STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@po.state.ct.us
www.ct.gov/csc

April 20, 2005

Kenneth C. Baldwin
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-028-050404** -Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 48 Westchester Road, Colchester, Connecticut.

Dear Attorney Baldwin:

At a public meeting held on April 19, 2005, the Connecticut Siting Council (Council) acknowledged your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies.

The proposed modifications are to be implemented as specified here and in your notice dated April 4, 2005, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. 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 will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of 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.

Thank you for your attention and cooperation.

Very truly yours,

Pamela B. Katz, P.E.
Chairman

PBK/laf

c: The Honorable Jenny Contois, First Selectman, Town of Colchester
Christopher Beauchemin, Town Planner, Town of Colchester
Jonathan Roush, Site Marketing Manager, Northeast, SBA Network Services, Inc.
Christopher B. Fisher, Esq., Cuddy & Feder LLP
Stephen J. Humes, Esq., McCarter & English LLP

ROBINSON & COLE LLP

KENNETH C. BALDWIN

?80 Trumbull Street
artford, CT 06103-3597
Iain (860) 275-8200
ax (860) 275-8299
baldwin@rc.com
)irect (860) 275-8345

EM-VER-028-050404

April 4, 2005

Via Hand Delivery

S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
48 Westchester Road
Colchester, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility on an existing tower owned by SBA Communications, 48 Westchester Road in Colchester. This facility consists of twelve (12) panel-type cellular antennas at the 167-foot level of the 180-foot tower. Equipment associated with the antennas is located in a shelter near the base of the tower.

The Connecticut Siting Council ("the Council") approved Cellco's shared use of the Westchester Road facility on March 22, 2000. Cellco now intends to modify its facility by removing three (3) cellular antennas and installing six (6) PCS antennas, for a total of fifteen (15) antennas, at the same level on the tower. Attached behind Tab 1 are specifications for the existing cellular antennas and the proposed PCS antennas for the Westchester Road facility.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Colchester First Selectman, Jenny Contois.

The planned modifications to the Westchester Road facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in any increase in the overall height of the existing structure. Cellco's replacement antennas will be mounted at the same level on the tower.

2. The proposed modifications will not affect ground-mounted equipment and will not require the extension of the site boundaries.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The proposed modifications will not result in radio frequency (RF) power density levels at the facility that exceed the Federal Communications Commission (FCC) adopted safety standard. Attached behind Tab 2 is a new General Power Density Calculation Table.

Also, attached behind Tab 3 is a structural analysis stating that the tower can support the proposed antenna modifications.

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

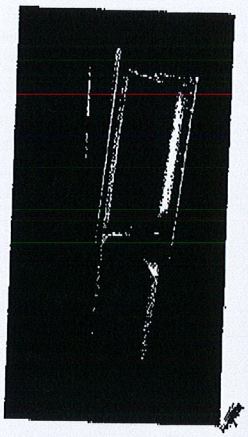
Enclosures
cc: Jenny Contois, First Selectman
Sandy M. Carter

[illegible] MHz Allgon Log Periodic Antenna

800 MHz Allgon Log Periodic Antenna
A-800-60-18i
A-800-85-9i

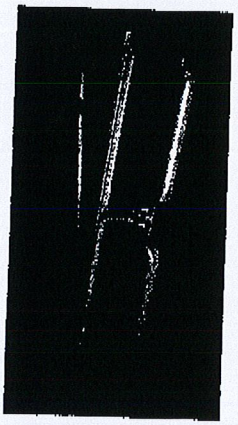
Electrical Specifications

	7125.18 (A-800-60-18i)	7129.12 (A-800-85-9i)
Gain	16 dBd (18 dBi)	7 dBd (9 dBi)
Polarization	linear, vertical	linear, vertical
VSWR, 50Ω	<1.5:1 (806 MHz to 824 MHz)	<1.5:1 (806 MHz to 824 MHz)
VSWR, 50Ω	<1.4:1 (824 MHz to 896 MHz)	<1.4:1 (824 MHz to 896 MHz)
Horizontal 3dB beamwidth	60°	85°
Vertical 3dB beamwidth	8°	60°
Custom electrical downtilts	0°	0°
40 degree cone Front-to-back ratio	>30 dB	>30 dB
Suppression of first upper side lobe	>17 dB	>20 dB
Maximum CW input power	500W	300W
Two tone intermodulation 3rd order	<-103 dBm for 2x20W (146 dBc at 2x43 dBm)	<-103 dBm for 2x20W (146 dBc at 2x43 dBm)



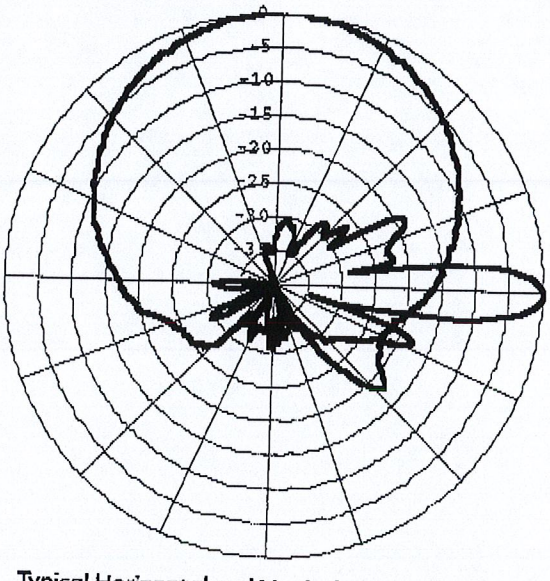
Mechanical Specifications

Connector	7/16 DIN or Type N side mounted	7/16 DIN side mounted
Height	102" (2600 mm)	14.2" (360 mm)
Width	17.3" (440 mm)	13" (330 mm)
Depth	12.6" (320 mm)	11.4" (290 mm)
Weight	38.5 lbs (17.5 kg)	4.4 lbs (2 kg)
Survival wind speed	156 mph (70 m/s)	156 mph (70 m/s)
Maximum wind area	10.2 sq.ft (0.95 sq.m)	1.2 sq.ft (0.11 sq.m)
Maximum wind load @100mph	268 lbf (1190 N)	31.5 lbf (138 N)
*All metallic components DC grounded for Lightning Protection		
Mounting Hardware Options for Installation		
1) Pole mount	2165.10	2165.10
2) Combined pole mount/downtilt bracket	7254.10 (-0.5° to +12°)	N/A

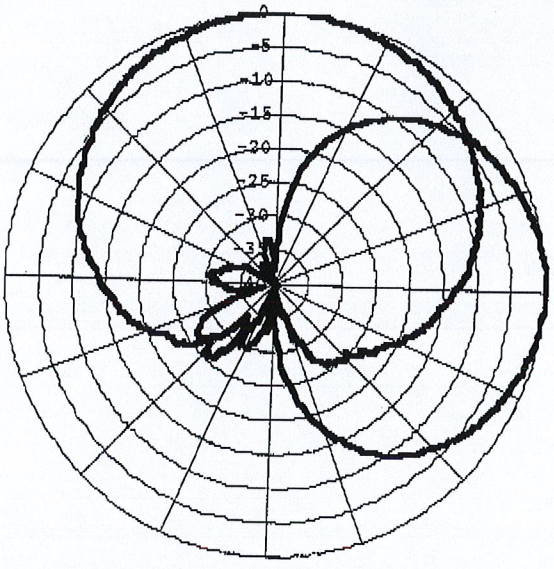


Comments
Gain is typical within frequency band.
Front-to-back ratio is defined within 20° from the backwards direction in any plane.
Sidelobe suppression and null fill is relative to peak of main beam.
Radome color is NCS 2502-B (RAL 7035)(gray).

For a complete list of released models pertaining to gain, electrical downtilt and connector placement, please see the quick reference guide on page 22.



Typical Horizontal and Vertical 7125.18 Patterns

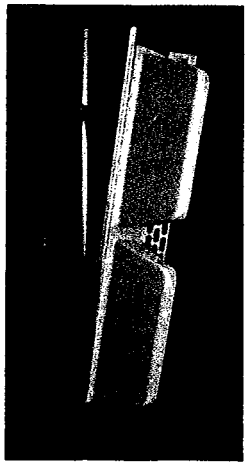


Typical Horizontal and Vertical 7129.12 Patterns

A poster displaying a comparison of antenna patterns has been included at the back of the catalog.

