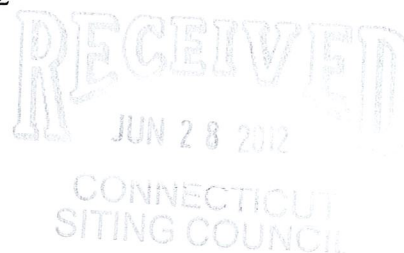


280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

June 27, 2012



Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-107-111213 – 525 Orange Center Road, Orange, Connecticut**
EM-VER-108-120123 – 691 Oxford Road, Oxford, Connecticut
EM-VER-111-120320 – 171 Town Hill Road, Plymouth, Connecticut
EM-VER-126-120214 – Birdseye Road, Shelton, Connecticut
EM-VER-139-120202B – 44 Fyler Place, Suffield, Connecticut

Completion of Construction Activity

Dear Ms. Roberts:

The purpose of this letter is to notify the Siting Council that construction activity associated with the above-referenced Cellco Partnership d/b/a Verizon Wireless telecommunications facilities has been completed.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to be "K. Baldwin".

Kenneth C. Baldwin

Copy to:
Sandy M. Carter



Law Offices

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HARTFORD

NEW LONDON

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WHITE PLAINS

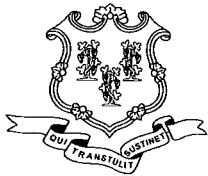
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STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: siting.council@ct.gov

www.ct.gov/csc

December 30, 2011

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

RE: **EM-VER-107-111213** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 525 Orange Center Road, Orange, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated December 12, 2011. 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. Please be advised that the validity of this action shall expire one year from the date of this letter. 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. Thank you for your attention and cooperation.

Very truly yours,

Linda Roberts
Executive Director

LR/CDM/laf

c: The Honorable James M. Zeoli, First Selectman, Town of Orange
Paul Dinice, Zoning Enforcement Officer, Town of Orange



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@ct.gov

www.ct.gov/csc

December 14, 2011

The Honorable James M. Zeoli
First Selectman
Town of Orange
Town Hall
617 Orange Center Road
Orange, CT 06477-2423

RE: **EM-VER-107-111213** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 525 Orange Center Road, Orange, Connecticut.

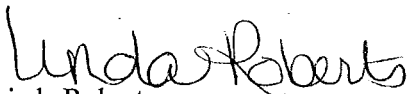
Dear First Selectman Zeoli:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

If you have any questions or comments regarding this proposal, please call me or inform the Council by December 29, 2011.

Thank you for your cooperation and consideration.

Very truly yours,


Linda Roberts
Executive Director

LR/jbw

Enclosure: Notice of Intent

c: Paul Dinice, Zoning Enforcement Officer, Town of Orange

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

December 12, 2011

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap
525 Orange Center Road, Orange, Connecticut**

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 155-foot level on the existing 160-foot tower at the above-referenced address. The tower is owned by the Town of Orange. The Council approved Cellco's use of the tower in 1997 (Docket No. 177a). Cellco now intends to modify its installation by replacing all of its existing antennas with six (6) model LPA-80060/4CF cellular antennas; three (3) model BXA-171063/12BF PCS antennas; and three (3) model BXA-70063/6CF LTE antennas, all at the same 155-foot level on the tower. Cellco also intends to install six (6) coax cable diplexers on its antenna platform. Attached behind Tab 1 are the specifications for the proposed replacement antennas and cable diplexers.

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 James Zeoli, First Selectman of the Town of Orange. The Town of Orange is the owner of the property on which the tower is located.

The planned modifications to the 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 an increase in the overall height of the existing tower. Cellco's antennas and diplexers will be located at the same 155-foot level on the existing 160-foot tower.



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11421159-v1

Linda Roberts
December 12, 2011
Page 2

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundaries.

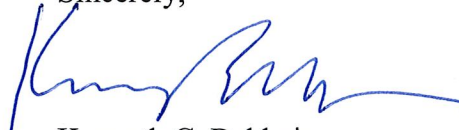
3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for Cellco's modified facility is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that the tower and foundation can support Cellco's proposed modification. (See Tab 3).

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

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

James Zeoli, Orange First Selectman
Sandy M. Carter

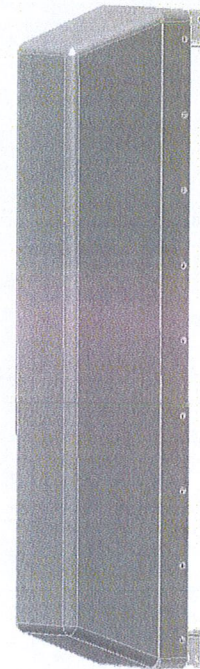


LPA-80060-4CF-EDIN-X

V-Pol | Log Periodic | 60° | 13.4 dBd

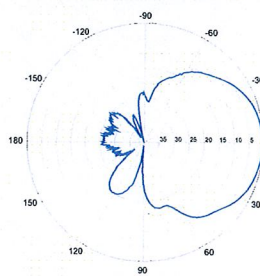
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.



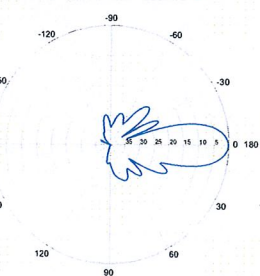
Electrical Characteristics	806-960 MHz	
Frequency bands	806-900 MHz	870-960 MHz
Polarization	Vertical	
Horizontal beamwidth	57°	55°
Vertical beamwidth	15°	14°
Gain	13.1 dBd (15.2 dBi)	13.4 dBd (15.5 dBi)
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.4:1	
Null fill	5% (-26.02 dB)	
Input power	700 W	
Lightning protection	Direct Ground	
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1205 x 235 x 246 mm	47.4 x 9.3 x 9.7 in
Depth of antenna with z-bracket	286 mm	11.3 in
Weight without mounting brackets	7 kg	15.4 lbs
Survival wind speed	201 km/hr	125 mph
Wind area	Front: 0.28 m² Side: 0.30 m²	Front: 3.05 ft² Side: 3.18 ft²
Wind load @ 161 km/hr (100 mph)	Front: 410 N Side: 467 N	Front: 92 lbf Side: 105 lbf
Requirements for Installation		
Elbow connectors	Due to connector placement it is necessary to use 90° elbow connectors for jumper cables as connectors are center-fed.	
Mounting Options	Part Number	Fits Pipe Diameter
2-Point Mounting & Downtilt Bracket Kit (0-20°)	21699999	50-102 mm 2.0-4.0 in
Lock-Down Brace	If the lock-down brace is used, the maximum diameter of the mounting pipe is 88.9 mm or 3.5 in.	

