADING CONDITIONS

QTY	Antenna	Elevation
12	DB896	195'
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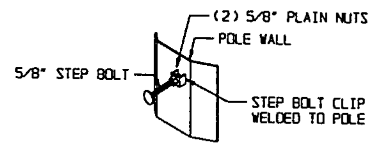
12	LDF7-50A 1-5/8"	10	155'

All transmission lines to be supported on the inside of pole thus adding no additional wind load.

NOTE: Any deviation from the proposed design antenna loading will require a tower analysis for verification of structural integrity.

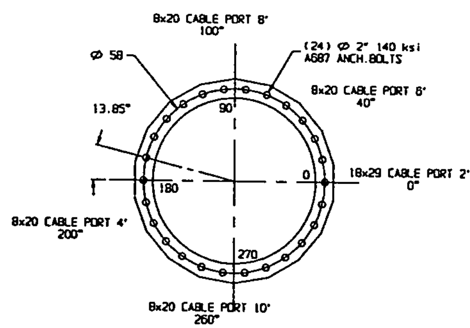


STEP BOLT INSTALLATION

INSTALLATION GENERAL NOTES
1. Installation of tower must be performed by a qualified tower erector.
2. Install sections such that climbing device is aligned.
3. Install safety climb per manufacturer's recommendations.
4. Slip-joint jacking force: Minimum 6000 lb.
5. Tighten all structural and anchor bolts per AISC specifications.
6. Sections are numbered at the bottom, near the climbing face.
7. Installer must grind outside/top and inside/bottom of each section and at the weld locations of the squaring bracing to facilitate slip joint fit. Cover grind area with spray galvanizing.

Pole section weights:

Section	Weight
Section JB180:	12100 +/-
Section JC:	10600 +/-
Section JB:	6900 +/-
Section JA:	4350 +/-
Section JE15:	1380 +/-



JB180 BASE FLANGE
1 3/4" PLATE

FRED A. NUDD CORPORATION
Route 104•Ontario, New York 14519•315/524-2531

SCALE: N/S	DRAWN BY: ELR	APPROVED BY:
DATE: 03/29/99		

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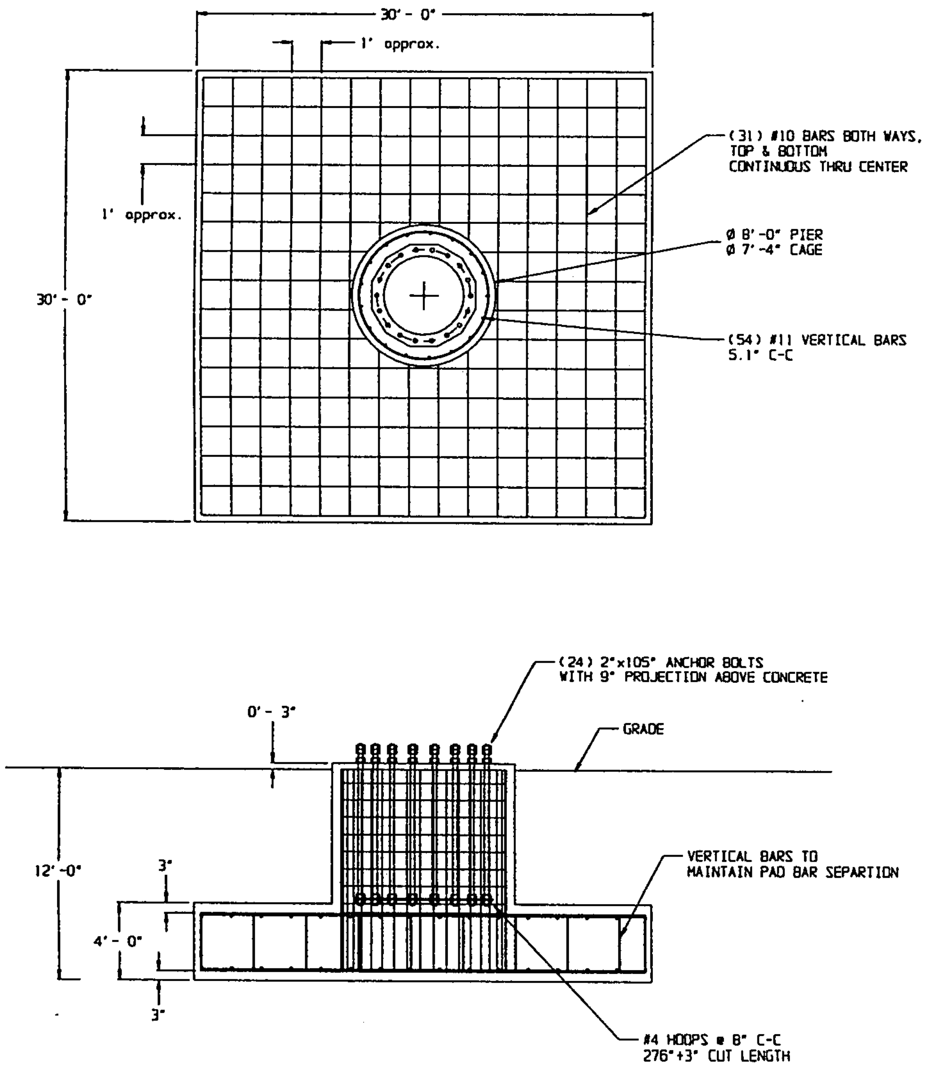
DESIGN OF 195' MJ-180

56A-8622 / LISBON, CT
NEW LONDON COUNTY

DRAWING NUMBER: 99-6531-1



CONCRETE SPECIFICATIONS

1. Concrete shall have a mininum compressive strength of at least 3000 psi at 28 days. It is our reconnendation that 4000 psi concrete be installed to account for any unknown installation variables that could degrade the concrete.
2. Concrete installation shall neet ACI 318-89 installation requirenents for reinforced concrete.
3. All concrete shall be placed against undisturbed soil free of free standing water and all foreign objects and naterials. If this is not possible, special pouring procedures will be required.
4. Mininun concrete cover shall be 3" over all reinforcing bars.
6. Reinforcing bars shall be ASTM A-615 Grade 60 deforned bars.
7. Assenble bars with tie wires or weld. Welding of bars nust conforn to AWS D1.4 specifications.
8. Proportion pouring:
   80% 1's and 2's,
   20% 1's only for finishing.

SOIL SPECIFICATIONS

Soil is assuned to be per boring logs by JGI, INC dated 08/05/98.
(JGI Project# 98343G)

1. Per observation of boring logs, down to bondable rock soil consist of nediun dense to very dense coarse to fine sand, sone silt, frequent cobbles and boulders.
2. All foundations shall be free of free standing water as far as possible prior to pouring concrete and shall be kept thus until backfill is in place. If not possible, special pouring procedures nust be followed.
3. Rock, non-cohesive, saturated or subnerged soils are not to be considered as nornal soil. See EIA 7.2.2.
4. Backfill shall be conpacted to 100 pcf in 6" lifts using excavated naterial.
5. Backfill shall be placed so as to prevent accunulation of water around foundations or anchors.

Total Concrete: 150 cuyd
Tower Reactions: OTM = 5953 kip•ft
Shear = 45.1 kips

FRED A. NUDD CORPORATION
Route 104•Ontario, New York 14519•315/524-2531

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DATE: 05/29/99		

FOUNDATION DETAILS

SBA, SITE# 8622
28 MELL ROAD, LISBON, CT

DRAWING NUMBER: 99-6531-2

CALCULATIONS FOR 195' MONOPOLE

SBA - LISBON SITE
2/99
Design Standards:
ANSI/EIA/TIA 222-F
AISC-ASD 9th Edition

Definition of Monopole characteristics:

Pole Height: $OAH := 195 \cdot ft$

# of sides: $Sides := 18$ (8,12,16,100 for round)

# of applied Point Loads: $PL := 5$

Definition of Wind and pressure characteristics:

Wind speed: $V := 85 \cdot mph$

Ice: $Ice := 0 \cdot in$

Exposure Coefficient: $K(z) := \left(\frac{z}{33 \cdot ft}\right)^{\frac{2}{7}}$

Gust response factor: $Gh := 1.69$

Velocity pressure: $q(z) := .00256 \cdot K(z) \cdot \left(\frac{V}{mph}\right)^2 \cdot Gh \cdot psf$

Calculate the number of locations to calculate pole windload such that each length is <25 ft.

$WLPoints := ceil\left(\frac{OAH}{25 \cdot ft}\right)$ $WLPoints = 8$

$i := 1 .. WLPoints$

Calculate length of each calculated section and elevation of center of each.