Electrical Specifications

	7129.16 (A-800-85-15i)	7130.14 (A-800-95-11i)
Gain	13 dBd (15 dBi)	9 dBd (11 dBi)
Polarization	linear, vertical	linear, vertical
VSWR, 50Ω	<1.5:1 (806 MHz to 824 MHz)	<1.5:1 (806 MHz to 824 MHz)
VSWR, 50Ω	<1.4:1 (824 MHz to 896 MHz)	<1.4:1 (824 MHz to 896 MHz)
Horizontal 3dB beamwidth	85°	95°
Vertical 3dB beamwidth	15°	30°
Custom electrical downtilts	0°	0°
40 degree cone Front-to-back ratio	>30 dB	>28 dB
Suppression of first upper side lobe	>17 dB	>15 dB
Maximum CW input power	500W	500W
Two tone intermodulation 3rd order	<-103 dBm for 2x20W (146 dBc at 2x43 dBm)	<-103 dBm for 2x20W (146 dBc at 2x43 dBm)

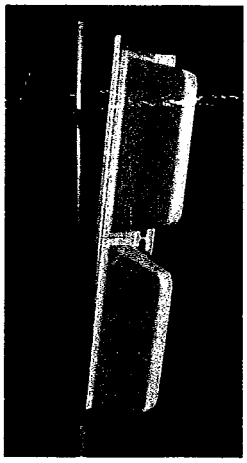


Mechanical Specifications

Connector	7/16 DIN or Type N side mounted	
Height	52" (1320 mm)	26.8" (680 mm)
Width	13" (330 mm)	11.4" (290 mm)
Depth	11.4" (290 mm)	11.4" (290 mm)
Weight	17.6 lbs (8 kg)	9.9 lbs (4.5 kg)
Survival wind speed	156 mph (70 m/s)	156 mph (70 m/s)
Maximum wind area	4.5 sq.ft (0.42 sq.m)	1.7 sq.ft (0.16 sq.m)
Maximum wind load @100mph	118 lbf (526 N)	44.6 lbf (199 N)

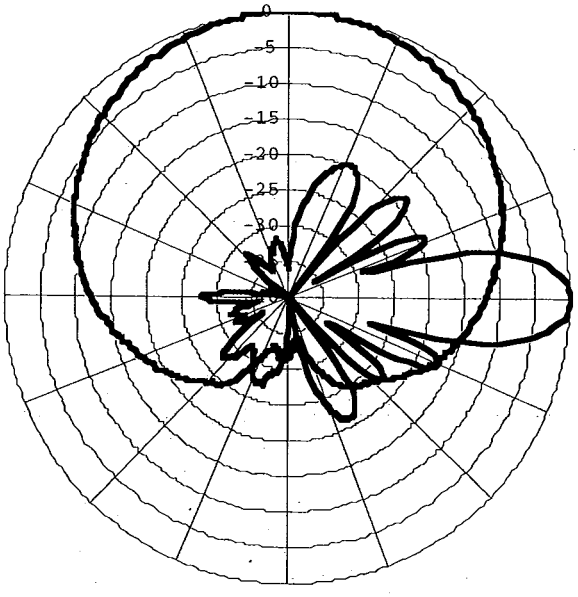
*All metallic components DC grounded for Lightning Protection

Mounting Hardware Options for Installation		
1) Pole mount	2165.10	2165.10
2) Combined pole mount/downtilt bracket	7254.10 (-1° to +24°)	7254.10 (-2° to +49°)

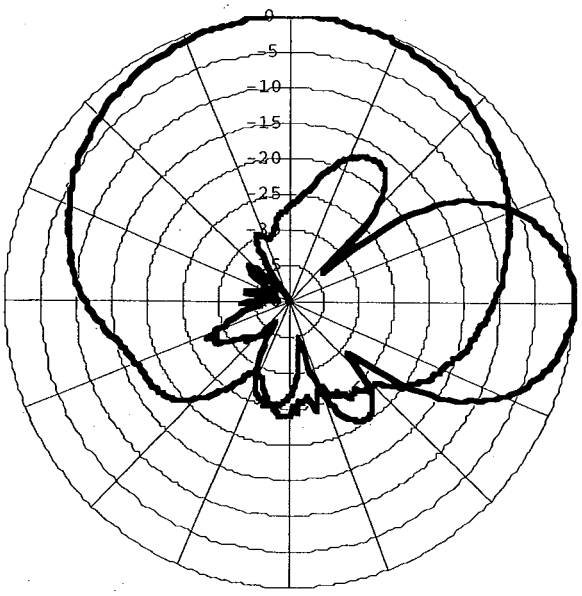


Comments
Gain is typical within frequency band.
Front-to-back ratio is defined within 20° from the backwards direction in any plane.
Sidelobe suppression and null fill is relative to peak of main beam.
Radome color is NCS 2502-B (RAL 7035)(gray).

For a complete list of released models pertaining to gain, electrical downtilt and connector placement, please see the quick reference guide on page 22.



Typical Horizontal and Vertical 7129.16 Patterns



Typical Horizontal and Vertical 7130.14 Patterns

A poster displaying a comparison of antenna patterns has been included at the back of the catalog.

ALLGON

45 Degree 800 MHz ALP

Gain	Part Number	Description	Page
7 dBd	7131.30.33.00	A-800-40-14i-15-D	23
	7131.30.05.00	A-800-40-14i-15-N	23
9 dBd	7131.20.33.00	A-800-40-16i-0-D	23
	7131.20.05.00	A-800-40-16i-0-N	23
10 dBd	7131.16.33.00	A-800-40-18i-0-D	23
	7131.16.05.00	A-800-40-18i-0-N	23

60 Degree 800 MHz ALP

Gain	Part Number	Description	Page
10 dBd	7125.14.33.00	A-800-60-13i-0-D	24
	7125.14.05.00	A-800-60-13i-0-N	24
12 dBd	7125.16.33.00	A-800-60-16i-0-D	24
	7125.16.05.00	A-800-60-16i-0-N	24
	7125.16.33.06	A-800-60-16i-6-D	24
13 dBd	7125.18.33.00	A-800-60-18i-0-D	25
	7125.18.05.00	A-800-60-18i-0-N	25

85 Degree 800 MHz ALP

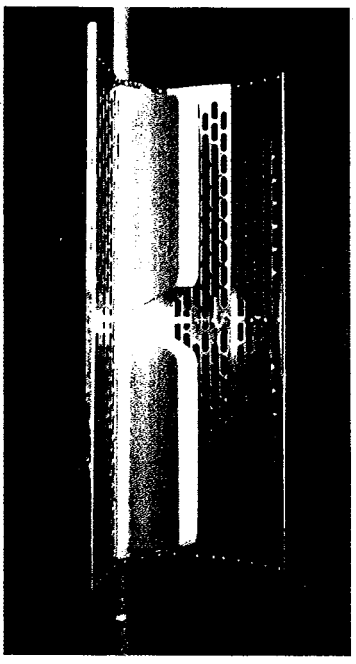
Gain	Part Number	Description	Page
7 dBd	7129.12.33.00	A-800-85-9i-0-D	25
9 dBd	7129.14.33.00	A-800-85-11i-0-D	26
	7129.14.05.00	A-800-85-11i-0-N	26
10 dBd	7129.32.33.00	A-800-85-12i-10-D	26
	7129.32.05.00	A-800-85-12i-10-N	26
11 dBd	7129.20.33.00	A-800-85-13i-0-D	26
	7129.20.05.00	A-800-85-13i-0-N	26
13 dBd	7129.16.33.00	A-800-85-15i-0-D	27
	7129.16.05.00	A-800-85-15i-0-N	27

95 Degree 800 MHz ALP

Gain	Part Number	Description	Page
8 dBd	7130.14.33.00	A-800-95-11i-0-D	27
	7130.14.05.00	A-800-95-11i-0-N	27
10 dBd	7130.16.33.00	A-800-95-14i-0-D	28
	7130.16.05.00	A-800-95-14i-0-N	28
	7130.16.33.06	A-800-95-14i-6-D	28
12 dBd	7130.18.33.00	A-800-95-16i-0-D	28
	7130.18.05.00	A-800-95-16i-0-N	28

110 Degree 800 MHz ALP

Gain	Part Number	Description	Page
8 dBd	7120.20.05.00	A-800-110-11i-0-N	29
10 dBd	7120.16.33.00	A-800-110-13i-0-D	29
	7120.16.05.00	A-800-110-13i-0-N	29



800 MHz Allgon Log Periodic Antenna

Description Detail:

A - 800 - 95 - 14 i - 0 - D

- A - Allgon Log Periodic Family
- 800 - Frequency Band
- 95 - Horizontal Beamwidth
- 14 - Gain in dBi
- 0 - Electrical Downtilt Angle
- D - 7/16 DIN Connector

Antennas may be ordered using part number or description.