LPA-80060-4CF-EDIN-X



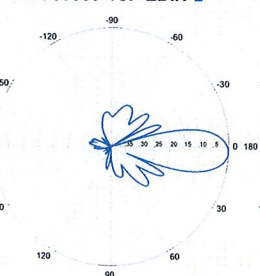
Horizontal | 850 MHz

LPA-80060-4CF-EDIN-0



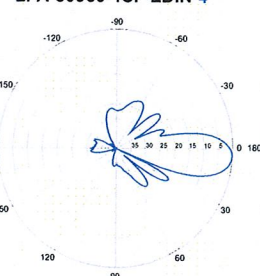
0° | Vertical | 850 MHz

LPA-80060-4CF-EDIN-2



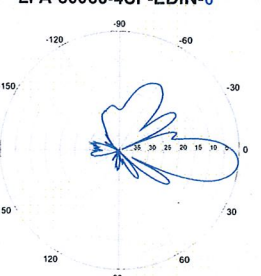
2° | Vertical | 850 MHz

LPA-80060-4CF-EDIN-4

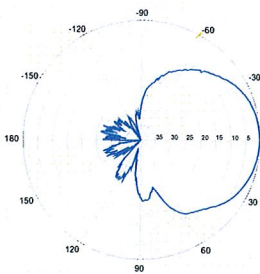


4° | Vertical | 850 MHz

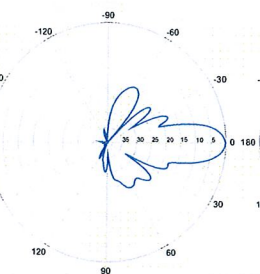
LPA-80060-4CF-EDIN-6



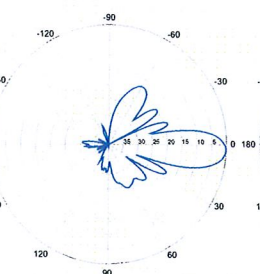
6° | Vertical | 850 MHz



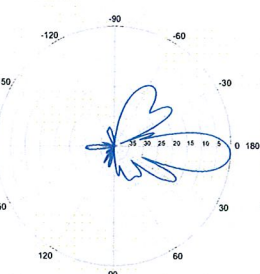
Horizontal | 950 MHz



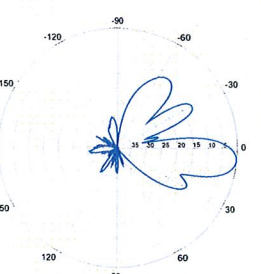
0° | Vertical | 950 MHz



2° | Vertical | 950 MHz



4° | Vertical | 950 MHz



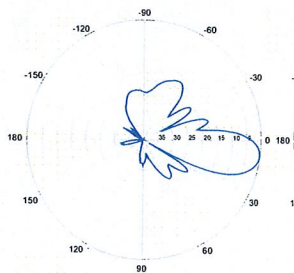
6° | Vertical | 950 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

LPA-80060-4CF-EDIN-X

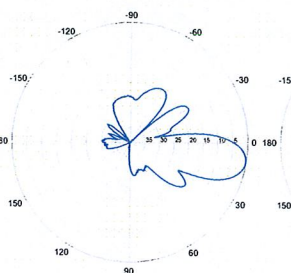
V-Pol | Log Periodic | 60° | 13.4 dBd

LPA-80060-4CF-EDIN-8



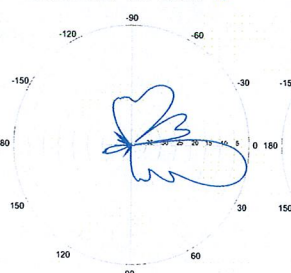
8° | Vertical | 850 MHz

LPA-80060-4CF-EDIN-10



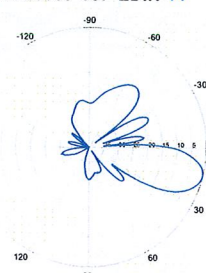
10° | Vertical | 850 MHz

LPA-80060-4CF-EDIN-12

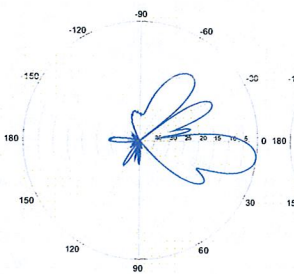


12° | Vertical | 850 MHz

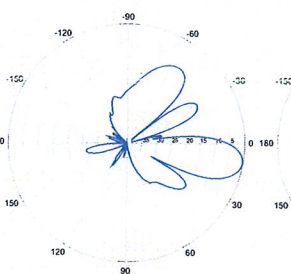
LPA-80060-4CF-EDIN-14



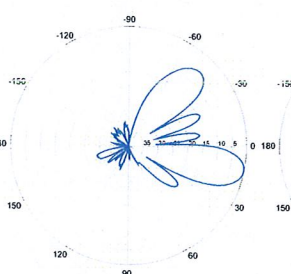
14° | Vertical | 850 MHz



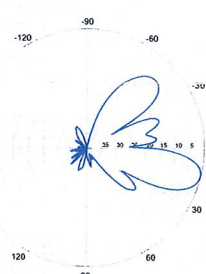
8° | Vertical | 950 MHz



10° | Vertical | 950 MHz



12° | Vertical | 950 MHz



14° | Vertical | 950 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-12BF-EDIN-X

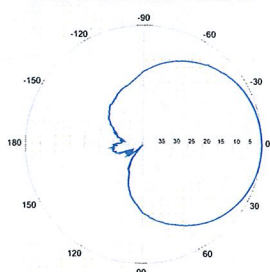
Replace "X" with desired electrical downtilt

X-Pol | FET Panel | 63° | 19.0 dBi

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1820 x 154 x 105 mm 71.7 x 6.1 x 4.1 in		
Depth with z-brackets	133 mm 5.2 in		
Weight without mounting brackets	6.8 kg 15 lbs		
Survival wind speed	> 201 km/hr > 125 mph		
Wind area	Front: 0.28 m² Side: 0.19 m² Front: 3.1 ft² Side: 2.1 ft²		
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N Front: 103 lbf Side: 68 lbf		
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12BF-EDIN-X-FP		