$SL := \frac{OAH}{WLPoints}$ $SL = 24.4 \cdot ft$

$Elev_i := (i - 1) \cdot SL + \frac{SL}{2}$

Define Top and Bottom diameters of pole:

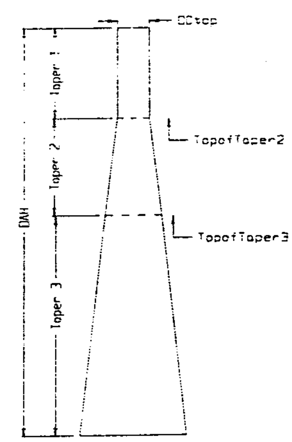
$OD_{top} := 24 \cdot in$ $Taper1 := \frac{0 \cdot in}{10 \cdot ft}$ $Taper2 := \frac{2.25 \cdot in}{10 \cdot ft}$ $Taper3 := \frac{2.25 \cdot in}{10 \cdot ft}$

Equation for pole diameter as a function of elevation:

$TopofTaper2 := 180 \cdot ft$

$TopofTaper3 := 180 \cdot ft$

$$\begin{aligned}\theta(z) := &\ OD_{top} \ldots \\ &+ Taper1 \cdot (OAH - if(z > TopofTaper2, z, TopofTaper2)) \ldots \\ &+ Taper2 \cdot (TopofTaper2 - z) \cdot (z \geq TopofTaper3) \cdot (z < TopofTaper2) \ldots \\ &+ \begin{bmatrix} Taper2 \cdot (TopofTaper2 - TopofTaper3) \ldots \\ + Taper3 \cdot (TopofTaper3 - z) \end{bmatrix} \cdot (z < TopofTaper3)\end{aligned}$$



Average diameter: $\theta(OAH) = 24 \cdot in$ $Dp := \theta\left(\frac{OAH}{2}\right)$

$\theta(TopofTaper2) = 24 \cdot in$

$\theta(TopofTaper3) = 24 \cdot in$

$\theta(0 \cdot ft) = 64.5 \cdot in$

Calculate **force coefficient** for 12 sided pole:

$\sqrt{K(OAH)} \cdot \frac{V}{mph} \cdot \frac{Dp}{ft} > 64 = 1$ $\sqrt{K(33 \cdot ft)} \cdot \frac{V}{mph} \cdot \frac{Dp}{ft} > 64 = 1$

If both are 1, then $Cf := 0.9$

i	$Elev_i$ (ft)	$q(Elev_i)$ (psf)
1	12.2	23.5
2	36.6	32.2
3	60.9	37.2
4	85.3	41
5	109.7	44.1
6	134.1	46.7
7	158.4	48.9
8	182.8	51

Definition of Point Loads: $pl := 1 .. PL$

$$DB896 := 248 \cdot lbf \cdot \left(\frac{V}{100 \cdot mph}\right)^2 \qquad PLATFORM14 := 294 \cdot lbf \cdot \left(\frac{V}{100 \cdot mph}\right)^2$$

pl	$PLWL_{pl} :=$	$PLElev_{pl} :=$
1	12· DB896 + 1· PLATFORM14	195· ft
2	12· DB896 + 1· PLATFORM14	185· ft
3	12· DB896 + 1· PLATFORM14	175· ft
4	12· DB896 + 1· PLATFORM14	165· ft
5	12· DB896 + 1· PLATFORM14	155· ft

Calculate **overturning moment** and shear as a function of elevation.

Point load forces:

$$OTMPL(z) := \sum_{pl} PLWL_{pl} \cdot \left(PLElev_{pl} - z\right) \cdot \left(PLElev_{pl} > z\right) \cdot K\left(PLElev_{pl}\right) \cdot Gh$$

$$ShearPL(z) := \sum_{pl} PLWL_{pl} \cdot \left(PLElev_{pl} > z\right) \cdot K\left(PLElev_{pl}\right) \cdot Gh$$

OTM and shear due to full sections above z:

$$OTM2(z) := \sum_{i} \left[\frac{\theta(i \cdot SL) + \theta((i-1) \cdot SL)}{2} + 2 \cdot Ice\right] \cdot SL \cdot q\left(Elev_i\right) \cdot Cf \cdot \left(Elev_i - z\right) \cdot ((i-1) \cdot SL \ge z)$$

$$Shear2(z) := \sum_{i} \left[\frac{\theta(i \cdot SL) + \theta((i-1) \cdot SL)}{2} + 2 \cdot Ice\right] \cdot SL \cdot q\left(Elev_i\right) \cdot Cf \cdot ((i-1) \cdot SL \ge z)$$

OTM and shear of section at z:

$$SecWz(z) := SL \cdot \sum_{i} i \cdot (((i \cdot SL) > z) \cdot ((i-1) \cdot SL < z))$$

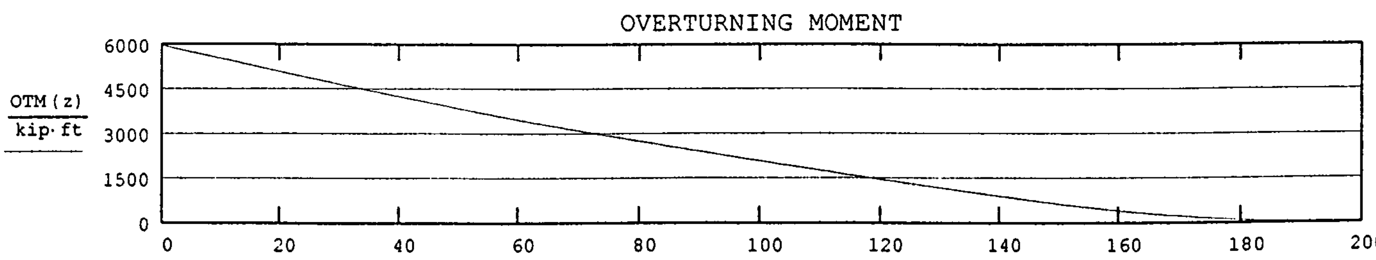
$$SecWzLngth(z) := (SecWz(z) - z) \cdot \Phi(SecWz(z) - z)$$

$$OTM3(z) := \left(\frac{\theta(SecWz(z)) + \theta(z)}{2} + 2 \cdot Ice\right) \cdot SecWzLngth(z) \cdot q\left(\frac{SecWz(z) + z}{2}\right) \cdot Cf \cdot \frac{SecWzLngth(z)}{2}$$

$$Shear3(z) := \left(\frac{\theta(SecWz(z)) + \theta(z)}{2} + 2 \cdot Ice\right) \cdot SecWzLngth(z) \cdot q\left(\frac{SecWz(z) + z}{2}\right) \cdot Cf$$

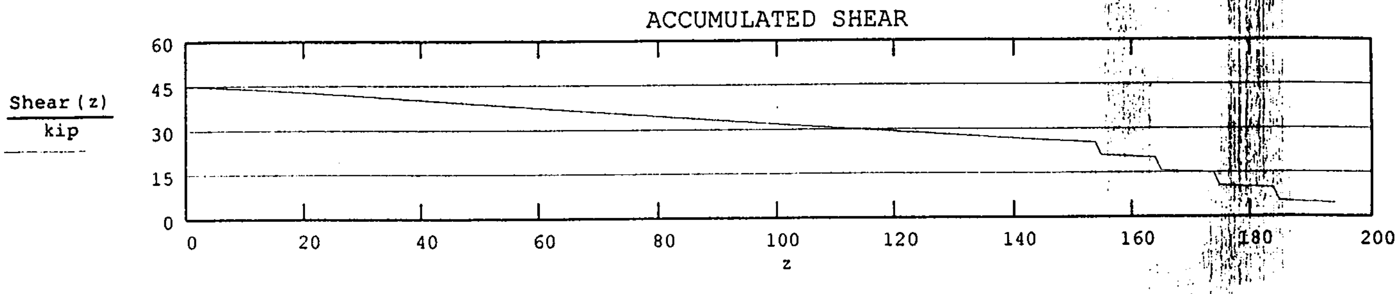
Total Moment is the sum of all three parts: $\qquad z := 0 \cdot ft .. OAH - 1 \cdot ft$

$$OTM(z) := OTM2(z) + OTMPL(z) + OTM3(z) \qquad OTM(0 \cdot ft) = 5952.8 \cdot kip \cdot ft$$



Total shear is sum of point loads, full section shears, and bottom section shears:

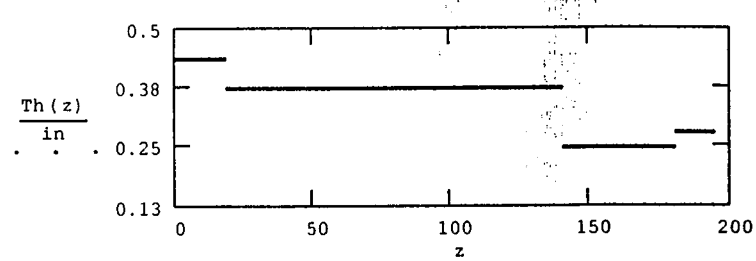
$\text{Shear}(z) := \text{Shear2}(z) + \text{ShearPL}(z) + \text{Shear3}(z)$ $\qquad$ $\text{Shear}(0\cdot ft) = 45.1 \cdot kip$



With these, assign plate thickness for each section. Elevations will have to be revised when final details are generated.