Proposed
PCS

DECIBEL®
Base Station Antennas

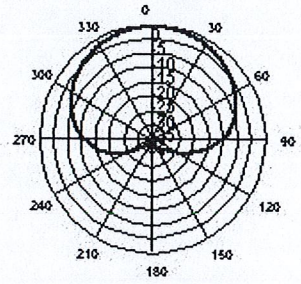
948F85T2E-M

16.1 dBi, Directed Dipole Antenna
1850-1990 MHz

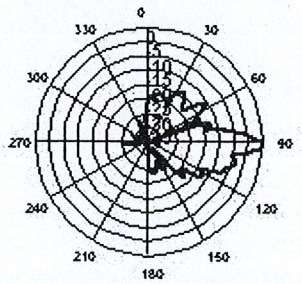
1850-1990 MHz
MaxFill™
dB Director®

- Exceptional azimuth roll-off reducing soft hand-offs and improving capacity
- Excellent upper side lobe suppression
- Deep null filling below the horizon assures improved signal intensity
- Low profile appearance and low wind loading profile for easier zoning approvals

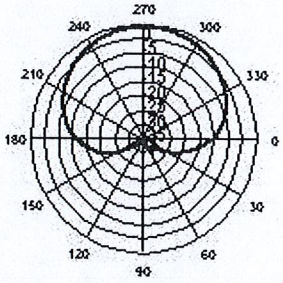
85°



Azimuth 1850 MHz (Tilt=2)



Vertical 1850 MHz (Tilt=2)



Horizontal 1850 MHz (Tilt=2)

ELECTRICAL	
Frequency (MHz):	1850-1990
Polarization:	Vertical
Gain (dBd/dBi):	14/16.1
Azimuth BW:	85°
Elevation BW:	8°
Beam Tilt:	2°
USLS* (dB):	>18
Null Fill* (dB):	15
Front-to-Back Ratio* (dB):	40
VSWR:	<1.33:1
IM Suppression - Two 20 Watt Carriers:	-150 dBc
Impedance:	50 Ohms
Max Input Power:	250 Watts
Lightning Protection:	DC Ground
Opt Electrical Tilt:	0°,4°,6°

MECHANICAL	
Weight:	8.5 lbs (3.9 kg)
Dimensions (LxWxD):	48 X 3.5 X 7 in (1219 X 89 X 178 mm)
Max. Wind Area:	1.18 ft² (0.11 m²)
Max. Wind Load (@ 100mph):	65 lbf (289 N)
Max. Wind Speed:	125 mph (201 km/h)
Radiator Material:	Low Loss Circuit Board
Reflector Material:	Aluminum
Radome Material:	ABS, UV Resistant
Mounting Hardware Material:	Galvanized Steel
Connector Type:	7-16 DIN - Female (Bottom)
Color:	Light Gray
Standard Mounting Hardware:	DB390 Pipe Mount Kit, included
Downtilt Mounting Hardware:	DB5098, optional
Opt. Mounting Hardware:	DB5094-AZ Azimuth Wall Mount

Andrew Corporation
8635 Stemmons Freeway
Dallas, Texas U.S.A 75247-3701
Tel: 214.631.0310

Fax: 214.631.4706
Toll Free Tel: 1.800.676.5342
Fax: 1.800.229.4706
www.andrew.com

dbtech@andrew.com

Date: 4/29/2004
* - Indicates Typical Values

General Power Density

Site Name: Colchester 2
Tower Height: 167.5 Ft. rad center

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissable Exposure	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
Verizon	880	9	200	1800	167.5	0.0231	0.56733	4.07%
Verizon	1900	3	255	765	167.5	0.0098	1	0.98%
Total Percentage of Maximum Permissible Exposure								5.05%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case scenario, maximum values used.

Structural Analysis for
SBA Network Services, Inc.

180' Existing Monopole Tower

Site Name: Colchester
SBA Site ID: CT02218-S

FDH Project Number 05-0357E

Prepared By:

Holly Rose, EI
Project Engineer

Reviewed By:

J. Darrin Holt, Ph.D., P.E.
President
CT PE License No. 22988

FDH Engineering, Inc.
PO Box 33037
Raleigh, NC 27636-3037
(919)-755-1012
info@fdh-inc.com

March 25, 2005

Prepared pursuant to EIA/TIA-222-F June 1996 Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

TABLE OF CONTENTS

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

EXECUTIVE SUMMARY

At the request of SBA Network Services, FDH Engineering performed a structural analysis of the existing monopole located in Colchester, CT to determine whether the tower is structurally adequate to support both the existing and proposed loads, pursuant to the *TIA/EIA-222-F* standards. Information pertaining to the current and proposed antennae loading and structural configuration was obtained from Valmont/Microflect (Order No. 19487-99) original design drawings dated November 3, 1999, and SBA Network Services.

The *basic design wind speed* per *TIA/EIA-222-F* standards is 85 MPH without ice and 74 MPH with ½" radial ice.

Conclusions

With the existing and proposed antennae installation from Verizon in place at 167 ft., the tower meets the requirements of *TIA/EIA-222-F*. Furthermore, provided the foundation was constructed per the original foundation drawings (see Valmont/Microflect Drawing No. 2985-F), the foundation should have the necessary capacity to support both the existing and proposed loading. For a more detailed description of the analysis of the tower, see the **Results** section of this report.

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

APPURTENANCE LISTING

The proposed and existing antennas with their corresponding cables/coax lines are shown in **Table 1.** *If the actual layout determined in the field deviates from this layout, FDH should be contacted to perform a revised analysis.*

Table 1 – Appurtenance Loading

Existing Loading:

Antenna	Centerline Elevation (ft)	Coax and Lines	Carrier	Description
1-3	177	(6) 1-5/8"	Omnipoint	(3) EMS RR90-17-02DP
4-15	167	(12) 1-5/8"[1]	Verizon	(8) Allgon 7129.16 (4) Allgon 7125.18
16-27	157	(12) 1-5/8"[2]	AT&T	(12) EMS RR90-17-02DP

1 The existing loading for Verizon at 167 ft. will be altered. See proposed loading below.
2 Currently, AT&T has (3) antennae and (6) coax installed at 157 ft. According to information provided by SBA, AT&T may install up to (12) antennae and (12) coax. Analysis performed with full loading in place.

Proposed Loading:

Antenna	Centerline Elevation (ft)	Coax and Lines	Carrier	Description
1-15	167	(15) 1-5/8"[1]	Verizon	(6) Allgon 7129.16 (3) Allgon 7125.18 (6) Decibel DB948F85T2E-M

1 This represents the full loading for Verizon after the proposed loading has been installed. Verizon will swap (2) Allgon 7129.16 and (1) Allgon 7125.18 existing antenna with (3) DB948F85T2E-M antennae. Verizon will also add (3) DB948F85T2E-M and (3) coax.

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

RESULTS

Based on information obtained from the original design drawings, the yield strength of steel for individual members was as follows:

Table 2 - Material Strength

Member Type	Yield Strength (KSI)
Pole Sections	65 ksi
Base Plate	60 ksi
Anchor Bolts	75 ksi

With both the existing and proposed loading in place, the monopole meets the requirements of *TIA/EIA-222-F*. **Table 3** displays the ratio (as a percentage) of actual force in the pole's shaft to its allowable capacity at various locations. Values greater than 100% indicate locations where the maximum force in the member exceeds its allowable capacity. *Note: Capacities up to 105% are considered acceptable.* **Table 4** displays the maximum foundation reactions.

If the assumptions outlined in this report differ from actual field conditions, FDH should be contacted to perform a revised analysis. Furthermore, as no information pertaining to the allowable twist and sway requirements for the existing or proposed appurtenances was provided, deflection and rotation were not taken into consideration when performing this analysis.

See the **Appendix** for detailed modeling information.

Table 3 – Summary of Working Percentage of Structural Components

Elevation (ft)	Existing and Proposed Loading Max. % Allowable Stress
0 to 50	72%
50 to 95	72%
95 to 130	67%
130 to 180	65%
Base Plate	89%
Anchor Bolts	68%

Table 4 – Maximum Base Reactions

Base Reaction	Linear (w/o ice)	Non-Linear (w/o ice)
Axial (k)	41.7	41.7
Shear (k)	30.5	30.5
Moment (k-ft)	3,638	3,736

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

GENERAL COMMENTS

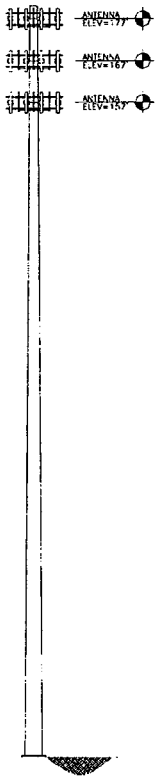
This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading information) modeled. If there are substantial modifications to be made or the assumptions made in this analysis are not accurate, FDH Engineering should be notified immediately to perform a revised analysis.

LIMITATIONS

All opinions and conclusions are considered accurate to a reasonable degree of engineering certainty based upon the evidence available at the time of this report. All opinions and conclusions are subject to revision based upon receipt of new or additional/updated information. All services are provided exercising a level of care and diligence equivalent to the standard and care of our profession. No other warranty or guarantee, expressed or implied, is offered. Our services are confidential in nature and we will not release this report to any other party without the client's consent. The use of this engineering work is limited to the express purpose for which it was commissioned and it may not be reused, copied, or distributed for any other purpose without the written consent of FDH Engineering, Inc.