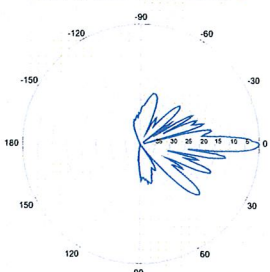


BXA-171063-12BF-EDIN-X



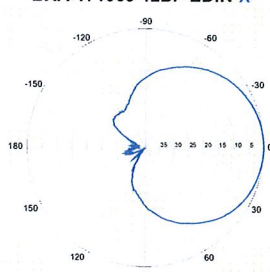
Horizontal | 1710-1880 MHz

BXA-171063-12BF-EDIN-0



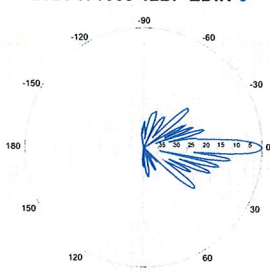
0° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-X



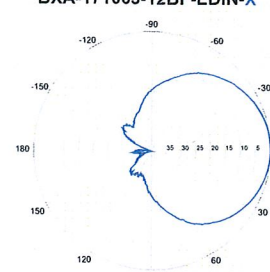
Horizontal | 1850-1990 MHz

BXA-171063-12BF-EDIN-0



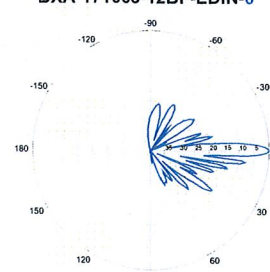
0° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-X



Horizontal | 1920-2170 MHz

BXA-171063-12BF-EDIN-0



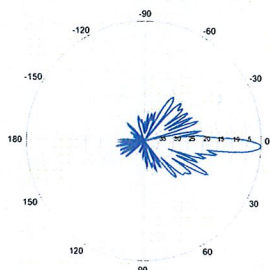
0° | Vertical | 1920-2170 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-12BF-EDIN-X

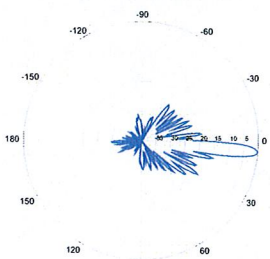
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12BF-EDIN-2



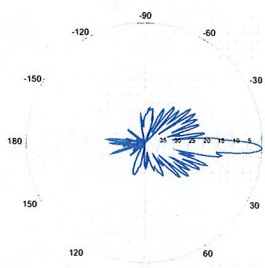
2° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-5



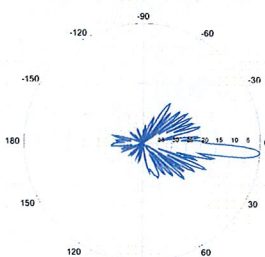
5° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-2



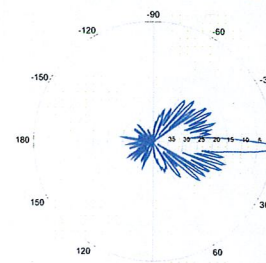
2° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-5



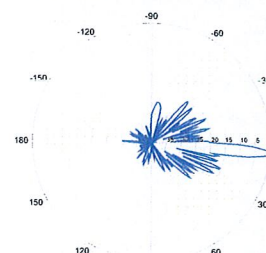
5° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-2



2° | Vertical | 1920-2170 MHz

BXA-171063-12BF-EDIN-5



5° | Vertical | 1920-2170 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

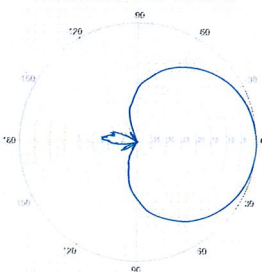
Replace 'X' with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz			
Frequency bands	696-806 MHz		806-900 MHz	
Polarization	±45°			
Horizontal beamwidth	65°		63°	
Vertical beamwidth	13°		11°	
Gain	14.0 dBd (16.1 dBi)		14.5 dBd (16.6 dBi)	
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10			
Impedance	50Ω			
VSWR	≤1.35:1			
Upper sidelobe suppression (0°)	-18.3 dB		-18.2 dB	
Front-to-back ratio (+/-30°)	-33.4 dB		-36.3 dB	
Null fill	5% (-26.02 dB)			
Isolation between ports	< -25 dB			
Input power with EDIN connectors	500 W			
Input power with NE connectors	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)			
Mechanical Characteristics				
Dimensions Length x Width x Depth	1804 x 285 x 132 mm		71.0 x 11.2 x 5.2 in	
Depth with z-brackets	172 mm		6.8 in	
Weight without mounting brackets	7.9 kg		17 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.51 m ²	Side: 0.24 m ²	Front: 5.5 ft ²	Side: 2.6 ft ²
Wind load @ 161 km/hr (100 mph)	Front: 759 N	Side: 391 N	Front: 169 lbf	Side: 89 lbf
Mounting Options	Part Number	Fits Pipe Diameter		Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in		6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP			

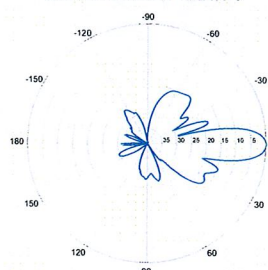


BXA-70063-6CF-EDIN-X



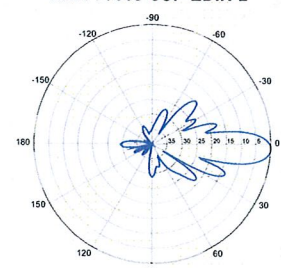
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

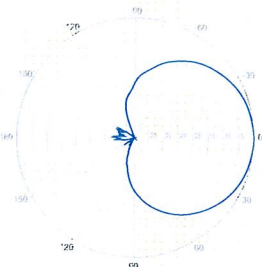


0° | Vertical | 750 MHz

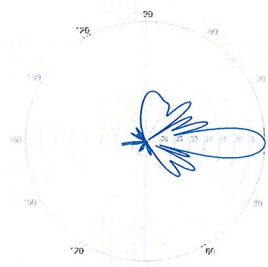
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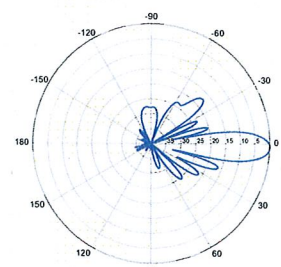
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