$a1 := 18\cdot ft \qquad b1 := 81\cdot ft \qquad c1 := 140\cdot ft \qquad d1 := 180\cdot ft$

$$Th(z) := \begin{vmatrix} .4375\cdot in & \text{if } 0\cdot ft \le z \le a1 \\ .375\cdot in & \text{if } a1 < z \le b1 \\ .375\cdot in & \text{if } b1 < z \le c1 \\ .25\cdot in & \text{if } c1 < z \le d1 \\ .281\cdot in & \text{otherwise} \end{vmatrix}$$



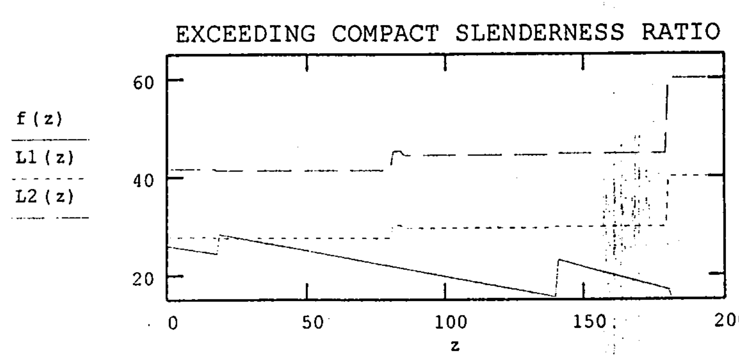
$$Fy(z) := \begin{vmatrix} (75000\cdot psi) & \text{if } 0\cdot ft \le z < a1 \\ (76000\cdot psi) & \text{if } a1 \le z < b1 \\ (63500\cdot psi) & \text{if } b1 \le z < 85\cdot ft \\ (66000\cdot psi) & \text{if } 85\cdot ft \le z < c1 \\ (65000\cdot psi) & \text{if } c1 \le z < d1 \\ (36000\cdot psi) & \text{if } d1 \le z < OAH \end{vmatrix}$$

Check **limiting slenderness ratio** by the limiting width-thickness ratios.
Calculate dimension of flat on outside:

$\phi := \dfrac{\pi}{Sides} \qquad b(z) := \theta(z)\cdot \tan(\phi) \qquad f(z) := \dfrac{b(z)}{Th(z)}$

Limit for non-compact section:

$L1(z) := \dfrac{240}{\sqrt{\dfrac{Fy(z)}{ksi}}} \qquad L2(z) := \dfrac{360}{\sqrt{\dfrac{Fy(z)}{ksi}}}$



Calculate the deadload/axial stresses.

$XArea(z) := Sides\cdot b(z)\cdot Th(z)$

$PoleWt := \left(\sum_z XArea(z)\cdot 1\cdot ft\right)\cdot .283\cdot \dfrac{lbf}{in^3}$

$DL := ((9 + 12)\cdot 27 + 6\cdot 170)\cdot lbf$

$PoleWt = 32660.4 \cdot lbf$

$\dfrac{DL + PoleWt}{XArea(0\cdot ft)} = 382.4 \cdot psi$

Calculate **allowable compressive stresses** for each section: 12 sided pole

$$Fa(z) := \begin{cases} .60 \cdot Fy(z) & \text{if } \frac{b(z)}{Th(z)} \cdot \sqrt{\frac{Fy(z)}{ksi}} < 240 \\ .870 \cdot Fy(z) \cdot \left(1 - .00129 \cdot \sqrt{\frac{Fy(z)}{ksi}} \cdot \frac{b(z)}{Th(z)}\right) & \text{if } 240 \le \frac{b(z)}{Th(z)} \cdot \sqrt{\frac{Fy(z)}{ksi}} \le 365 \end{cases}$$

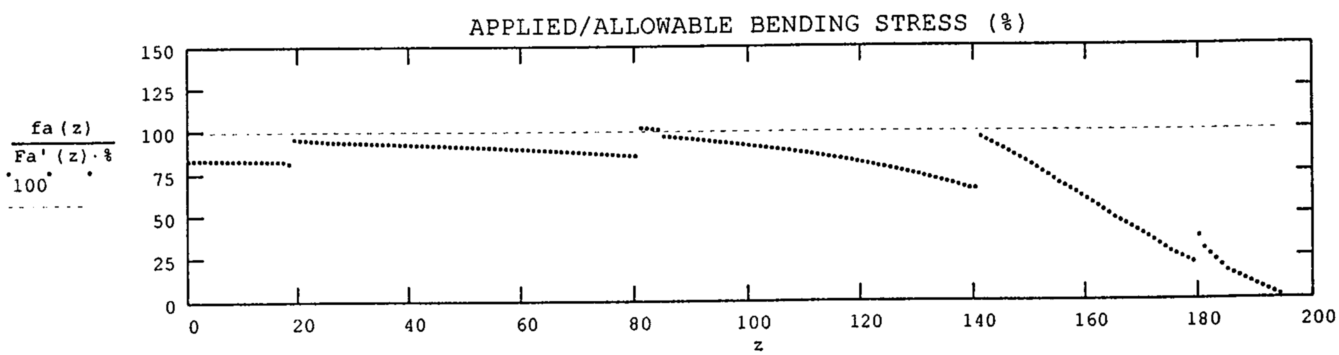
$Fa'(z) := Fa(z) \cdot \frac{4}{3}$ per EIA 3.1.1.1

Calculate Moment of Inertia for polygon section:

$ID(z) := \theta(z) - 2 \cdot Th(z)$

$$I(z) := \frac{Sides \cdot \left(\frac{\theta(z)}{2}\right)^2 \cdot \tan(\phi) \cdot \left[6 \cdot \left(\frac{\theta(z)}{2 \cdot \cos(\phi)}\right)^2 - \left[2 \cdot \sqrt{\left(\frac{\theta(z)}{2 \cdot \cos(\phi)}\right)^2 - \left(\frac{\theta(z)}{2}\right)^2}\right]^2\right]}{24} \ldots$$
$$+ -\left[\frac{Sides \cdot \left(\frac{ID(z)}{2}\right)^2 \cdot \tan(\phi) \cdot \left[6 \cdot \left(\frac{ID(z)}{2 \cdot \cos(\phi)}\right)^2 - \left[2 \cdot \sqrt{\left(\frac{ID(z)}{2 \cdot \cos(\phi)}\right)^2 - \left(\frac{ID(z)}{2}\right)^2}\right]^2\right]}{24}\right]$$

Calculate applied compressive stress: $fa(z) := \frac{OTM(z) \cdot \theta(z)}{2 \cdot I(z) \cdot \cos\left(\frac{\phi}{2}\right)} + \frac{DL + PoleWt}{XArea(0 \cdot ft)}$



$E1 := 18.1 \cdot ft$ $\qquad$ $E2 := 81.1 \cdot ft$ $\qquad$ $E3 := 140.1 \cdot ft$

$\frac{fa(E1)}{Fa'(E1)} = 96.7 \,\%$ $\qquad$ $\frac{fa(E2)}{Fa'(E2)} = 102.8 \,\%$ $\qquad$ $\frac{fa(E3)}{Fa'(E3)} = 98.2 \,\%$

All these points must be less then 100%.

Anchor bolt calculations: Here we assume that the plate is rigid allowing a linear stress distribution.

$Fu := 143000 \cdot psi$ $\qquad$ $BoltArea := \frac{\pi}{4} \cdot Bolt\phi^2$

Initial bolt size: $Bolt\phi := 2 \cdot in$

$NutOD := 3.125 \cdot in$

Bolt Circle: $(\theta(0 \cdot ft) - 1.5 \cdot in) - 3 \cdot Bolt\phi = 57 \, in$

Set bolt circle: $BC := 58 \cdot in$

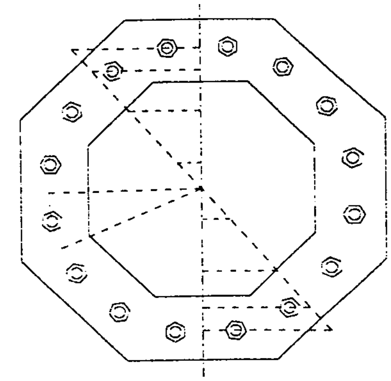
Number of bolts: $Bolts := 24$

Central angle between bolts: $\alpha := \frac{2 \cdot \pi}{Bolts}$

Distance to neutral axis: $Distance_i := \frac{BC}{2} \cdot \sin(i \cdot \alpha)$

BoltOD	Nut "F"
1"	1-5/8"
1-1/4"	2"
1-1/2"	2 3/8"
1-3/4"	2 3/4"
2"	3 1/8"
2-1/2"	3 7/8"

These are summed to calculate the largest bolt load:



$$BoltLoad := \frac{OTM(0\cdot ft)}{2\cdot\sum_i \frac{(Distance_i)^2}{max(Distance)}} - \left(\frac{DL + PoleWt}{Bolts}\right)$$

$BoltLoad = 203844 \cdot lbf$

$$f_t := \frac{BoltLoad}{BoltArea}$$ $f_t = 64885.3 \cdot psi$

$$fv := \frac{Shear(0\cdot ft)}{Bolts\cdot BoltArea}$$ $fv = 597.9 \cdot psi$

Anchor bolt stress: $$\frac{f_t}{.333\cdot Fu\cdot\frac{4}{3}} = 102.2 \cdot \%$$

Flange bolt calculations for E section:

$Bolt\phi 2 := .5\cdot in$

$BC2 := 27\cdot in$

$Bolts2 := 18$

$Ft := 44000\cdot psi\cdot\frac{4}{3}$

$$\alpha := \frac{2\cdot\pi}{Bolts2}$$ $$Distance2_j := \frac{BC2}{2}\cdot sin(j\cdot\alpha)$$

$$BoltLoad2 := \frac{OTM(TopofTaper2)}{2\cdot\sum_j \frac{(Distance2_j)^2}{max(Distance2)}}$$

$$\frac{BoltLoad2}{Ft\cdot\frac{\pi}{4}\cdot Bolt\phi 2^2} = 82.4 \cdot \%$$

Flange Plate Design:
For simplicity, calculate the maximum bending stress on the pole, assume it to be acting uniformly and calculate the bending stress of the plate.