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

Page	1 of		1
By	HMR	Date	3/25/2005
Job No.	05-0357E		
Revision No.	1	Date	3/25/2005
Pole	180 ft. Monopole		
Location	Colchester, CT		
Site	SBA Site Number CT02218-S		
Owner			
Design	85 MPH no ice and 74 MPH w/ 1/2" radial ice		



Load Cases		
Case 1	85 MPH NO ICE 74 MPH w/ 1/2" RADIAL ICE	DESIGN WIND
Case 2	50 MPH WITH NO ICE	OPERATIONAL WIND

Pole Specifications	
Pole Shape Type:	16-SIDED POLYGON
Taper:	0.2050 IN/FT
Shaft Steel:	ASTM A607 GRADE 65
Base Plate Steel:	ASTM A633 GRADE 50 (50 ksi)
Anchor Bolts:	(20) 2-1/4" Dia. #18 ASTM A615 Grade 75

Appurtenance List		
No.	Elevation	Description
1-3	177	(3) RR90-17-02DP w/ (6) 1-5/8"
4-18	167	(6) Allgon 7129.16 (3) Allgon 7125.18 (6) DB948F85T2E-MW (15)
19-30	157	(12) RR90-17-02DP w/ (12) 1-5/8"

	85 MPH WIND		50 MPH WIND	
Elevation	Lateral Deflection (in)	Rotation (Sway) (Degrees)	Lateral Deflection (in)	Rotation (Sway) (Degrees)
Top of Monopole(180 ft.)	113.0	5.6	39.0	1.9

Shaft Section Data					
Shaft Section	Sect. Length (ft)	Plate Thickness (in.)	Lap Splice (in.)	Diam. Across Flats (in)	
				Top	Bottom
1	53.00	0.2190	63.0	24.910	35.770
2	39.42	0.3130	78.0	34.200	42.340
3	53.00	0.3750	85.0	40.480	51.350
4	53.00	0.438	0.0	49.140	60.000

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

APPENDIX

PO Box 33037 Raleigh, NC 27636 (919)755-1012 fax: (919)755-1031 info@fdh-inc.com

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005
(c) 2000 FDH Engineering Inc. Raleigh, North Carolina

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:85 MPH Without Radial Ice
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Segment Properties: (Max Segment Length = 5 ft)

LOAD CASE 1: BASIC WIND VELOCITY = 85 MPH.
Design Loads per TIA/EIA-22-F Standard: Gust Factor.....Gh= 1.69
Pole DL overload Factor= 1
Per TIA/EIA Table 1: Note3: For all cross sectional shapes,
Force coefficient [Cf] need not exceed 1.2
for any value of C. (Where C=sqrt(Kz)*V*D.)

Segment Feature Location	Segment Elev. (ft)	Diam. Across Flates (in)	Cross Section Area (inA2)	Inertia (inA4)	Expos Coeff. [Kz]	Veloc. Press. [qz] (psf)	Force Coeff. [Cf]	Projected Aera Shaft Segment [Ae] (ftA2)	[Cf*Ae] (ftA2)
top	180.100	24.910	17.209	1328.9	1.624	30.036	0.720	0.212	0.152
	180.000	24.920	17.216	1330.5	1.624	30.032	0.720	6.432	4.631
	177.000	25.545	17.652	1434.1	1.616	29.888	0.720	4.375	3.150
	175.000	25.945	17.931	1503.0	1.611	29.791	0.720	11.240	8.093
	170.000	26.969	18.645	1689.8	1.597	29.545	0.720	6.954	5.007
	167.000	27.594	19.080	1811.0	1.589	29.395	0.720	4.723	3.401
	165.000	27.994	19.359	1891.5	1.584	29.294	0.720	12.110	8.719
	160.000	29.018	20.073	2108.6	1.570	29.038	0.720	7.476	5.383
	157.000	29.643	20.508	2248.9	1.561	28.881	0.720	5.071	3.651
	155.000	30.043	20.787	2341.8	1.556	28.776	0.720	12.981	9.346
	150.000	31.067	21.501	2591.5	1.541	28.507	0.720	13.416	9.660
	145.000	32.092	22.215	2858.3	1.526	28.233	0.720	13.851	9.973
	140.000	33.116	22.929	3142.9	1.511	27.951	0.720	14.286	10.286
	135.000	34.141	23.643	3445.8	1.496	27.662	0.720	7.896	5.685
top sec(2)	132.300	34.694	24.029	3617.1	1.487	27.503	0.720	6.784	4.885
	130.000	34.736	34.290	5146.3	1.480	27.365	0.720	8.782	6.323
bot sec(1)	127.050	35.336	34.888	5420.3	1.470	27.186	0.720	6.192	4.458
	125.000	35.760	35.311	5619.7	1.463	27.060	0.720	15.410	11.095
	120.000	36.785	36.332	6121.3	1.446	26.747	0.720	15.845	11.409
	115.000	37.810	37.353	6652.0	1.429	26.423	0.720	16.281	11.722
	110.000	38.835	38.374	7212.4	1.411	26.090	0.720	16.716	12.035
	105.000	39.860	39.395	7803.5	1.392	25.745	0.720	17.151	12.349
	100.000	40.885	40.416	8426.0	1.373	25.389	0.720	3.832	2.759
top sec(3)	98.900	41.110	40.640	8567.3	1.368	25.309	0.720	13.651	9.829
	95.000	41.284	48.824	10349.2	1.353	25.020	0.720	7.404	5.331
bot sec(2)	92.900	41.711	49.333	10676.3	1.344	24.860	0.720	10.351	7.453
	90.000	42.309	50.048	11147.1	1.332	24.636	0.720	18.192	13.098
	85.000	43.335	51.272	11985.0	1.310	24.237	0.720	18.628	13.412
	80.000	44.360	52.495	12863.8	1.288	23.821	0.720	19.063	13.726
	75.000	45.386	53.719	13784.6	1.264	23.386	0.720	19.499	14.039
	70.000	46.411	54.943	14748.4	1.240	22.929	0.720	19.935	14.353
	65.000	47.437	56.167	15756.0	1.214	22.449	0.720	20.370	14.667
	60.000	48.462	57.391	16808.5	1.186	21.941	0.720	20.806	14.980
	55.000	49.488	58.615	17906.9	1.157	21.402	0.720	8.444	6.080
top sec(4)	53.000	49.898	59.104	18359.4	1.145	21.177	0.720	12.701	9.144
	50.000	49.755	68.746	21177.4	1.126	20.827	0.720	17.393	12.523
bot sec(3)	45.920	50.591	69.912	22272.7	1.099	20.327	0.720	3.962	2.853
	45.000	50.779	70.175	22524.8	1.093	20.210	0.720	21.790	15.689
	40.000	51.804	71.603	23928.2	1.057	19.541	0.720	22.225	16.002
	35.000	52.828	73.031	25388.6	1.017	18.810	0.720	22.661	16.316
	30.000	53.853	74.459	26907.4	1.000	18.496	0.720	23.096	16.629
	25.000	54.877	75.887	28485.5	1.000	18.496	0.720	23.531	16.942
	20.000	55.902	77.315	30124.1	1.000	18.496	0.720	23.966	17.256
	15.000	56.926	78.744	31824.4	1.000	18.496	0.720	24.402	17.569
	10.000	57.951	80.172	33587.5	1.000	18.496	0.720	24.837	17.883
	5.000	58.975	81.600	35414.6	1.000	18.496	0.720	25.272	18.196
base	0.000	60.000	83.028	37306.8					

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005
(c) 2000 FDH Engineering Inc. Raleigh, North Carolina

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:85 MPH Without Radial Ice.
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Analysis Results:

Pole Elemt No.	Segment Feature Location	Segment Elev. (ft)	Linear Deflec. (in)	Non-Lin Deflec. (in)	Lin. Rotat. (deg.)	Non-Lin. Rotat. (deg.)
46.	top	180.100	109.357	113.119	5.38	5.57
45.		180.000	109.245	113.002	5.38	5.57
44.		177.000	105.865	109.502	5.38	5.57
43.		175.000	103.612	107.170	5.38	5.57
42.		170.000	97.988	101.346	5.36	5.55
41.		167.000	94.624	97.862	5.35	5.54
40.		165.000	92.388	95.547	5.33	5.52
39.		160.000	86.835	89.796	5.27	5.46
38.		157.000	83.539	86.384	5.22	5.40
37.		155.000	81.361	84.128	5.18	5.36
36.		150.000	75.997	78.575	5.06	5.24
35.		145.000	70.779	73.172	4.90	5.08
34.		140.000	65.734	67.948	4.73	4.89
33.		135.000	60.885	62.927	4.53	4.69
32.	top sec(2)	132.300	58.354	60.307	4.42	4.57
31.		130.000	56.249	58.128	4.32	4.47
30.	bot sec(1)	127.050	53.608	55.394	4.23	4.38
29.		125.000	51.807	53.530	4.16	4.31
28.		120.000	47.540	49.113	3.99	4.13
27.		115.000	43.457	44.888	3.81	3.94
26.		110.000	39.566	40.862	3.62	3.75
25.		105.000	35.870	37.039	3.43	3.55
24.		100.000	32.375	33.423	3.24	3.35
23.	top sec(3)	98.900	31.633	32.656	3.20	3.31
22.		95.000	29.081	30.017	3.05	3.15
21.	bot sec(2)	92.900	27.756	28.647	2.98	3.08
20.		90.000	25.978	26.809	2.88	2.98
19.		85.000	23.054	23.786	2.70	2.80
18.		80.000	20.312	20.952	2.53	2.61
17.		75.000	17.753	18.309	2.36	2.43
16.		70.000	15.377	15.854	2.18	2.25
15.		65.000	13.184	13.590	2.01	2.07
14.		60.000	11.174	11.514	1.83	1.89
13.		55.000	9.345	9.627	1.66	1.71
12.	top sec(4)	53.000	8.664	8.925	1.59	1.64
11.		50.000	7.697	7.927	1.49	1.54
10.	bot sec(3)	45.920	6.478	6.670	1.36	1.41
9.		45.000	6.218	6.402	1.34	1.38
8.		40.000	4.899	5.043	1.18	1.22
7.		35.000	3.740	3.849	1.03	1.06
6.		30.000	2.740	2.819	0.88	0.90
5.		25.000	1.897	1.951	0.73	0.75
4.		20.000	1.211	1.245	0.58	0.60
3.		15.000	0.679	0.698	0.43	0.45
2.		10.000	0.301	0.310	0.29	0.30
1.		5.000	0.075	0.077	0.14	0.15
0.	Base	0.000	0.000	0.000	0.00	0.00

Base Reactions :	Linear	Non-Linear
Shear(Kips) :	-30.5170	-30.5170
Axial(Kips) :	41.7123	41.7123
Moment(Ft-Kips) :	-3638.2105	-3735.5479

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

****

Data File...: Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:85 MPH Without Radial Ice.
Owner.....:SBA,Inc.