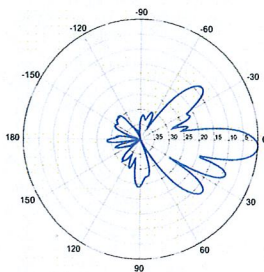
2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-70063-6CF-EDIN-X

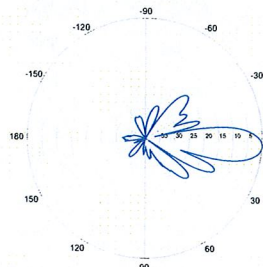
X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



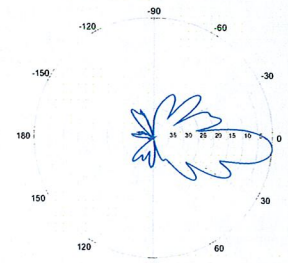
3° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-4

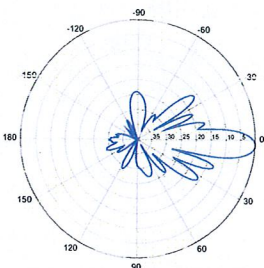


4° | Vertical | 750 MHz

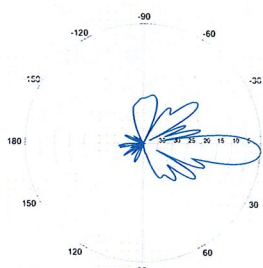
BXA-70063-6CF-EDIN-5



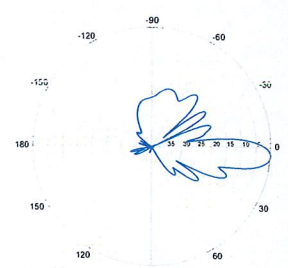
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

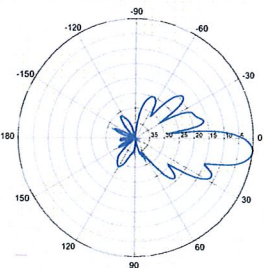


4° | Vertical | 850 MHz



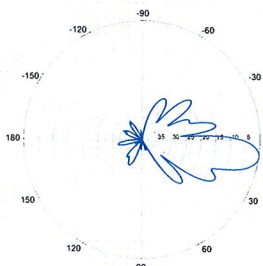
5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6



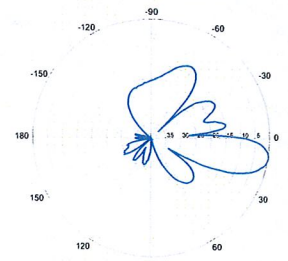
6° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-8

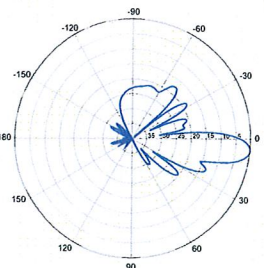


8° | Vertical | 750 MHz

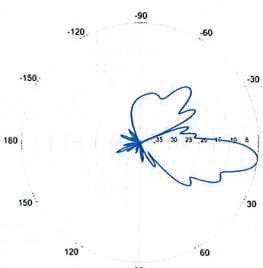
BXA-70063-6CF-EDIN-10



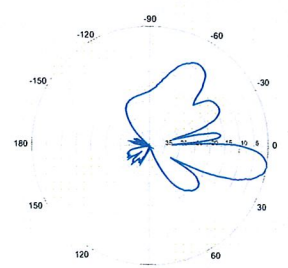
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

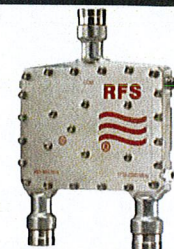
Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.



ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Product Description

The ShareLite FD9R6004 Series of diplexers are designed to enable feeder sharing between systems in the 698-960 MHz range and in the 1710-2200 MHz range. The diplexer is equipped with in-line connector placement so it can be installed in the BTS cabinet or at the tower top. This is especially valuable in crowded sites or when the feeders are not easily accessible. Due to its wideband design, the FD9R6004 Series can accommodate many combining solutions between 698-960 MHz and 1710-2200 MHz systems such as LTE 700 MHz, Cellular 800 MHz with PCS, GSM900 with GSM1800, or GSM900 with UMTS. This diplexer features a highly selective filter. It provides a high level of isolation between ports, while keeping the insertion loss on both paths at an extremely low level. The FD9R6004 diplexers are available with various DC pass options, helpful in configurations with or without the Tower Mount Amplifiers installed.



Features/Benefits

- **LTE ready design**
- **Extremely Low Insertion Loss**
- **High level of Rejection between bands – Protection against interferences**
- **Extremely High Power Handling Capability**
- **Integrated DC block/bypass versions available**
- **Very compact & small size design – Easy installation and reduced tower load**
- **In-line long-neck connectors for easy connection & waterproofing**
- **Exceptional reliability & environmental protection (IP 67)**
- **Equipped with 1 * Breathable Vent – Prevent any humidity inside the product**
- **Mounting hardware for Wall and Pole mount provided (P/N SEM2-1A)**
- **Grounding already provided through the mounting bracket**
- **Kit available for easy dual mount**

Technical Specifications

Product Type	Diplexer/Cross Band Coupler
Frequency Range 1, MHz	698-960
Frequency Range 2, MHz	1710-2200
Application	LTE700, GSM900, UMTS, GSM1800, Cellular 800, PCS
Configuration	Sharelite Single diplexer, outdoor, DC pass in the 1710-2170MHz path, with mounting hardware SEM2-1A
Mounting	Wall Mounting: With 4 screws (maximum 6mm diameter); Pole Mounting: With included clamp set 40-110mm (1.57-4.33)
Return Loss All Ports Min/Typ, dB	19/23
Power Handling Continuous, Max, W	1250 at common port; 750 in low frequency path & 500 in high frequency path
Power Handling Peak, Max, W	15000 in low frequency path & 8000 in high frequency path
Impedance, Ohms	50
Insertion Loss, Path 1, dB	0.07 typ.
Insertion Loss, Path 2, dB	0.13 typ.
Rejection Between Bands Min/Typ, dB	58/64@698-960MHz; 60/70@1710-2200MHz
IMP Level at the COM Port, Typ, dBm	-112 @ 2x43
DC Pass in Low Frequency Path	No
DC Pass in High Frequency Path	Yes
Temperature Range, °C (°F)	-40 to +60 (-40 to +140)
Environmental	ETSI 300-019-2-4 Class 4.1E
Ingress Protection	IP 67
Lightning Protection	EN/IEC61000-4-5 Level 4
Connectors	In-line long-neck 7-16-Female
Weight, kg (lb)	1.2 (2.6)
Shipping Weight, kg (lb)	3.2 (7) for 2 * single units in 1 * box, 9.8 (21.6) for 6 * units = 3 * Boxes in 1 * overwrap
Dimensions, H x W x D, mm (in)	147 x 164 x 37 (5.8 x 6.5 x 1.5)
Shipping Dimensions, H x W x D, mm (in)	254 x 406 x 82 (10 x 16 x 3.2) for 2 * Single Units in 1 * box, 280 x 406 x 241 (11 x 16 x 9.5) for 6 * units = 3 * Boxes in 1 * overwrap
Volume, L	0.43
Housing	Aluminum