Calculate section modulus at base assuming circular section:

Bending stress:

$$\sigma_{pole} := \frac{OTM(0\cdot ft)\cdot\theta(0\cdot ft)}{2\cdot I(0\cdot ft)}$$ $\sigma_{pole} = 49962.7 \cdot psi$

Calculate the line load on the inside edge of the plate:

$$Load := \frac{\frac{\pi}{4}\cdot\left[\theta(0\cdot ft)^2 - (\theta(0\cdot ft) - 2\cdot Th(0\cdot ft))^2\right]\cdot\sigma_{pole}}{\pi\cdot\theta(0\cdot ft)}$$ $Load = 21710.4 \cdot \frac{lbf}{in}$

We now apply this line load to the edge of the plate using AISC beam diagram #23, Beam fixed at one end, free to deflect vertically but not rotate at the other - concentrated load at deflected end. The section calculated as the width of the beam will be mid-way between pole and anchor bolts.

$$l := \frac{BC - \theta(0\cdot ft) - NutOD}{2}$$ $$bx := \alpha\cdot\frac{l + \theta(0\cdot ft)}{2}$$ $$Moment := Load\cdot bx\cdot\frac{l}{2}$$

$l = 1.7 \cdot in$ $bx = 11.6 \cdot in$ $Moment = 211.6 \cdot in\cdot kip$

Assume a plate thickness for calculating plate bending stress: $FlangeTh := 1.75 \cdot in$

$FlangeWt = 25 \cdot lbf$

$Fy_{flange} := 50000 \cdot psi$

$$\sigma_{flange} := \frac{Moment \cdot 6}{bx \cdot FlangeTh^2} \qquad \sigma_{flange} = 35888.6 \cdot psi$$

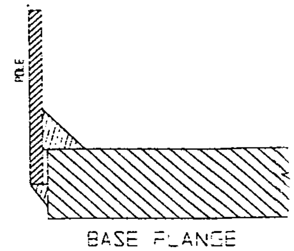
$$\text{AISC F2-1:} \quad Fb_{flange} := .75 \cdot Fy_{flange} \cdot \frac{4}{3} \qquad \frac{\sigma_{flange}}{Fb_{flange}} = 71.8 \cdot \%$$

Check base flange weld: Note that the pole will be welded to the base flange with fillet welds inside and outside. Inside will be limited by the plate thickness.

Tension stress of base metal:

$$\frac{Load}{\frac{.5625 \cdot in + Th(0 \cdot ft)}{\sqrt{2}} \cdot .3 \cdot 80 \cdot ksi \cdot \frac{4}{3}} = 95.9 \cdot \%$$

$$TensionArea := .6875 \cdot in + Th(0 \cdot ft)$$



$$TensionStress := \frac{Load}{TensionArea} \qquad \frac{TensionStress}{.6 \cdot Fy_{flange} \cdot \frac{4}{3}} = 48.2 \cdot \%$$

Shear Stress on base metal:

$$\frac{TensionStress}{.3 \cdot 58000 \cdot psi \cdot \frac{4}{3}} = 83.2 \cdot \%$$

Top Flange calculations: $ToT := TopofTaper2$

$$S2_{pole} := \frac{\pi}{32 \cdot \theta(ToT)} \cdot \left[(\theta(ToT))^4 - (\theta(ToT) - 2 \cdot Th(ToT))^4 \right] \qquad \sigma2_{pole} := \frac{OTM(ToT)}{S2_{pole}}$$

$$Load2 := \frac{\frac{\pi}{4} \cdot \left[\theta(ToT)^2 - (\theta(ToT) - 2 \cdot Th(ToT))^2 \right] \cdot \sigma2_{pole}}{\pi \cdot \theta(ToT)}$$

$$l2 := \frac{BC2 - \theta(ToT) - 1 \cdot in}{2} \qquad bx := \alpha \cdot \frac{l2 + \theta(ToT)}{2} \qquad Moment2 := Load2 \cdot bx \cdot \frac{l2}{2}$$

$$Flange2Th := .625 \cdot in \qquad \sigma2_{flange} := \frac{Moment2 \cdot 6}{bx \cdot Flange2Th^2} \qquad \frac{\sigma2_{flange}}{Fb_{flange}} = 40.6 \cdot \%$$

Save data to file for foundation design:

$$WRITEPRN(\text{"data.prn"}) := \left[\frac{OTM(0 \cdot ft)}{ft \cdot kip} \quad \frac{Shear(0 \cdot ft)}{lbf} \quad \frac{BC}{in} \quad Bolts \quad \frac{Bolt\phi}{in} \right] \qquad E := 29 \cdot 10^6 \cdot psi$$

Calculate deflection and rotation at the top at operational windspeed:

$$\delta := \frac{1}{E} \cdot \int_{0 \cdot ft}^{OAH} \frac{OTM(z)}{I(z)} \cdot (OAH - z) \, dz \cdot \frac{(50 \cdot mph)^2}{V^2} \qquad \delta = 66.6 \cdot in$$

$$\gamma := \frac{1}{E} \cdot \int_{0 \cdot ft}^{OAH} \frac{OTM(z)}{I(z)} \, dz \cdot \frac{(50 \cdot mph)^2}{V^2} \qquad \gamma = 3.12 \cdot deg$$

$$Angle := atan\left(\frac{\delta}{OAH}\right) \qquad Angle = 1.63 \cdot deg$$

MONOPOLE TOWER PAD & PIER FOUNDATION DESIGN

Applied loads:

Overturning Moment:	$OTM = 5953 \cdot kip \cdot ft$	
Shear Load at base:	$Shear = 45080 \cdot lbf$	
Deadload of Structure:	$Deadload := 36000 \cdot lbf$	
Tower face at bottom:	$Face := 64.5 \cdot in$	
	$BC = 58 \cdot in$	

Assumed material properties:

$\gamma_{concrete} := 150 \cdot \frac{lbf}{ft^3}$ $\quad \gamma_{soil} := 100 \cdot \frac{lbf}{ft^3}$

Concrete: $f'c := 3000 \cdot psi$

Rebar: $Fy_{rebar} := 60000 \cdot psi$

Allowable soil bearing pressure: $Fb := 4000 \cdot psf$ $\quad \theta_{soil} := 30 \cdot deg$

Foundation Dimensions:

$Pad := 30 \cdot ft$

$Thickness := 4 \cdot ft$

$OverallDepth := 12 \cdot ft$ $\quad PierDepth := OverallDepth - Thickness$

$BC + 2 \cdot 9 \cdot in = 76 \cdot in$ $\quad Pier\phi := 96 \cdot in$

Total Moment: $OTM := OTM + Shear \cdot (PierDepth + 12 \cdot in)$

Check dimensional fit of foundation:

$Face < Pad = 1$ $\quad 1 = OK$

Calculate overturning moment capacity:

$$Soil_1 := \left(PierDepth \cdot Pad^2 \cdot \gamma_{soil}\right) \cdot \frac{Pad}{2} \cdot (OverallDepth > Thickness)$$

$$Soil_2 := \frac{PierDepth^2 \cdot \tan\left(\theta_{soil}\right)}{2} \cdot Pad \cdot \gamma_{soil} \cdot \left(2 \cdot Pad \cdot \tan\left(\theta_{soil}\right)\right)$$

$$Soil_3 := \frac{PierDepth^2 \cdot \tan\left(\theta_{soil}\right)}{2} \cdot Pad \cdot \gamma_{soil} \cdot \frac{Pad}{2} \cdot 2 \cdot sides$$

$$Soil = \begin{bmatrix} 10800 \\ 1920 \\ 1662.8 \end{bmatrix} \cdot ft \cdot kip$$

$$Concrete := Pad^2 \cdot Thickness \cdot \gamma_{concrete} \cdot \frac{Pad}{2}$$ $\quad Concrete = 8100 \cdot ft \cdot kip$

$$PadVolume := Pad^2 \cdot Thickness$$ $\quad PadVolume = 133.3 \cdot cuyd$

$$OTMCapacity := \frac{Concrete}{1.25} + \frac{\sum_{i=1}^{3} Soil_i}{2}$$

$OTMCapacity = 13671 \cdot ft \cdot kip$

$\frac{OTM \cdot 1.5}{OTMCapacity} = 69.8 \cdot \%$

Check maximum bearing pressure at edge of slab: $Fb = 4000 \cdot psf$

$$VLoad := Deadload + Pad^2 \cdot \left(PierDepth \cdot \gamma_{soil} + Thickness \cdot \gamma_{concrete}\right)$$

$$fb_{Max} := \frac{VLoad}{Pad^2} + \frac{OTM \cdot 6}{Pad^3}$$

$$fb_{Min} := \frac{VLoad}{Pad^2} - \frac{OTM \cdot 6}{Pad^3}$$

Both must be + to prevent soil tension and pad uplift.

$$fb = \begin{bmatrix} 2853 \\ 27 \end{bmatrix} \cdot psf$$

$$PercentLoaded := \frac{fb_{Max}}{Fb}$$ $PercentLoaded = 71.3 \cdot \%$

Calculate bearing stress at face of pier:

$$fb_{Mid} := \frac{\frac{Pad}{2} - \frac{Pier\phi}{2}}{Pad} \cdot \left(fb_{Min} - fb_{Max}\right) + fb_{Max}$$ $fb = \begin{bmatrix} 2853 \\ 27 \\ 1816.8 \end{bmatrix} \cdot psf$

Average this with the maximum stress and apply as a moment over the pad:

$$PadMoment := \frac{fb_{Max} + fb_{Mid}}{2} \cdot Pad \cdot \frac{\left(\frac{Pad}{2} - \frac{Pier\phi}{2}\right)^2}{2}$$ $PadMoment = 4237.9 \cdot ft \cdot kip$

Calculate Pad Reinforcement:

$PadBars := 23$ $BarNumber := 10$

$Cover := 3 \cdot in$

$$As := PadBars \cdot \left(\frac{BarNumber}{8} \cdot in\right)^2 \cdot \frac{\pi}{4}$$

$d := Thickness - Cover$

$$BendingCap := \frac{.9}{1.3} \cdot As \cdot Fy_{rebar} \cdot \left(d - \frac{As \cdot Fy_{rebar}}{0.85 \cdot f'c \cdot Pad \cdot 2}\right)$$ $BendingCap = 4306.5 \cdot ft \cdot kip$

$$PercentLoaded := \frac{PadMoment}{BendingCap}$$ $PercentLoaded = 98.4 \cdot \%$

Minimum reinforcement for section designed for strength: $\frac{200 \cdot psi}{Fy_{rebar}} = 0.003333$

$$\rho_{actual} := \frac{As}{Pad \cdot d}$$ $\rho_{actual} = 0.0017$

NOTE: Section is not designed for strength, therefore, utilize ACI 10.5.2. Steel requirements:

$$As_{pad} := \rho_{actual} \cdot Pad \cdot d \cdot \frac{4}{3}$$ $As_{pad} = 37.63 \cdot in^2$

$\rho = 0.00174$

$$\left(PadBars \cdot \frac{4}{3}\right) \cdot \frac{\pi}{4} \cdot \left(\frac{BarNumber}{8} \cdot in\right)^2 = 37.63 \cdot in$$

$$PadBars := PadBars \cdot \frac{4}{3}$$ $PadBars = 30.7$ Use (31)-#10 bars each way

Calculate reinforcement requirements for Pier:

$Cage\phi := Pier\phi - 2 \cdot 4 \cdot in$

Reinforcing Bar calculations: AS with the anchor bolts, we assume a linear stress distribution.

Initial bar size: $PierBarNumber := 11$ $d_b := 1.41 \cdot in$

Number of bars: $PierBars := 54$ $BarArea := \frac{\pi}{4} \cdot \left(d_b\right)^2$

Central angle between bars: $\alpha := \frac{2 \cdot \pi}{PierBars}$

Distance to neutral axis: $Distance_i := \frac{Cage\phi}{2} \cdot \sin(i \cdot \alpha)$ $\frac{Cage\phi}{2} \cdot \alpha = 5.1 \cdot in$

These are summed to calculate the largest bar load:

$$\text{BarLoad} := \frac{\text{OTM}}{2\cdot\sum_i \frac{(\text{Distance}_i)^2}{\max(\text{Distance})}}$$

BarLoad = 64121 •lbf

$$f_t := \frac{\text{BarLoad}}{\text{BarArea}} \qquad \phi := .90 \qquad Ft := \frac{\phi\cdot Fy_{bar}}{1.3}$$

$$\frac{f_t}{Ft} = 98.9 \cdot \%$$

f_t = 41064.9 •psi

Calculate development length of rebar:

$$l_{db} := \frac{.04}{in}\cdot \text{BarArea}\cdot \frac{\frac{Fy_{bar}}{psi}}{\sqrt{\frac{f'c}{psi}}}$$

l_{db} = 68.4 •in

$$l_{db} \geq .0003\cdot\frac{in^2}{lbf}\cdot d_b\cdot Fy_{bar} = 1$$

ACI 12.3.2:Verfify that it is within limits:

Final Dimensions:

Pad Dimensions:	Pier Dimensions:
Pad = 30•ft	Pierϕ = 8.0•ft
Thickness = 4•ft	PierDepth = 8•ft
OverallDepth = 12•ft	
PadBars = 30.7	PierBars = 54
BarNumber = 10	PierBarNumber = 11
PadVolume = 133.3 •yd^3	PierVolume = 15.8 •yd^3

CageWt = 3436.1 •lbf

Calculate required anchor bolt length:

Bolt length is based on the development length of the longitudinal bars plus the distance to the cluster plate. This assumes that the failure mode is a 45°.

$$\text{BoltLength} := l_{db} + (\text{Cage}\phi - BC) + 6\cdot in$$

BoltLength = 104.42 •in

Set: BoltLength := 105· in min.

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square
New Britain, Connecticut 06051
Phone: (860) 827-2935
Fax: (860) 827-2950

December 4, 2000

Honorable Anthony J. DaRos
First Selectman
Town of Branford
Town Hall
1019 Main Street
P. O. Box 150
Branford, CT 06405-0150

RE: **TS-VER-014-001117** - Cellco Partnership d/b/a Verizon Wireless request for an order to approve tower sharing at an existing telecommunications facility located at 850 West Main Street, Branford, Connecticut.

Dear Mr. DaRos:

The Connecticut Siting Council (Council) received this request for tower sharing, pursuant to Connecticut General Statutes § 16-50aa.

The Council will consider this item at the next meeting scheduled for December 14, 2000, at 10:00 a.m. in Hearing Room One, Ten Franklin Square, New Britain, Connecticut.

Please call me or inform the Council if you have any questions or comments regarding this proposal.

Thank you for your cooperation and consideration.

Very truly yours,

Joel M. Rinebold
Executive Director

JMR/laf

Enclosure: Notice of Tower Sharing

Network Dept.

verizonwireless

Verizon Wireless
20 Alexander Drive
Wallingford, Connecticut 06492

HAND DELIVERED

November 16, 2000

Mr. Mortimer A. Gelston, Chairman
Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051

Re: **Request by Cellco Partnership d/b/a Verizon Wireless for an Order to Approve the Shared Use of a Tower Facility located at 850 West Main Street, Branford, Connecticut.**

Dear Chairman Gelston:

Pursuant to Connecticut General Statutes (C.G.S.) Sec. 16-50aa, Cellco Partnership d/b/a Verizon Wireless hereby requests an order from the Connecticut Siting Council ("Council") to approve the proposed shared use by Verizon Wireless of an existing tower located at 850 West Main Street, Branford, Connecticut. The property is owned by Remo Tartaglia Jr. ET ALS, of West Haven, Connecticut and the tower is owned and managed by Sprint Sites USA. As shown on the attached drawing and as further described below, Verizon Wireless proposes to install antennas on the existing tower and to locate its equipment shelter at the base of the tower. Verizon Wireless requests that the Council finds that the proposed shared use of the tower facility satisfy the criteria stated in C.G.S. Sec. 16-50aa, and to issue an order approving the proposed shared use.

Background

Verizon Wireless is licensed by the Federal Communications Commission to provide cellular telephone service in the New Haven County New England County Metropolitan Area (NECMA), which includes the area to be served by the proposed Branford installation.

The facility at 850 West Main Street in Branford consists of a 120 foot AGL monopole tower built by Sprint Sites USA. and is located on a leased parcel. The monopole tower presently supports the antennas of Sprint Sites USA. The tower has been constructed to support the antennas of other wireless providers. Verizon Wireless and Sprint Sites USA have agreed to the proposed-shared use of this tower pursuant to mutually acceptable terms and conditions. Sprint Sites USA has authorized Verizon Wireless to apply for all necessary permits, approvals and authorizations which may be required for the proposed shared use of this facility.