Pole Height.....: 180.1 ft.
Pole Shape.....: 16-Sided Polygon.
Pole Type.....: Taper Shaft with Slip Joint Splices.
Pole Taper(Ave.): 0.20497 (in/ft).

Tube Properties:

Tube Sect No.	Top Splice Elev (ft)	Bot. Splice Elev. (ft)	Tube Length (ft)	Wall Thick (t) (in)	Top Diam. (Db) (in)	Bot. Diam. (Dt) (in)	Slip Joint Overlap (in)
1.	180.10	127.05	53.000	0.2190	24.910	35.770	63.00
2.	132.30	92.90	39.420	0.3130	34.260	42.340	72.00
3.	98.90	45.92	53.000	0.3750	40.480	51.350	84.96
4.	53.00	0.00	53.000	0.4380	49.140	60.000	0.00

Tube Section Properties:

Tube Sect No.	Section Weight (lbs)	Locat.	Elev. (ft)	Diam. Across Flate (in)	Wall Thick (t) (in)	Section Taper (in/ft)	Area (in^2)	Inertia (in^4)
1	3786.2	@Top	180.10	24.910	0.2190	0.2049	17.21	1328.9
		@Splice	132.30	34.694			24.03	3617.1
		@Bottom	127.05	35.770			24.78	3966.4
2	5075.9	@Top	132.30	34.260	0.3130	0.2050	33.82	4935.9
		@Splice	98.90	41.110			40.64	8567.3
		@Bottom	92.90	42.340			41.87	9365.6
3	9802.0	@Top	98.90	40.480	0.3750	0.2051	47.86	9750.9
		@Splice	53.00	49.898			59.10	18359.4
		@Bottom	45.92	51.350			60.84	20022.1
4	13608.8	@Top	53.00	49.140	0.4380	0.2049	67.89	20395.4
		@Bottom	0.00	60.000			83.03	37306.8

Total Shaft Steel Weight = 32273 lbs

Antenna / Arm Properties:

Ant. Arm No.	Arm Mount Elev. (ft)	Load Applic. Elev. (ft)	Arm Length (ft)	Area [CaAa] (ft^2)	Description & Comments
[1]	180.000	181.000	0.00	5.000	(1) 5/8" Lightning Rod
[2]	177.000	177.000	4.00	13.070	(3) RR90-17-02DP w/ (6) 1-5/8" inside
[3]	177.000	177.000	0.00	35.000	13' Low Profile Platform
[4]	167.000	167.000	4.00	85.330	(6) Allgon 7129.16 (3) Allgon 7125.18 (6)DB948F85T2E-M w/ (15) 1-5/8" inside
[5]	167.000	167.000	0.00	35.000	13' Low Profile Platform
[6]	157.000	157.000	4.00	34.380	(12) RR90-17-02DP w/ (12) 1-5/8" inside
[7]	157.000	157.000	0.00	35.000	13' Low Profile Platform

Total 0 (in.) Size Equivalent Cables Runing Outside of Pole from 0 (ft) to 0 (ft).

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:85 MPH Without Radial Ice
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Shaft Segments --- FORCES AND MOMENTS:

Load Case 1: Basic Wind Velocity = 85 MPH.

Wind Force (F=qz*Gh*[Cf*Ae+sum(Ca*Aa)]) <= 2*qz*Gh*Ag, where Ag is total area of pole.

Segment Elev. (ft)	[-----Cumulative Forces-----] Wind Forces (Kips)	Axial Forces (Kips)	[-----Moments (Ft-Kips)-----] From Ant/ Arm	From Shaft Wind	From P-Delta Effects	Total Moment
180.10	0.0077	0.0059	0.23	0.00	0.00	0.23
180.00	0.4969	0.2918	0.25	0.00	0.00	0.26
177.00	3.0841	2.2849	1.02	0.73	0.46	2.21
175.00	3.4915	2.5961	6.38	1.53	0.79	8.70
170.00	3.7415	2.7886	19.79	5.58	1.76	27.13
167.00	9.8882	7.0354	27.84	8.76	2.84	39.44
165.00	10.3199	7.3709	45.16	11.21	3.59	59.96
160.00	10.5841	7.5780	88.46	19.51	5.59	113.57
157.00	14.1487	11.0645	114.44	25.29	7.24	146.97
155.00	14.6032	11.4242	138.53	29.49	8.36	176.38
150.00	15.0686	11.7961	198.76	42.27	11.27	252.30
145.00	15.5444	12.1802	259.00	57.39	14.26	330.64
140.00	16.0303	12.5764	319.23	74.88	17.31	411.41
135.00	16.2961	12.7954	379.46	94.80	20.40	494.66
132.30	16.5231	13.2512	411.98	106.27	22.06	540.32
130.00	16.8155	13.8450	439.69	116.57	23.52	579.78
127.05	17.0203	14.0899	475.23	130.63	25.49	631.35
125.00	17.5277	14.6994	499.92	140.83	26.86	667.62
120.00	18.0434	15.3262	560.15	168.24	30.34	758.73
115.00	18.5669	15.9704	620.39	198.22	33.88	852.49
110.00	19.0975	16.6320	680.62	230.83	37.47	948.91
105.00	19.6348	17.3109	740.85	266.08	41.07	1048.00
100.00	19.7532	17.4626	801.08	304.02	44.68	1149.79
98.90	20.1736	18.6488	814.33	312.50	45.46	1172.29
95.00	20.3990	19.2971	861.31	344.20	48.38	1253.89
92.90	20.7122	19.7875	886.61	361.74	49.96	1298.31
90.00	21.2575	20.6494	921.55	386.87	52.17	1360.58
85.00	21.8069	21.5321	981.78	432.92	56.00	1470.70
80.00	22.3594	22.4357	1042.01	481.73	59.80	1583.53
75.00	22.9143	23.3601	1102.24	533.29	63.53	1699.06
70.00	23.4705	24.3053	1162.47	587.63	67.18	1817.29
65.00	24.0269	25.2713	1222.70	644.75	70.72	1938.18
60.00	24.5824	26.2582	1282.94	704.65	74.13	2061.73
55.00	24.8023	26.6587	1343.17	767.33	77.39	2187.89
53.00	25.1296	27.9533	1367.26	792.85	78.62	2238.73
50.00	25.5703	29.7635	1403.40	832.10	80.48	2315.97
45.92	25.6683	29.9828	1452.55	887.27	83.00	2422.82
45.00	26.2042	31.1888	1463.63	899.81	83.54	2446.98
40.00	26.7327	32.4192	1523.86	970.59	86.43	2580.89
35.00	27.2513	33.6739	1584.10	1044.03	89.09	2717.21
30.00	27.7711	34.9529	1644.33	1120.05	91.48	2855.86
25.00	28.3007	36.2562	1704.56	1198.67	93.59	2996.83
20.00	28.8401	37.5838	1764.79	1279.95	95.38	3140.12
15.00	29.3893	38.9357	1825.02	1363.91	96.83	3285.77
10.00	29.9482	40.3119	1885.26	1450.63	97.90	3433.79
5.00	30.5170	41.7123	1945.49	1540.14	98.57	3584.19
0.00	30.5170	41.7123	2005.72	1632.49	98.80	3737.01

Antenna / Arm Loads:

Ant. Arm No.	Arm Mount Elev. (ft)	Load Applic. Elev. (ft)	Veloc. Press. [qz] (psf)	Antenna Force (lbs)	Antenna Weight (lbs)	Antenna Moment (lbs-ft)
[1]	180.000	181.000	30.08	254.17	108.00	254.17
[2]	177.000	177.000	29.89	660.17	41.00	0.00
[3]	177.000	177.000	29.89	1767.87	1300.00	0.00

[4]	167.000	167.000	29.40	4239.03	311.00	0.00
[5]	167.000	167.000	29.40	1738.73	1300.00	0.00
[6]	157.000	157.000	28.88	1678.07	162.00	0.00
[7]	157.000	157.000	28.88	1708.33	1300.00	0.00

Total Number of Antennas / Arms = 7

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:85 MPH Without Radial Ice
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Pole Shaft Segments--- ACTUAL AND ALLOWABLE STRESSES:

Load Case 1: Basic Wind Velocity = 85 MPH.
Pole Material Yield Strenth: 65 (ksi).