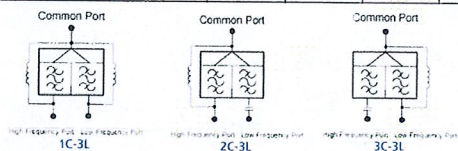
Notes

ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Other Documentation

FD9R6004/2C-3L Installation Instructions: [Wideband_Diplexer_Installation_Rev5.pdf](#)

Selection Guide Diplexer 698-960 / 1710-2200MHz					
	Model Number	Full DC Pass	DC Pass High Band	DC Pass Low Band	Mounting Hardware Included
Single	FD9R6004/1C-3L				X
	FD9R6004/2C-3L				X
	FD9R6004/3C-3L				X
Dual	KIT-FD9R6004/1C-DL				X
	KIT-FD9R6004/2C-DL				X
	KIT-FD9R6004/3C-DL				X



The FD9R6004 Series is upgradeable to a Dual Diplexer kit by means of 2 diplexers and mounting hardware kits SEM2-1A and SEM2-3

Mounting Hardware and Ground Cable Ordering Information	
Model Number	Description
SEM2-1A	Mounting Hardware, Pole mount ø40-110mm (Included with the Single and Dual Diplexer) Wall Screws M6 (Not included with the product)
SEM2-3	Assembly kit for 2 pcs of FD9R6004/xC-3L (Can be ordered separately but included with the Dual Diplexer Kit)
CA020-2	Ground Cable, 2m, includes lugs (Optional)
CA030-2	Ground Cable, 2m, includes lugs (Optional)
SEM6	Mounting Hardware for 6 Diplexers, Tower Base (Optional)

Site Name: Orange 1		General	Power	Density					
Tower Height: Verizon @ 155ft									
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total	
*AT&T UMTS	1	500	147	0.0083	880	0.5867	1.42%		
*AT&T UMTS	2	500	147	0.0166	1900	1.0000	1.66%		
*AT&T GSM	3	296	147	0.0148	880	0.5867	2.52%		
*AT&T GSM	2	427	147	0.0142	1930	1.0000	1.42%		
*AT&T LTE	1	500	147	0.0083	740	0.4933	1.69%		
*Pocket	3	631	113	0.0533	2130	1.0000	5.33%		
*Cleanwire	2	153	167	0.0039	2496	1.0000	0.39%		
*Cleanwire	1	211	167	0.0027	11 GHz	1.0000	0.27%		
*Sprint	11	122	134	0.0269	1962.5	1.0000	2.69%		
*Nextel	9	100	169	0.0113	851	0.5673	2.00%		
*T-Mobile	8	129	121	0.0253	1935	1.0000	2.53%		
*T-Mobile	2	730	121	0.0359	2100	1.0000	3.59%		
Verizon PCS	7	265	155	0.0278	1970	1.0000	2.78%		
Verizon Cellular	9	370	155	0.0498	869	0.5793	8.60%		
Verizon AWS	1	662	155	0.0099	2145	1.0000	0.99%		
Verizon 700	2	775	155	0.0232	698	0.4653	4.99%		
								42.87%	
* Source: Siting Council									

Structural Analysis Report

160-ft Existing Valmont Monopole

*Proposed Verizon Wireless
Antenna Upgrade*

Verizon Site Ref: Orange 1

*525 Orange Center Road
Orange, CT*

Centek Project No. 11074.CO31

Date: November 23, 2011



Prepared for:

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

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- ANTENNA CUT SHEETS.
- TOWER INVENTORY MAPPING REPORT PREPARED BY JWB TOWER SERVICES, LLC DATED SEPTEMBER 16, 2011.

Introduction

The purpose of this report is to summarize the results of the non-linear, P- Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing monopole (tower) located in Orange, CT.

The host tower is a 160-ft tall, four-section, twelve sided, tapered monopole, originally designed and manufactured by Valmont Structures job no; 16632-97, dated February 25, 1998. The manufacturer's drawings and calculations were unavailable for use in this report. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis report prepared by Centek; job no; 11074.CO33, dated October 4, 2011. Antenna and appurtenance information were obtained from the tower mapping and inventory report prepared by JWB Tower Services, LLC (JWB) dated September 16, 2011 and a Verizon RF data sheet.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 21.2-in at the top and 64.0-in at the base.

Verizon is proposing the removal of twelve (12) panel antennas and the installation of twelve (12) panel antennas and six (6) diplexers mounted to the existing platform w/ handrails. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- NEXTEL (Existing):
Antennas: Nine (9) Decibel DB844H90E-M panel antennas pipe mounted to Verizon's platform w/ handrails with a RAD center elevation of 167-ft above the existing tower base plate.
Coax Cables: Nine (9) 1-1/4" $\varnothing$ coax cables running on the inside of the existing tower.
- CLEARWIRE (Existing):
Antennas: Three (3) Argus LLPX310R panel antennas w/ Samsung WiMax remote radio heads, two (2) Andrew VHLP2-11-DW1 dish antennas and one (1) GPS antenna pipe mounted to Verizon's platform with rails with a RAD center elevation of 167-ft above the existing tower base plate.
Coax Cables: Two (2) 2" $\varnothing$ flex conduits and three (3) 1/2" $\varnothing$ coax cables running on the inside of the existing tower.
- AT&T (Existing):
Antennas: Six (6) Powerwave 7770 panel antennas, six (6) Powerwave LGP21401 TMA's, six (6) Powerwave LGP21901 diplexers and one (1) Bias-T mounted on a 13-ft platform with rails with a RAD center elevation of 148-ft above the existing tower base plate.
Coax Cables: Twelve (12) 1-1/4" $\varnothing$ coax cables running on the inside of the existing tower.