Verizon Wireless proposes to install twelve (12) Decibel Model DB844H90E antennas, approximately 48 inches in height, on a platform with their center of radiation at approximately 110 feet above ground level ("AGL"). Verizon Wireless will also install one (1) GPS antenna on the tower platform. Equipment associated with these antennas, as well as a 40 KW diesel-fueled emergency stand-by generator, would be located in a new approximately 12-foot x 30-foot equipment shelter located at the base of the tower.

C.G.S. Sec. 16-50aa provides that, upon written request for approval of a proposed shared use, "if the Council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the Council shall issue an order approving such shared use" (C.G.S. Sec. 16-50aa©(1).)

Discussion

A. Technical Feasibility. The existing tower is structurally sound and capable of supporting the proposed Verizon Wireless antennas. The tower will not require any structural modification to support the proposed attachments. A copy of the structural design will be submitted to the Council under separate cover. Verizon Wireless engineers have determined that the proposed antenna installations present minimal potential for interference to or from existing radio transmissions from this location. In addition, the applicant is unaware of any occasion where its operations have caused interference with AM, FM or television reception. The proposed shared use of this tower therefore is technically feasible.

B. Legal Feasibility. Under C.G.S. Sec. 16-50aa, the Council has been authorized to issue an order approving the proposed-shared use of an existing communication tower facility such as the facility at 850 West Main Street. (C.G.S. Sec. 16-50aa©(1).) This authority complements the Council's prior existing authority under C.G.S. Sec. 16-50p to issue orders approving the construction of new towers that are subject to the Council's jurisdiction. C.G.S. Sec. 16-50x(a) directs the Council to "give consideration to other state laws and municipal regulations as it shall deem appropriate" in ruling on requests for the shared use of existing tower facilities. Under the authority vested in the Council by C.G.S. Sec. 16-50aa, an order by the Council approving the shared use would permit the applicant to obtain a building permit for the proposed installations.

C. Environmental Feasibility. The proposed shared use would have a minimal environmental effect, for the following reasons:

1. The proposed installations would have an insignificant incremental visual impact, and would not cause any significant change or alteration in the physical or environmental characteristics of the existing site. The addition of the proposed antennas would not increase the height of the tower, and would not extend the boundaries of the tower site, including the placement of the equipment building near the base of the existing tower.

2. The proposed installation would not increase the noise levels at the existing facility by six decibels or more. The only additional noise will occur during emergency use or periodic exercising of the generator.

3. Operation of the additional antennas will not increase the total radio frequency electromagnetic radiation power density, measured at the tower base to a level at or above the applicable standard. "Worst-case" exposure calculations for a point at the base of the tower in relation to operation of each of the various carriers' antenna arrays are as follows:

	Applicable ANSI Stnd	Calculated "Worst-Case"	Percentage of Stnd
Verizon Wireless	0.583 mW/cm2	0.0564 mW/cm2	9.68%
Sprint PCS	1.000 mW/cm2	0.0335 mW/cm2	3.35%
		Total	13.03%

The collective "worst-case" exposure would be only 13.03 % of the ANSI standard, as calculated for mixed frequency sites. Power density levels from shared use of the tower facility would thus be well below applicable ANSI standards.

4. The proposed installations would not require any water or sanitary facilities, or generate discharges to water bodies. Operation of the emergency back-up generator will result in limited air emissions; pursuant to R.S.A. Section 22a-174-3, the generator will require the issuance of a permit from the Department of Environmental Protection Bureau of Air Management. After construction is complete, the proposed installation would not generate any traffic other than periodic maintenance visits.

The proposed use of this facility would therefore have a minimal environmental effect, and is environmentally feasible.

D. Economic Feasibility. As previously mentioned, the tower owner and the applicant have entered into a mutual agreement to share use of the existing tower on terms agreeable to the parties, and the proposed tower sharing is thus economically feasible.

E. Public Safety Concerns. As stated above, the existing tower is structurally capable of supporting the proposed Verizon Wireless antennas and the structural analysis, which has been ordered, will verify the structural integrity of the tower. The tower was originally designed as a multi carrier tower and Verizon Wireless will be the second carrier on a three-carrier pole. The Applicant is not aware of any other public safety concerns relative to the proposed tower sharing of the existing tower. In fact, the provision of continued and improved cellular phone service in the southwestern Branford area, especially along the heavily traveled Route 1 and Interstate 95 area of Branford, through shared use of the tower is expected to enhance the safety and welfare of area residents and travelers. The public safety benefits of wireless service are further illustrated by the decision of local authorities elsewhere in Connecticut to provide cellular phones to residents to improve local public safety and emergency communications. The proposed-shared use of this facility would likewise improve public safety in the Branford area.

Conclusion

For the reasons discussed above, the proposed shared use of the existing telecommunications tower facility at 171 South Broad Street satisfies the criteria stated in C.G.S. Sec. 16-50aa, and advances the General Assembly's and the Council's goal of preventing the proliferation of towers in Connecticut. The Applicant therefore requests that the Council issue an order approving the proposed shared use.

Thank you for your consideration of this matter.

Pursuant to Connecticut General Statutes Sec. 16-50v and Section 16-50v-1(a) of the Regulations of Connecticut State Agencies, Verizon Wireless has enclosed a check in the amount of $500.00 for the required filing fee
Respectfully yours,

Sandy M. Carter
Sandy M. Carter
Manager-Regulatory
Verizon Wireless

Attachments
Cc: Mr. Anthony DaRos, First Selectman

Network Dept.

verizon wireless

Verizon Wireless
20 Alexander Drive
Wallingford, Connecticut 06492

November 16, 2000

Honorable Anthony DaRos,
First Selectman
Town Hall
1019 Main Street
Branford, Connecticut 06405

Dear Mr. DaRos:

This letter is to inform you that Cellco Partnership d/b/a Verizon Wireless plans to install antennas and associated equipment at the existing tower facility located at 850 West Main Street, Branford, Connecticut. I am enclosing a copy of Verizon Wireless's tower sharing application to the Connecticut Siting Council.

The application fully sets forth the Company's proposal. However, if you have any questions or require further information on our plans or the Siting Council's procedures, please contact me at (203) 294-8519 or Mr. Joel Rinebold, Executive Director of the Connecticut Siting Council at (860) 827-2935.

Sincerely,

Sandy M. Carter

Sandy M. Carter
Manager – Regulatory
Verizon Wireless

Enclosure

203 294 7424

Sprint

Sprint Sites USA
East Region - Northeast District Office
535 East Crescent Avenue
Ramsey, NJ 07430
Mailstop NJRAMA0101

VIA FEDERAL EXPRESS 203 294 8519

November 9, 2000

Sandy Carter
Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

RE: Sprint Site Number: CT03XC048-01
Site Address: 850 West Main Street, Branford, CT 06405

Dear Ms. Carter:

I, Robert Greenwell, representing Sprint Spectrum L.P. (Sprint), authorize Verizon Wireless to act as applicant, representing Sprint before the Connecticut Siting Council to obtain zoning approval for any permit required for governmental compliance. However, Verizon Wireless shall not be authorized to make any concessions or commitments to the Connecticut Siting Council that may affect the operations or future leasing opportunities of Sprint beyond what is shown on the construction drawing prepared by Goodkind & O'Dea, Inc., dated April 23, 2000, Site Name Branford SW, without obtaining prior approval and consent from Sprint.

Sincerely,

Robert Greenwell
Regional Manager
(201) 995-4021

DB842H80N-XY, DB842H90N-XY dB DIRECTOR™ LOG PERIODIC ANTENNAS DB844H80N-XY, DB844H90N-XY 9-13 dBd GAIN, 40 dB F/B RATIO, 806-960 MHz

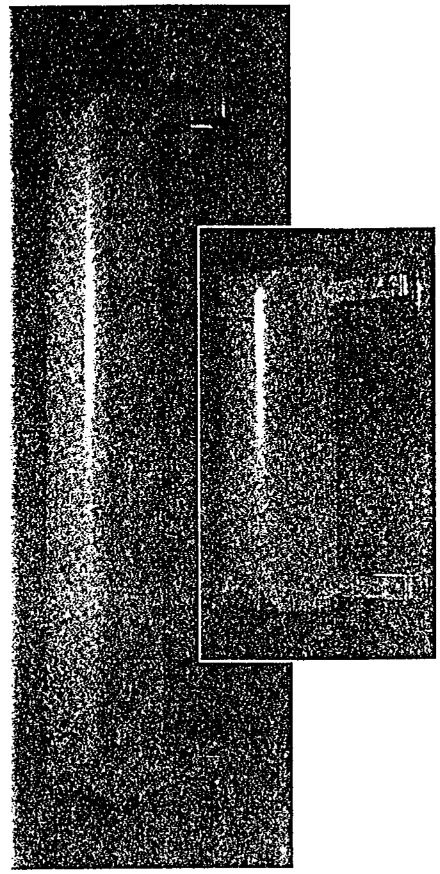
Base Station Antennas

Ideal for cellular and trunking/ESMR applications, these high quality log periodics are now available from Decibel in four new models with 80 or 90 degree horizontal apertures. They're compact, lightweight, and provide an **unmatched front-to-back ratio of 40 dB.**

- Less Wind Loading - They measure only 24 or 48 inches (610 or 1219 mm) tall, 8.5 inches deep (216 mm), and 6 inches wide (152 mm). They weigh only 5 or 10 pounds.
- Downtilt - Electrical downtilt is available on all 4-foot models, 6°, 8°, 11°, 13°, or for mechanical downtilt, order DB5083 bracket.
- Null-Fill - Four-foot models provide null-fill and upper lobe suppression.
- Most Stringent IM Test - Each antenna is tested for the absence of IM with 16 carriers at 500 watts of composite power.
- Sturdy Construction - Made in the U.S. of high-strength aluminum alloy backs, brass elements and UV resistant ABS plastic radomes. No rivets are used!
- Lightning Resistant - All metal parts are grounded.
- Terminations and Mounts - All models are available with N-Female or 7/16 DIN connectors. DB380 pipe mount is included.