Segment Elev. (ft)	[----------ACTUAL STRESSES----------] Bending [fb] (ksi)	Axial [fb] (ksi)	Torsion [ft] (ksi)	Shear [fv] (ksi)	Combined [Ftot] (ksi)	Allow. Stess [Fb] (ksi)	Percent Used [Ftot/Fb] %
180.10	0.026	0.000	0.000	0.001	0.027	52.00	0.05
180.00	0.029	0.017	0.000	0.059	0.059	52.00	0.11
177.00	0.240	0.129	0.215	0.358	0.573	52.00	1.10
175.00	0.919	0.145	0.208	0.399	1.103	52.00	2.12
170.00	2.649	0.150	0.193	0.411	2.812	52.00	5.41
167.00	3.676	0.369	1.034	1.060	4.294	52.00	8.26
165.00	5.429	0.381	1.004	1.090	5.978	52.00	11.50
160.00	9.561	0.378	0.934	1.078	10.025	52.00	19.28
157.00	11.851	0.540	1.216	1.409	12.509	52.00	24.06
155.00	13.843	0.550	1.184	1.435	14.489	52.00	27.86
150.00	18.504	0.549	1.106	1.431	19.116	52.00	36.76
145.00	22.710	0.548	1.036	1.428	23.304	51.36	45.37
140.00	26.519	0.548	0.972	1.426	27.103	50.61	53.56
135.00	29.982	0.541	0.914	1.405	30.551	49.85	61.29
132.30	31.704	0.551	0.885	1.402	32.280	49.44	65.29
130.00	23.940	0.404	0.623	1.005	24.360	52.00	46.85
127.05	25.179	0.404	0.601	1.000	25.597	52.00	49.23
125.00	25.989	0.416	0.587	1.017	26.419	52.00	50.81
120.00	27.893	0.422	0.554	1.017	28.326	52.00	54.47
115.00	29.643	0.428	0.524	1.017	30.080	52.00	57.85
110.00	31.257	0.433	0.497	1.018	31.698	52.00	60.96
105.00	32.748	0.439	0.471	1.019	33.194	52.00	63.84
100.00	34.130	0.432	0.448	0.999	34.568	52.00	66.48
98.90	34.413	0.459	0.443	1.015	34.877	52.00	67.07
95.00	30.599	0.395	0.368	0.856	30.999	52.00	59.61
92.90	31.030	0.401	0.360	0.860	31.435	52.00	60.45
90.00	31.592	0.413	0.350	0.870	32.009	52.00	61.55
85.00	32.531	0.420	0.334	0.871	32.955	52.00	63.37
80.00	33.406	0.427	0.318	0.872	33.837	52.00	65.07
75.00	34.223	0.435	0.304	0.873	34.660	52.00	66.65
70.00	34.985	0.442	0.290	0.874	35.430	52.00	68.13
65.00	35.698	0.450	0.278	0.875	36.150	52.00	69.52
60.00	36.365	0.458	0.266	0.876	36.824	52.00	70.82
55.00	36.990	0.455	0.255	0.865	37.446	52.00	72.01
53.00	37.222	0.473	0.251	0.869	37.697	52.00	72.49
50.00	33.287	0.433	0.217	0.762	33.721	52.00	64.85
45.92	33.666	0.429	0.210	0.752	34.097	52.00	65.57
45.00	33.747	0.444	0.208	0.765	34.193	52.00	65.75
40.00	34.182	0.453	0.200	0.764	34.636	52.00	66.61
35.00	34.588	0.461	0.192	0.764	35.050	52.00	67.40
30.00	34.966	0.469	0.185	0.763	35.437	52.00	68.15
25.00	35.319	0.478	0.178	0.763	35.798	52.00	68.84
20.00	35.648	0.486	0.171	0.763	36.135	52.00	69.49
15.00	35.956	0.494	0.165	0.763	36.451	52.00	70.10
10.00	36.244	0.503	0.159	0.763	36.747	52.00	70.67
5.00	36.514	0.511	0.154	0.764	37.026	52.00	71.20
0.00	36.768	0.502	0.148	0.751	37.271	52.00	71.67

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:85 MPH Without Radial Ice
Owner.....:SBA,Inc.

MONOPOLE BASE PLATE DESIGN DETAILS

Shaft Shape.....: 16 Sided Polygon
Bottom Shaft D(F-F): 60 In.
Total Moment.....: 3737.0112 Ft-Kips
Axial Force.....: 41.7123 Kips
Stress Increse.....: 1.333 Factor
Bottom Shaft D(P-P): 61.1755 Inches
Tesile Strenth.....: 136.3636 Ksi
Shear Force.....: 30.517 Kips

Bolt Type.....: ASTM A615 #18J GR 75
Bolt Diameter.....: 2.25 Inchs
Bolt Moment Inertia: 11771.761 InA2
Number of Bolts: 20
Bolt Circle Dia: 68.62 Inches

	Calculated Force (Kips)	Allowable Force (Kips)	Percentage Used (%)
Tension :	130.7	194.9	67.07
Compression:	132.8	194.9	68.15
Shear :	1.526	93.36	1.634

Plate Strenth.....: 60 KSI
Plate Moment.....: 572.3181 In-Kips
Bend Plane Width.....: 9.5478 Inches
Mini. Plate Thickness: 2.4483 Inches

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005
(c) 2000 FDH Engineering Inc. Raleigh, North Carolina

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:74 MPH + 0.5 Inchs Radial Ice
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Segment Properties: (Max Segment Length = 5 ft)

LOAD CASE 2: WIND VELOCITY = 74 MPH With 0.5 Inchs Radial Ice.
Design Loads per TIA/EIA-22-F Standard: Gust Factor.....Gh= 1.69
Pole DL overload Factor= 1
Per TIA/EIA Table 1: Note3: For all cross sectional shapes,
Force coefficient [Cf] need not exceed 1.2
for any value of C. (Where C=sqrt(Kz)*V*D.)

Segment Feature Location	Segment Elev. (ft)	Diam. Across Flates (in)	Cross Section Area (in^2)	Inertia (in^4)	Expos Coeff. [Kz]	Veloc. Press. [qz] (psf)	Force Coeff. [Cf]	Projected Aera Shaft Segment [Ae] (ft^2)	[Cf*Ae] (ft^2)
top	180.100	24.910	17.209	1328.9	1.624	22.765	0.720	0.220	0.159
	180.000	24.920	17.216	1330.5	1.624	22.762	0.720	6.687	4.814
	177.000	25.545	17.652	1434.1	1.616	22.653	0.720	4.545	3.272
	175.000	25.945	17.931	1503.0	1.611	22.579	0.720	11.665	8.398
	170.000	26.969	18.645	1689.8	1.597	22.393	0.720	7.209	5.190
	167.000	27.594	19.080	1811.0	1.589	22.279	0.720	4.893	3.523
	165.000	27.994	19.359	1891.5	1.584	22.203	0.720	12.535	9.025
	160.000	29.018	20.073	2108.6	1.570	22.009	0.720	7.731	5.567
	157.000	29.643	20.508	2248.9	1.561	21.890	0.720	5.241	3.774
	155.000	30.043	20.787	2341.8	1.556	21.810	0.720	13.406	9.652
	150.000	31.067	21.501	2591.5	1.541	21.606	0.720	13.841	9.965
	145.000	32.092	22.215	2858.3	1.526	21.398	0.720	14.276	10.279
	140.000	33.116	22.929	3142.9	1.511	21.185	0.720	14.711	10.592
	135.000	34.141	23.643	3445.8	1.496	20.966	0.720	8.125	5.850
top sec(2)	132.300	34.694	24.029	3617.1	1.487	20.845	0.720	6.979	5.025
	130.000	34.736	34.290	5146.3	1.480	20.741	0.720	9.032	6.503
bot sec(1)	127.050	35.336	34.888	5420.3	1.470	20.605	0.720	6.366	4.584
	125.000	35.760	35.311	5619.7	1.463	20.510	0.720	15.835	11.401
	120.000	36.785	36.332	6121.3	1.446	20.272	0.720	16.270	11.714
	115.000	37.810	37.353	6652.0	1.429	20.027	0.720	16.705	12.028
	110.000	38.835	38.374	7212.4	1.411	19.774	0.720	17.141	12.341
	105.000	39.860	39.395	7803.5	1.392	19.513	0.720	17.576	12.655
	100.000	40.885	40.416	8426.0	1.373	19.243	0.720	3.925	2.826
top sec(3)	98.900	41.110	40.640	8567.3	1.368	19.182	0.720	13.983	10.068
	95.000	41.284	48.824	10349.2	1.353	18.963	0.720	7.583	5.460
bot sec(2)	92.900	41.711	49.333	10676.3	1.344	18.842	0.720	10.598	7.630
	90.000	42.309	50.048	11147.1	1.332	18.672	0.720	18.617	13.404
	85.000	43.335	51.272	11985.0	1.310	18.370	0.720	19.053	13.718
	80.000	44.360	52.495	12863.8	1.288	18.054	0.720	19.488	14.032
	75.000	45.386	53.719	13784.6	1.264	17.725	0.720	19.924	14.345
	70.000	46.411	54.943	14748.4	1.240	17.379	0.720	20.360	14.659
	65.000	47.437	56.167	15756.0	1.214	17.014	0.720	20.795	14.973
	60.000	48.462	57.391	16808.5	1.186	16.630	0.720	21.231	15.286
	55.000	49.488	58.615	17906.9	1.157	16.221	0.720	8.614	6.202
top sec(4)	53.000	49.898	59.104	18359.4	1.145	16.051	0.720	12.956	9.328
	50.000	49.755	68.746	21177.4	1.126	15.786	0.720	17.740	12.773
bot sec(3)	45.920	50.591	69.912	22272.7	1.099	15.406	0.720	4.040	2.909
	45.000	50.779	70.175	22524.8	1.093	15.318	0.720	22.215	15.995
	40.000	51.804	71.603	23928.2	1.057	14.811	0.720	22.650	16.308
	35.000	52.828	73.031	25388.6	1.017	14.256	0.720	23.085	16.622
	30.000	53.853	74.459	26907.4	1.000	14.019	0.720	23.521	16.935
	25.000	54.877	75.887	28485.5	1.000	14.019	0.720	23.956	17.248
	20.000	55.902	77.315	30124.1	1.000	14.019	0.720	24.391	17.562
	15.000	56.926	78.744	31824.4	1.000	14.019	0.720	24.826	17.875
	10.000	57.951	80.172	33587.5	1.000	14.019	0.720	25.262	18.188
	5.000	58.975	81.600	35414.6	1.000	14.019	0.720	25.697	18.502
base	0.000	60.000	83.028	37306.8					