- **SPRINT (Existing):**
Antennas: Six (6) Decibel DB980H90E-M panel antennas mounted on a 13-ft platform with rails with a RAD center elevation of 138-ft above the existing tower base plate.
Coax Cables: Six (6) 1-5/8" Ø coax cables running on the inside of the existing tower.
- **T-MOBILE (Existing):**
Antennas: Six (6) RR90-17-02DP panel antennas, three (3) RFS APX16DWV-16DWV-S panel antennas, six (6) Remec G3SS TMA's and three (3) 7"x7"x3" TMA's mounted on a 13-ft platform with rails with a RAD center elevation of 123-ft above the existing tower base plate.
Coax Cables: Twelve (12) 1-5/8" Ø coax cables running on the inside of the existing tower and six (6) 1-5/8" Ø coax cables running on the exterior of the existing monopole.
- **METROPCS (Existing):**
Antennas: Three (3) RFS APXV18-206517S panel antennas and one (1) 12"x12" dish flush mounted with a RAD center elevation of 113-ft above exiting grade.
Coax Cables: Six (6) 1-5/8" Ø coax cables and two (2) Cat5 cables running on the inside of the existing monopole.
- **SPRINT (Existing):**
Antennas: One (1) GPS antenna on a GPS Stand-off mount with a RAD center elevation of 83.4-ft above the existing tower base plate.
Coax Cables: One (1) 1/2"Ø coax cable running on the inside of the existing tower.
- **VERIZON (Existing to Remain):**
Coax Cables: Twelve (12) 1-5/8" Ø coax cables running on the inside of the existing tower.
- **VERIZON (Existing to Remove):**
Antennas: Six (6) Antel LPA-185063-8CF and six (6) Decibel DB846F65ZAXY panel antennas mounted on a 13-ft platform with rails with a RAD center elevation of 158-ft above the existing tower base plate.
- **VERIZON (PROPOSED):**
Antennas: Three (3) Antel BXA-70063-6CF panel antennas, six (6) Antel LPA-80060-6CF panel antennas, three (3) Antel BXA-171063-12BF panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted on a 13-ft platform with rails with a RAD center elevation of 158-ft above the existing tower base plate.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed as indicated in this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled RISATower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for 90 mph basic wind speed (fastest mile) with no ice and 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice tower structure and its components.

Basic Wind Speed:	New Haven; v = 85 mph (fastest mile)	[Section 16 of TIA/EIA-222-F-96]
	Orange; v = 110 mph (3 second gust) equivalent to v = 90 mph (fastest mile)	[Appendix K of the 2005 CT Building Code Supplement]
	Appendix K wind speed controls.	
Load Cases:	<u>Load Case 1</u> ; 90 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design of monopole towers.	[Section 2.3.16 of TIA/EIA-222-F-96]
	<u>Load Case 2</u> ; 78 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 78 mph wind speed velocity represents 75% of the wind pressure generated by the 90 mph wind speed. This load case typically controls the design of lattice towers.	[Section 2.3.16 of TIA/EIA-222-F-96]
	<u>Load Case 3</u> ; Seismic – not checked	[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software RISATower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **77.7%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	0'-37.17'	77.7%	PASS

Foundation and Anchors

The existing foundation consists of an 8.0-ft square x 10.0-ft long reinforced concrete pier on a 22.0-ft x 4.0-ft thick reinforce concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned structural report prepared by Centek; job no; 11074.CO33, dated October 4, 2011. The base of the tower is connected to the foundation by means of (24) 2.25"Ø, ASTM A615-75 anchor bolts embedded approximately 10-ft into the concrete foundation structure.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	44 kips
	Compression	53 kips
	Moment	4645 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS) ⁽¹⁾	Proposed Loading (FS) ⁽¹⁾	Result
Reinforced Concrete Pad and Pier	OTM ⁽²⁾	2.0	3.83	PASS

Note 1: FS denotes Factor of Safety.

Note 2: OTM denotes Overturning Moment

CEN TEK Engineering, Inc.

Structural Analysis - 160-ft Valmont Monopole
Verizon Wireless Antenna Upgrade – Orange 1
Orange, CT
November 23, 2011

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Compression	66.7%	PASS
Base Plate	Bending	41.2%	PASS

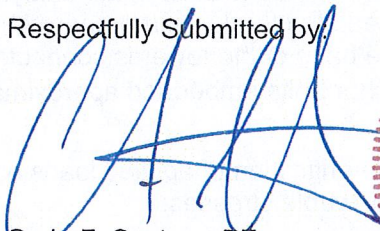
Conclusion

This analysis shows that the subject tower is adequate to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by Verizon Wireless. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

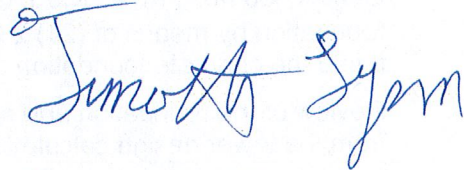
Please feel free to call with any questions or comments.

Respectfully Submitted by:


Carlo F. Centore, PE
Principal ~ Structural Engineer



Prepared by:



Timothy J. Lynn, EIT
Structural Engineer

Standard Conditions for Furnishing of
Professional Engineering Services on
Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

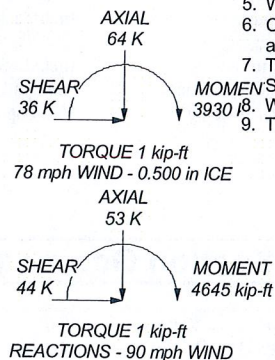
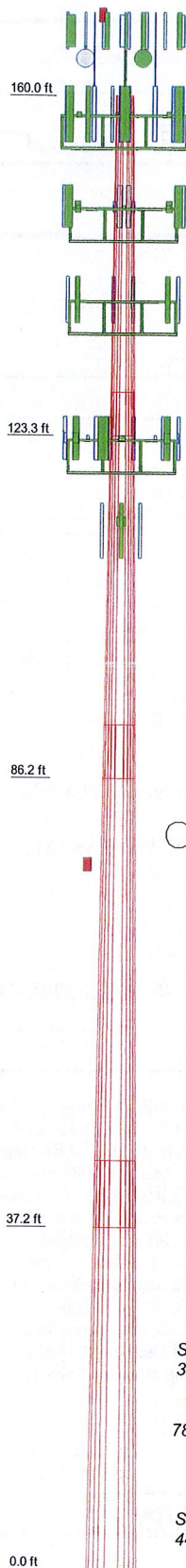
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