Ordering Information - See table for models to fit your requirements.

UPS Shippable



4-Foot and 2-Foot dB DIRECTORS

Models Available

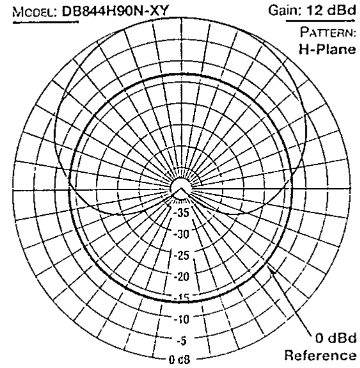
Model*	DB842H80N-XY	DB844H80N-XY	DB842H90N-XY	DB844H90N-XY
Gain – dBd/dBi	10/12.1	13/15.1	9/11.1	12/14.1
F/B Ratio – dB	40	40	40	40
Horizontal beamwidth**	80°	80°	90°	90°
Vertical beamwidth**	30°	15°	30°	15°
Height – in. (mm)	24 (610)	48 (1219)	24 (610)	48 (1219)
Weight – lbs. (kg)	5 (2.3)	10 (4.6)	5 (2.3)	10 (4.6)
Shipping weight – lbs. (kg)	8 (3.6)	15 (6.8)	8 (3.6)	15 (6.8)

* For 7/16 DIN connectors substitute "E" for "N" in the model numbers. Example: DB842H80E-XY.

** 3 dB from maximum.

Side offset mounting bracket is included. For electrical downtilt of 6°, 8°, 11° or 13° add T6, T8, T11 or T13 before the "N" or "E" in any 4-foot model number. Example: DB844H80T6N-XY. Note: Electrical downtilt causes a gain loss of .05 dB, or , at the horizon, a reduction of 3, 6, 9 or 12 dB on downtilts of 6°, 8°, 11° or 13° respectively. For mechanical downtilt order DB5083 bracket.

Typical DB842H90N-XY, DB844H90N-XY Horizontal Pattern



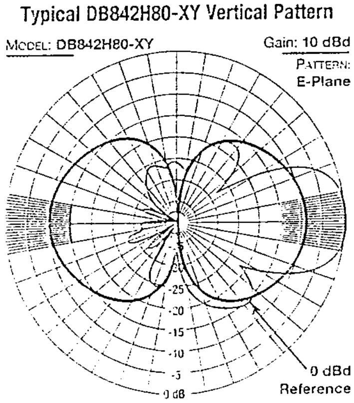
Mechanical Data

Width – in. (mm)	6 (152)
Depth – in. (mm)	8.5 (216)
Height	See table above
Maximum wind speed – mph (km/h)	125 (200)
Wind area – ft² (m²)	
24" (610 mm) antenna	1 (.093)
48" (1219 mm) antenna	2 (.186)
Wind load (at 100 mph/161 km/h) – lbf (N) kp	
24" (610 mm) antenna	40 (178) 18
48" (1219 mm) antenna	80 (356) 36
Radome	Gray ABS
Backplate	Passivated aluminum
Radiators	Brass
Mounting hardware	Galvanized steel
Weight	See table above

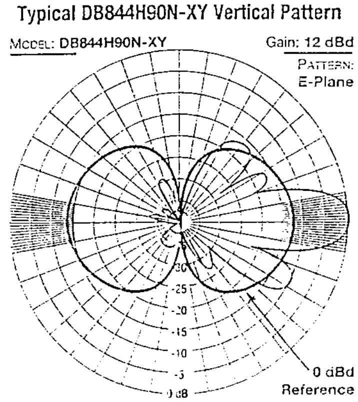
Electrical Data

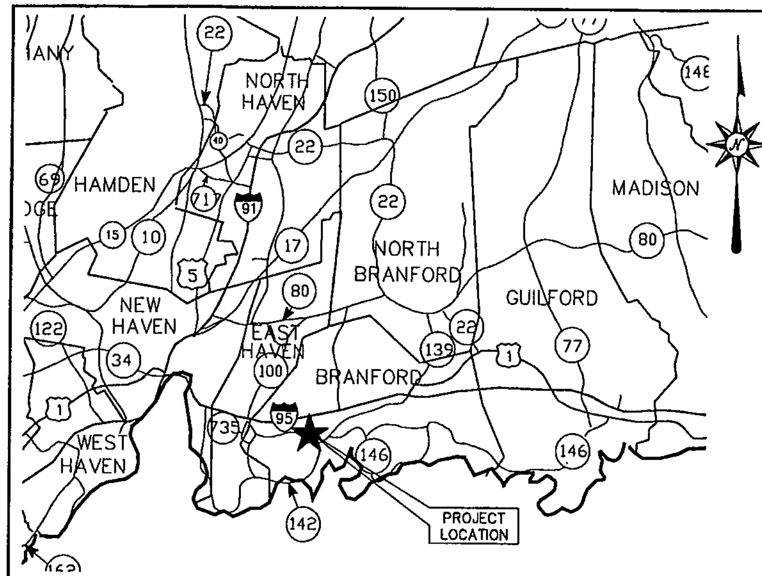
Frequency Range - MHz	806-960
Gain - dBd	See table above
Front-to-back ratio - dB	>40
Beamwidths	See table above
VSWR	<1.5:1
Null-fill and secondary lobe suppression	On 48" (1219 mm) models only
Maximum power input - watts	500
Nominal impedance - ohms	50
Lightning protection	All metal parts grounded
Termination	N-Female or 7/16 DIN

Typical DB842H80-XY Vertical Pattern



Typical DB844H90N-XY Vertical Pattern



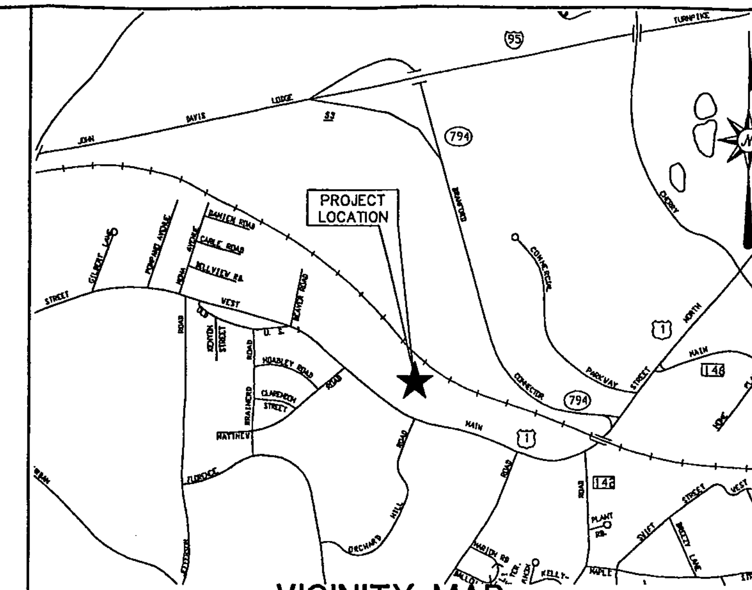


LOCATION MAP

SCALE: NONE

SITING COUNCIL SUBMISSION

BRANFORD SOUTHWEST TELECOMMUNICATION FACILITY



VICINITY MAP

SCALE: 1"=1000'

850 WEST MAIN STREET
BRANFORD, CONNECTICUT 06405

PREPARED FOR:

CELLCO PARTNERSHIP DBA
VERIZON WIRELESS
20 ALEXANDER DRIVE
WALLINGFORD, CONNECTICUT 06492

CONTENTS

PREPARED BY:

Companies

ARCHITECTURE ENGINEERING PLANNING LANDSCAPE ARCHITECTURE
LAND SURVEYING ENVIRONMENTAL SCIENCES ANALYTICAL SERVICES

355 RESEARCH PARKWAY
MERIDEN, CONNECTICUT 06450
(203) 630-1406
(203) 630-2615 Fax

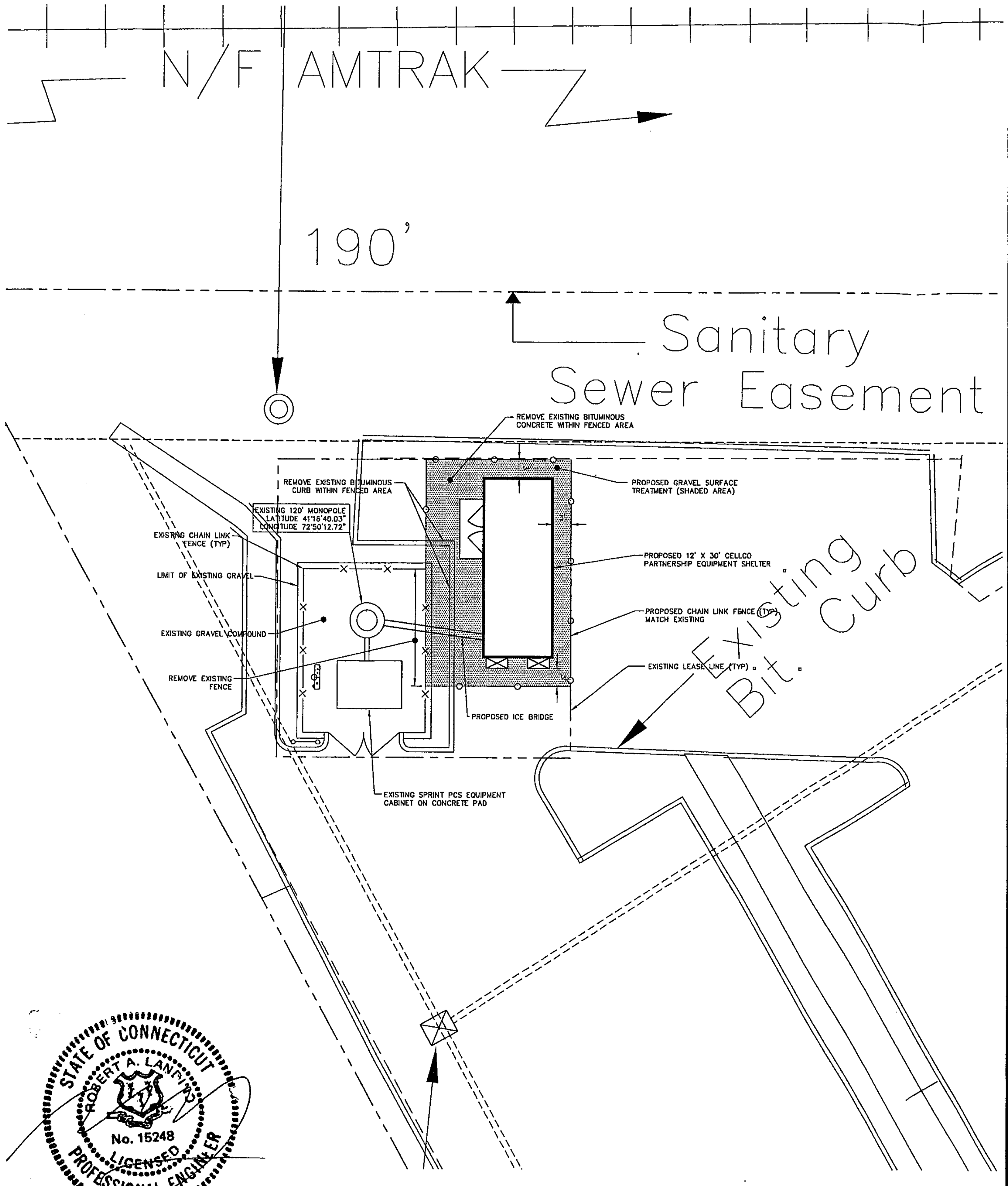
STATE OF CONNECTICUT
ROBERT A. LANG
No. 15248
LICENSED PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION

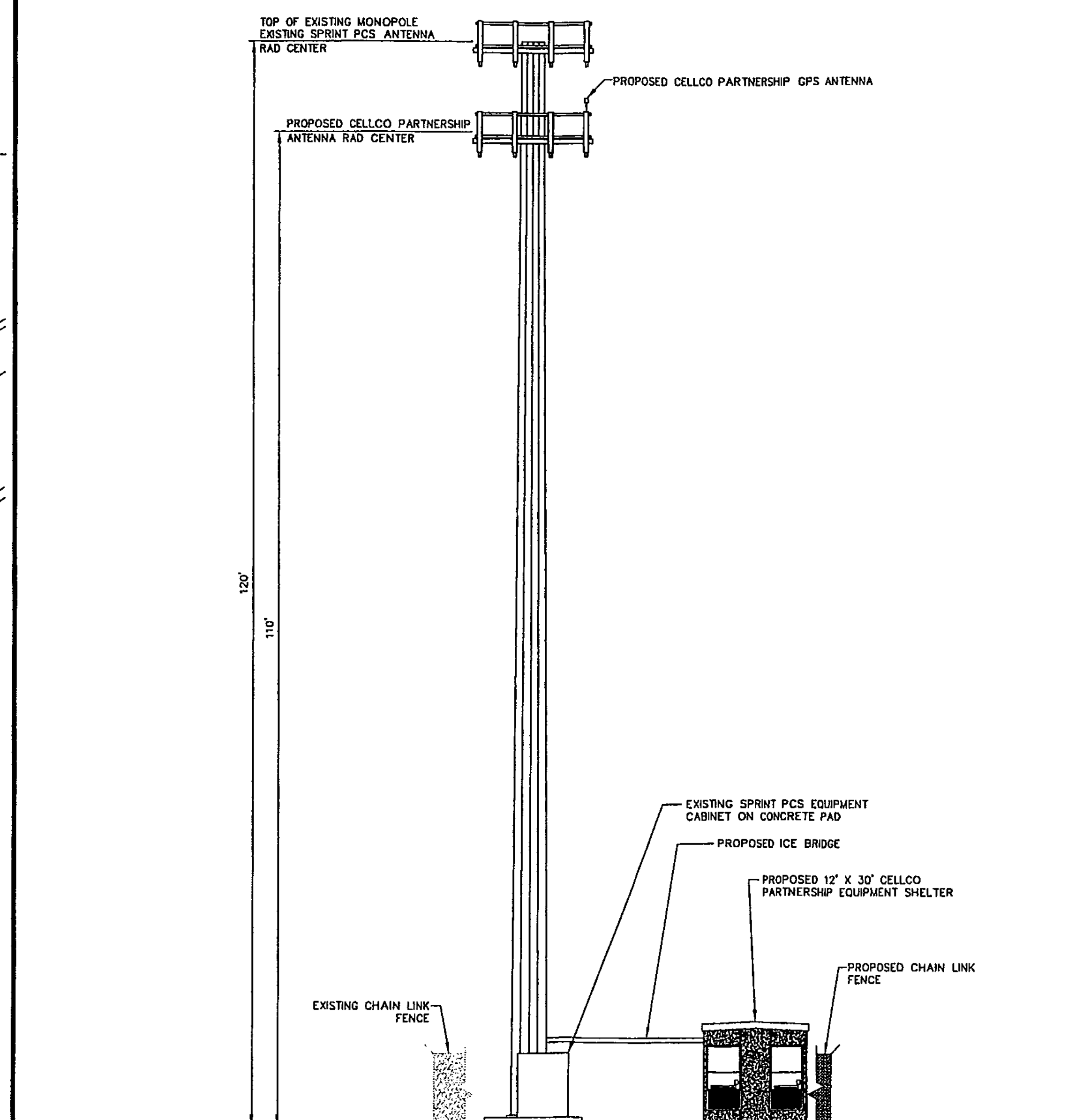
DATES

ISSUE DATE: NOVEMBER 01, 2000
REVISION:

CAD FILE: CVCB1901



SITE PLAN
SCALE: 1"=10'



TOWER ELEVATION
SCALE: 1"=10'

BL Companies
ARCHITECTURE
ENGINEERING
PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING
ENVIRONMENTAL SCIENCES
ANALYTICAL SERVICES

355 Research Parkway
Meriden, CT 06450
(203) 630-1406
(203) 630-2615 Fax

SITE PLAN AND TOWER ELEVATION
BRANFORD SW TELECOMMUNICATION FACILITY
850 WEST MAIN STREET
BRANFORD, CONNECTICUT

REVISIONS No.	Date	Desc.

Designed	R.C.B.
Drawn	R.C.B.
Checked	R.C.B.
Approved	R.A.L.
Scale	AS SHOWN
Project No.	00C819
Date	11/01/00
CAD File	SCC81901

Sheet No.
SC-1

Xref (s): XYC81901, XCC81901, XCC81902