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:74 MPH + 0.5 Inchs Radial Ice.
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Analysis Results:

Pole Elemt No.	Segment Feature Location	Segment Elev. (ft)	Linear Deflec. (in)	Non-Lin Deflec. (in)	Lin. Rotat. (deg.)	Non-Lin. Rotat. (deg.)
46.	top	180.100	89.895	94.466	4.44	4.68
45.		180.000	89.802	94.368	4.44	4.68
44.		177.000	87.013	91.430	4.44	4.68
43.		175.000	85.154	89.471	4.44	4.67
42.		170.000	80.513	84.582	4.42	4.66
41.		167.000	77.738	81.659	4.41	4.65
40.		165.000	75.893	79.715	4.40	4.63
39.		160.000	71.312	74.889	4.35	4.58
38.		157.000	68.594	72.026	4.30	4.53
37.		155.000	66.798	70.134	4.27	4.50
36.		150.000	62.376	65.477	4.17	4.39
35.		145.000	58.076	60.948	4.04	4.25
34.		140.000	53.920	56.572	3.89	4.10
33.		135.000	49.927	52.369	3.73	3.92
32.	top sec(2)	132.300	47.845	50.176	3.64	3.83
31.		130.000	46.112	48.353	3.56	3.74
30.	bot sec(1)	127.050	43.939	46.067	3.48	3.66
29.		125.000	42.458	44.509	3.42	3.60
28.		120.000	38.950	40.819	3.28	3.45
27.		115.000	35.594	37.291	3.13	3.29
26.		110.000	32.398	33.931	2.97	3.13
25.		105.000	29.363	30.743	2.82	2.96
24.		100.000	26.495	27.730	2.66	2.79
23.	top sec(3)	98.900	25.886	27.090	2.62	2.76
22.		95.000	23.793	24.893	2.50	2.62
21.	bot sec(2)	92.900	22.706	23.753	2.44	2.56
20.		90.000	21.248	22.223	2.36	2.48
19.		85.000	18.851	19.709	2.22	2.32
18.		80.000	16.605	17.354	2.07	2.17
17.		75.000	14.509	15.158	1.93	2.02
16.		70.000	12.564	13.120	1.78	1.87
15.		65.000	10.769	11.242	1.64	1.72
14.		60.000	9.125	9.521	1.50	1.57
13.		55.000	7.629	7.958	1.36	1.42
12.	top sec(4)	53.000	7.073	7.376	1.30	1.36
11.		50.000	6.282	6.550	1.22	1.27
10.	bot sec(3)	45.920	5.286	5.510	1.11	1.16
9.		45.000	5.074	5.288	1.09	1.14
8.		40.000	3.997	4.163	0.97	1.01
7.		35.000	3.050	3.176	0.84	0.88
6.		30.000	2.234	2.325	0.72	0.75
5.		25.000	1.547	1.609	0.59	0.62
4.		20.000	0.987	1.026	0.47	0.49
3.		15.000	0.554	0.576	0.35	0.37
2.		10.000	0.246	0.255	0.23	0.24
1.		5.000	0.061	0.064	0.12	0.12
0.	Base	0.000	0.000	0.000	0.00	0.00

Base Reactions :	Linear	Non-Linear
Shear(Kips) :	-24.4961	-24.4961
Axial(Kips) :	50.0419	50.0419
Moment(Ft-Kips) :	-2963.0302	-3075.3560

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

Data File...: Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:74 MPH + 0.5 Inchs Radial Ice.
Owner.....:SBA,Inc.

Pole Height.....: 180.1 ft.
Pole Shape.....: 16-Sided Polygon.
Pole Type.....: Taper Shaft with Slip Joint Splices.
Pole Taper(Ave.): 0.20497 (in/ft).

Tube Properties:

Tube Sect No.	Top Splice Elev (ft)	Bot. Splice Elev. (ft)	Tube Length (ft)	Wall Thick (t) (in)	Top Diam. (Db) (in)	Bot. Diam. (Dt) (in)	Slip Joint Overlap (in)
1.	180.10	127.05	53.000	0.2190	24.910	35.770	63.00
2.	132.30	92.90	39.420	0.3130	34.260	42.340	72.00
3.	98.90	45.92	53.000	0.3750	40.480	51.350	84.96
4.	53.00	0.00	53.000	0.4380	49.140	60.000	0.00

Tube Section Properties:

Tube Sect No.	Section Weight (lbs)	Locat.	Elev. (ft)	Diam. Across Flate (in)	Wall Thick (t) (in)	Section Taper (in/ft)	Area (in^2)	Inertia (in^4)
1	4797.7	@Top	180.10	24.910	0.2190	0.2049	17.21	1328.9
		@Splice	132.30	34.694			24.03	3617.1
		@Bottom	127.05	35.770			24.78	3966.4
2	6022.4	@Top	132.30	34.260	0.3130	0.2050	33.82	4935.9
		@Splice	98.90	41.110			40.64	8567.3
		@Bottom	92.90	42.340			41.87	9365.6
3	11324.4	@Top	98.90	40.480	0.3750	0.2051	47.86	9750.9
		@Splice	53.00	49.898			59.10	18359.4
		@Bottom	45.92	51.350			60.84	20022.1
4	15415.0	@Top	53.00	49.140	0.4380	0.2049	67.89	20395.4
		@Bottom	0.00	60.000			83.03	37306.8

Total Shaft Steel Weight With Ice = 37559 lbs

Antenna / Arm Properties:

Ant. Arm No.	Arm Mount Elev. (ft)	Load Applic. Elev. (ft)	Arm Length (ft)	Area [CaAa] (ft^2)	Description & Comments
[1]	180.000	181.000	0.00	6.700	(1) 5/8" Lightning Rod
[2]	177.000	177.000	4.00	14.290	(3) RR90-17-02DP w/ (6) 1-5/8" inside
[3]	177.000	177.000	0.00	40.000	13' Low Profile Platform
[4]	167.000	167.000	4.00	90.910	(6) Allgon 7129.16 (3) Allgon 7125.18 (6)DB948F85T2E-M w/ (15) 1-5/8" inside
[5]	167.000	167.000	0.00	40.000	13' Low Profile Platform
[6]	157.000	157.000	4.00	38.090	(12) RR90-17-02DP w/ (12) 1-5/8" inside
[7]	157.000	157.000	0.00	40.000	13' Low Profile Platform

Total 0 (in.) Size Equivalent Cables Runing Outside of Pole from 0 (ft) to 0 (ft).

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005
(c) 2000 FDH Engineering Inc. Raleigh, North Carolina

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:74 MPH + 0.5 Inchs Radial Ice
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Shaft Segments --- FORCES AND MOMENTS:

Load Case 2: Wind Velocity = 74 MPH With 0.5 Inchs Radial Ice.

Wind Force (F=qz*Gh*[Cf*Ae+sum(Ca*Aa)]) <= 2*qz*Gh*Ag, where Ag is total area of pole.