- RISATower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- RISATower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	36.670	12	0.219	4.670	21.200	31.460	A572-65	2.3
2	41.830	12	0.344	5.830	29.715	41.440	A572-65	5.6
3	54.830	12	0.438	7.330	39.118	54.460	A572-65	12.2
4	44.500	12	0.469	51.533	64.000		A572-65	13.1
								33.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
GPS (Clearwire - Existing)	168	7770.00 (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	7770.00 (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	7770.00 (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	7770.00 (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	(2) LGP21401 TMA (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	(2) LGP21401 TMA (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	(2) LGP21401 TMA (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	(2) LGP21901 Diplexer (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	(2) LGP21901 Diplexer (ATI - Existing)	148
DB844H90E-M (Nextel - Existing)	167	(2) LGP21901 Diplexer (ATI - Existing)	148
LLPX310R (Clearwire - Existing)	167	Smart Bias T (ATI - Existing)	148
LLPX310R (Clearwire - Existing)	167	7770.00 (ATI - Existing)	148
LLPX310R (Clearwire - Existing)	167	13' Platform w/Rails (ATI - Existing)	146
RRU (Clearwire - Existing)	167	(2) DB980H90E-M (Sprint - Existing)	138
RRU (Clearwire - Existing)	167	(2) DB980H90E-M (Sprint - Existing)	138
RRU (Clearwire - Existing)	167	(2) DB980H90E-M (Sprint - Existing)	138
(4) 8"x2 1/2" Pipe Mount (Nextel - Existing)	165	13' Platform w/Rails (Sprint - Existing)	136
(4) 8"x2 1/2" Pipe Mount (Nextel - Existing)	165	APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	123
(4) 8"x2 1/2" Pipe Mount (Nextel - Existing)	165	APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	123
VHLP2-11-DW1 (Clearwire - Existing)	164	(2) RR90-17-02DP (T-Mobile - Existing)	123
VHLP2-11-DW1 (Clearwire - Existing)	164	(2) RR90-17-02DP (T-Mobile - Existing)	123
BXA-171063-12BF (Verizon - Proposed)	158	(2) G3SS TMA (T-Mobile - Existing)	123
BXA-70063/6CF (Verizon - Proposed)	158	(2) G3SS TMA (T-Mobile - Existing)	123
LPA-80060-6CF (Verizon - Proposed)	158	(2) G3SS TMA (T-Mobile - Existing)	123
LPA-80060-6CF (Verizon - Proposed)	158	7"x7"x3" TMA (T-Mobile - Existing)	123
BXA-171063-12BF (Verizon - Proposed)	158	7"x7"x3" TMA (T-Mobile - Existing)	123
BXA-70063/6CF (Verizon - Proposed)	158	APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	123
LPA-80060-6CF (Verizon - Proposed)	158	13' Platform w/Rails (T-Mobile - Existing)	121
LPA-80060-6CF (Verizon - Proposed)	158	1' x 1' Panel (MetroPCS - Existing)	114
BXA-70063/6CF (Verizon - Proposed)	158	APXV18-206517S (MetroPCS - Existing)	113
LPA-80060-6CF (Verizon - Proposed)	158	APXV18-206517S (MetroPCS - Existing)	113
(2) FD9R6004/2C-3L Diplexer (Verizon - Proposed)	158	Valmont Uni-Tri Bracket (MetroPCS - Existing)	113
(2) FD9R6004/2C-3L Diplexer (Verizon - Proposed)	158	APXV18-206517S (MetroPCS - Existing)	113
(2) FD9R6004/2C-3L Diplexer (Verizon - Proposed)	158	GPS (Sprint - Existing)	76
LPA-80060-6CF (Verizon - Proposed)	158	Stand-off	75
13' Platform w/Rails (Verizon - Existing)	156	Stand-off	75
7770.00 (ATI - Existing)	148		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 78 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 77.7%

Centek Engineering Inc.

63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 11074.CO31 - Orange 1

Project: 160-ft Valmont Monopole - 525 Orange Center Rd., Orange, CT

Client: Verizon Wireless

Code: TIA/EIA-222-F

Path:

Drawn by: TJL

Date: 11/23/11

Scale: NTS

App'd:

Dwg No. E-1

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RISATower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job	11074.CO31 - Orange 1	Page	1 of 22
	Project	160-ft Valmont Monopole - 525 Orange Center Rd., Orange, CT	Date	11:11:39 11/23/11
	Client	Verizon Wireless	Designed by	TJL

Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in New Haven County, Connecticut.

Basic wind speed of 90 mph.

Nominal ice thickness of 0.500 in.

Ice density of 56 pcf.

A wind speed of 78 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

Weld together tower sections have flange connections..

Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..

Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..

Welds are fabricated with ER-70S-6 electrodes..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	✓ Assume Rigid Index Plate	Calculate Redundant Bracing Forces
Use Moment Magnification	Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
✓ Use Code Stress Ratios	Use Clear Spans For KL/r	SR Leg Bolts Resist Compression
Use Code Safety Factors - Guys	Retention Guys To Initial Tension	All Leg Panels Have Same Allowable
Escalate Ice	✓ Bypass Mast Stability Checks	Offset Girt At Foundation
Always Use Max Kz	Use Azimuth Dish Coefficients	Consider Feedline Torque
Use Special Wind Profile	✓ Project Wind Area of Appurt.	Include Angle Block Shear Check
Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Poles
Leg Bolts Are At Top Of Section	SR Members Have Cut Ends	✓ Include Shear-Torsion Interaction
Secondary Horizontal Braces Leg	✓ Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	160.000-123.330	36.670	4.670	12	21.200	31.460	0.219	0.876	A572-65 (65 ksi)
L2	123.330-86.170	41.830	5.830	12	29.715	41.440	0.344	1.376	A572-65 (65 ksi)
L3	86.170-37.170	54.830	7.330	12	39.118	54.460	0.438	1.752	A572-65

RISATower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job	11074.CO31 - Orange 1	Page	2 of 22
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	Client	Verizon Wireless	Designed by	TJL