Segment Elev. (ft)	[-----Cumulative Forces-----] Wind Forces (Kips)	Axial Forces (Kips)	[-----Moments (Ft-Kips)-----] From Ant/ Arm	From Shaft Wind	From P-Delta Effects	Total Moment
180.10	0.0061	0.0074	0.23	0.00	0.00	0.23
180.00	0.4494	0.3772	0.26	0.00	0.00	0.26
177.00	2.6531	3.2717	1.03	0.57	0.60	2.21
175.00	2.9736	3.6663	5.71	1.21	1.03	7.94
170.00	3.1700	3.9104	17.39	4.39	2.24	24.02
167.00	8.2317	9.7482	24.40	6.89	3.75	35.04
165.00	8.5704	10.1734	38.93	8.83	4.79	52.54
160.00	8.7774	10.4360	75.26	15.35	7.51	98.12
157.00	11.8059	15.0390	97.05	19.88	9.76	126.70
155.00	12.1616	15.4949	117.36	23.19	11.28	151.83
150.00	12.5255	15.9660	168.13	33.22	15.17	216.53
145.00	12.8972	16.4525	218.91	45.08	19.13	283.12
140.00	13.2764	16.9543	269.68	58.79	23.13	351.60
135.00	13.4837	17.2316	320.45	74.40	27.13	421.98
132.30	13.6607	17.7373	347.87	83.39	29.27	460.53
130.00	13.8887	18.3960	371.22	91.46	31.12	493.80
127.05	14.0483	18.6866	401.18	102.47	33.56	537.21
125.00	14.4435	19.4098	422.00	110.45	35.26	567.71
120.00	14.8448	20.1536	472.77	131.90	39.49	644.16
115.00	15.2519	20.9179	523.54	155.35	43.75	722.64
110.00	15.6643	21.7028	574.31	180.84	48.01	803.16
105.00	16.0816	22.5082	625.08	208.39	52.26	885.73
100.00	16.1735	22.6881	675.86	238.02	56.46	970.34
98.90	16.4999	23.9742	687.03	244.65	57.36	989.04
95.00	16.6749	24.6771	726.63	269.39	60.69	1056.71
92.90	16.9179	25.2438	747.95	283.09	62.48	1093.51
90.00	17.3408	26.2397	777.40	302.70	64.95	1145.05
85.00	17.7667	27.2597	828.17	338.63	69.20	1236.01
80.00	18.1948	28.3036	878.94	376.69	73.39	1329.02
75.00	18.6245	29.3716	929.72	416.90	77.47	1424.08
70.00	19.0551	30.4635	980.49	459.25	81.43	1521.17
65.00	19.4856	31.5795	1031.26	503.75	85.25	1620.26
60.00	19.9152	32.7194	1082.03	550.40	88.91	1721.35
55.00	20.0852	33.1821	1132.81	599.21	92.37	1824.39
53.00	20.3383	34.5794	1153.11	619.07	93.68	1865.87
50.00	20.6790	36.5075	1183.58	649.62	95.64	1928.84
45.92	20.7547	36.7559	1225.01	692.56	98.26	2015.83
45.00	21.1688	38.1223	1234.35	702.31	98.82	2035.49
40.00	21.5770	39.5161	1285.12	757.39	101.80	2144.31
35.00	21.9774	40.9374	1335.89	814.50	104.53	2254.92
30.00	22.3787	42.3861	1386.67	873.61	106.98	2367.26
25.00	22.7873	43.8623	1437.44	934.74	109.13	2481.30
20.00	23.2034	45.3660	1488.21	997.90	110.94	2597.05
15.00	23.6268	46.8972	1538.98	1063.14	112.40	2714.53
10.00	24.0577	48.4558	1589.75	1130.51	113.48	2833.74
5.00	24.4961	50.0419	1640.53	1200.02	114.15	2954.70
0.00	24.4961	50.0419	1691.30	1271.73	114.38	3077.41

Antenna / Arm Loads:

Ant. Arm No.	Arm Mount Elev. (ft)	Load Applic. Elev. (ft)	Veloc. Press. [qz] (psf)	Antenna Force (lbs)	Antenna Weight (lbs)	Antenna Moment (lbs-ft)
[1]	180.000	181.000	22.80	258.14	144.00	258.14
[2]	177.000	177.000	22.65	547.07	110.00	0.00
[3]	177.000	177.000	22.65	1531.32	2100.00	0.00

[4]	167.000	167.000	22.28	3422.97	1067.00	0.00
[5]	167.000	167.000	22.28	1506.09	2100.00	0.00
[6]	157.000	157.000	21.89	1409.09	441.00	0.00
[7]	157.000	157.000	21.89	1479.75	2100.00	0.00

Total Number of Antennas / Arms = 7

FDH Engineering Inc. Monopole Design Program
Version 1.0 (8-2000) 28-Mar-2005

****

Data File...:180'Pole\Ante.txt Job No.:05-0357E Engineer:HMR
Description :180.1-FT --Colchester, CT
Design.....:74 MPH + 0.5 Inchs Radial Ice
Owner.....:SBA,Inc.
Analyzing Method: Finite Element Method

Pole Shaft Segments--- ACTUAL AND ALLOWABLE STRESSES:

Load Case 2: Wind Velocity = 74 MPH With 0.5 Inchs Radial Ice.
Pole Material Yield Strenth: 65 (ksi).

Segment Elev. (ft)	[----------ACTUAL STRESSES----------] Bending [fb] (ksi)	Axial [fb] (ksi)	Torsion [ft] (ksi)	Shear [fv] (ksi)	Combined [Ftot] (ksi)	Allow. Stess [Fb] (ksi)	Percent Used [Ftot/Fb] %
180.10	0.027	0.000	0.000	0.001	0.027	52.00	0.05
180.00	0.030	0.022	0.000	0.053	0.054	52.00	0.10
177.00	0.241	0.185	0.181	0.308	0.493	52.00	0.95
175.00	0.839	0.204	0.176	0.340	1.072	52.00	2.06
170.00	2.345	0.210	0.163	0.348	2.565	52.00	4.93
167.00	3.267	0.511	0.846	0.882	3.958	52.00	7.61
165.00	4.757	0.526	0.822	0.905	5.407	52.00	10.40
160.00	8.260	0.520	0.764	0.894	8.846	52.00	17.01
157.00	10.217	0.733	1.004	1.176	11.041	52.00	21.23
155.00	11.916	0.745	0.977	1.195	12.736	52.00	24.49
150.00	15.880	0.743	0.913	1.189	16.673	52.00	32.06
145.00	19.446	0.741	0.855	1.185	20.223	51.36	39.37
140.00	22.664	0.739	0.803	1.181	23.431	50.61	46.30
135.00	25.578	0.729	0.755	1.163	26.328	49.85	52.82
132.30	27.022	0.738	0.731	1.159	27.780	49.44	56.19
130.00	20.390	0.536	0.514	0.830	20.939	52.00	40.27
127.05	21.425	0.536	0.497	0.825	21.971	52.00	42.25
125.00	22.100	0.550	0.485	0.838	22.660	52.00	43.58
120.00	23.681	0.555	0.458	0.837	24.244	52.00	46.62
115.00	25.128	0.560	0.433	0.836	25.695	52.00	49.41
110.00	26.456	0.566	0.410	0.835	27.028	52.00	51.98
105.00	27.677	0.571	0.389	0.835	28.254	52.00	54.33
100.00	28.803	0.561	0.370	0.818	29.369	52.00	56.48
98.90	29.033	0.590	0.365	0.830	29.628	52.00	56.98
95.00	25.787	0.505	0.304	0.700	26.296	52.00	50.57
92.90	26.135	0.512	0.298	0.703	26.650	52.00	51.25
90.00	26.587	0.524	0.289	0.710	27.115	52.00	52.14
85.00	27.340	0.532	0.275	0.710	27.874	52.00	53.60
80.00	28.037	0.539	0.263	0.710	28.579	52.00	54.96
75.00	28.684	0.547	0.251	0.710	29.233	52.00	56.22
70.00	29.284	0.554	0.240	0.710	29.841	52.00	57.39
65.00	29.842	0.562	0.229	0.709	30.406	52.00	58.47
60.00	30.361	0.570	0.220	0.709	30.933	52.00	59.49
55.00	30.844	0.566	0.210	0.700	31.411	52.00	60.41
53.00	31.023	0.585	0.207	0.703	31.609	52.00	60.79
50.00	27.723	0.531	0.179	0.616	28.255	52.00	54.34
45.92	28.011	0.526	0.173	0.608	28.538	52.00	54.88
45.00	28.072	0.543	0.172	0.618	28.616	52.00	55.03
40.00	28.400	0.552	0.165	0.617	28.953	52.00	55.68
35.00	28.704	0.561	0.158	0.616	29.265	52.00	56.28
30.00	28.984	0.569	0.152	0.615	29.554	52.00	56.84
25.00	29.243	0.578	0.147	0.614	29.822	52.00	57.35
20.00	29.483	0.587	0.141	0.614	30.070	52.00	57.83
15.00	29.705	0.596	0.136	0.613	30.301	52.00	58.27
10.00	29.910	0.604	0.131	0.613	30.515	52.00	58.68
5.00	30.101	0.613	0.127	0.613	30.715	52.00	59.07
0.00	30.278	0.603	0.122	0.603	30.881	52.00	59.39