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L4	37.170-0.000	44.500		12	51.533	64.000	0.469	1.876	(65 ksi) A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia.	Area	I	r	C	I/C	J	It/Q	w	w/t
	in	in ²	in ⁴	in	in	in ³	in ⁴	in ²	in	
L1	21.948	14.795	831.313	7.511	10.982	75.701	1684.465	7.282	5.095	23.263
	32.570	22.031	2744.484	11.184	16.296	168.412	5561.069	10.843	7.844	35.819
L2	32.119	32.534	3582.389	10.515	15.393	232.735	7258.892	16.012	7.042	20.47
	42.902	45.521	9812.935	14.712	21.466	457.140	19883.667	22.404	10.184	29.605
L3	42.187	54.553	10417.699	13.847	20.263	514.122	21109.082	26.849	9.310	21.255
	56.381	76.190	28381.014	19.340	28.210	1006.052	57507.629	37.499	13.421	30.643
L4	55.477	77.116	25666.021	18.281	26.694	961.487	52006.317	37.954	12.554	26.767
	66.258	95.943	49427.852	22.744	33.152	1490.946	100154.229	47.220	15.895	33.891

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1 160.000-123.30				1	1	1		
L2 123.330-86.170				1	1	1		
L3 86.170-37.170				1	1	1		
L4 37.170-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C _A A _A	Weight
				ft		ft ² /ft	klf
1 1/4 (Nextel - Existing)	A	No	Inside Pole	160.000 - 3.000	9	No Ice 1/2" Ice	0.000 0.001
2" dia Flex Conduit (Clearwire - Existing)	A	No	Inside Pole	160.000 - 3.000	2	No Ice 1/2" Ice	0.000 0.005
1/2 (Clearwire - Existing)	A	No	Inside Pole	160.000 - 3.000	3	No Ice 1/2" Ice	0.000 0.000
1 5/8 (Verizon - Existing)	B	No	Inside Pole	156.000 - 3.000	12	No Ice 1/2" Ice	0.000 0.001
1 1/4 (AT&T - Existing)	C	No	Inside Pole	146.000 - 3.000	12	No Ice 1/2" Ice	0.000 0.001
1 5/8 (Sprint - Existing)	A	No	Inside Pole	136.000 - 3.000	6	No Ice 1/2" Ice	0.000 0.001
1 5/8 (T-Mobile - Existing)	B	No	Inside Pole	123.000 - 3.000	12	No Ice 1/2" Ice	0.000 0.001

RISATower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job	11074.CO31 - Orange 1	Page	3 of 22
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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		$C_A A_A$ ft ² /ft	Weight klf
1 5/8 (T-Mobile - Existing)	B	No	CaAa (Out Of Face)	123.000 - 3.000	1	No Ice	0.198	0.001
1 5/8 (T-Mobile - Existing)	B	No	CaAa (Out Of Face)	123.000 - 3.000	5	1/2" Ice	0.298	0.003
1 5/8 (T-Mobile - Existing)	B	No	CaAa (Out Of Face)	123.000 - 3.000	5	No Ice	0.000	0.001
1 5/8 (T-Mobile - Existing)	B	No	CaAa (Out Of Face)	123.000 - 3.000	5	1/2" Ice	0.000	0.003
1 5/8 (MetroPCS - Existing)	C	No	Inside Pole	113.000 - 3.000	6	No Ice	0.000	0.001
1 5/8 (MetroPCS - Existing)	C	No	Inside Pole	113.000 - 3.000	6	1/2" Ice	0.000	0.001
CATEGORY 5e (1 WIRE) (MetroPCS - Existing)	C	No	Inside Pole	113.000 - 3.000	2	No Ice	0.000	0.000
1/2 (Sprint - Existing)	C	No	Inside Pole	113.000 - 3.000	2	1/2" Ice	0.000	0.000
1/2 (Sprint - Existing)	A	No	Inside Pole	75.000 - 3.000	1	No Ice	0.000	0.000
1/2 (Sprint - Existing)	A	No	Inside Pole	75.000 - 3.000	1	1/2" Ice	0.000	0.000

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L1	160.000-123.330	A	0.000	0.000	0.000	0.000	0.691
		B	0.000	0.000	0.000	0.000	0.408
		C	0.000	0.000	0.000	0.000	0.180
L2	123.330-86.170	A	0.000	0.000	0.000	0.000	0.852
		B	0.000	0.000	0.000	7.292	1.153
		C	0.000	0.000	0.000	0.000	0.473
L3	86.170-37.170	A	0.000	0.000	0.000	0.000	1.133
		B	0.000	0.000	0.000	9.702	1.529
		C	0.000	0.000	0.000	0.000	0.714
L4	37.170-0.000	A	0.000	0.000	0.000	0.000	0.792
		B	0.000	0.000	0.000	6.766	1.066
		C	0.000	0.000	0.000	0.000	0.498

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L1	160.000-123.330	A	0.500	0.000	0.000	0.000	0.000	0.691
		B	0.500	0.000	0.000	0.000	0.000	0.408
		C	0.500	0.000	0.000	0.000	0.000	0.180
L2	123.330-86.170	A	0.500	0.000	0.000	0.000	0.000	0.852
		B	0.500	0.000	0.000	0.000	10.975	1.487
		C	0.500	0.000	0.000	0.000	0.000	0.473
L3	86.170-37.170	A	0.500	0.000	0.000	0.000	0.000	1.133
		B	0.500	0.000	0.000	0.000	14.602	1.973
		C	0.500	0.000	0.000	0.000	0.000	0.714
L4	37.170-0.000	A	0.500	0.000	0.000	0.000	0.000	0.792
		B	0.500	0.000	0.000	0.000	10.183	1.376
		C	0.500	0.000	0.000	0.000	0.000	0.498

Discrete Tower Loads

RISATower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job		Page
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	Project	Date	
	160-ft Valmont Monopole - 525 Orange Center Rd., Orange, CT	11:11:39 11/23/11	
	Client	Designed by	
	Verizon Wireless	TJL	

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
(4) 8'x2 1/2" Pipe Mount (Nextel - Existing)	A	From Face	3.000 0.000 0.000	0.000	165.000	No Ice 1/2" Ice	2.300 3.132	2.300 3.132	0.041 0.057
(4) 8'x2 1/2" Pipe Mount (Nextel - Existing)	B	From Face	3.000 0.000 0.000	0.000	165.000	No Ice 1/2" Ice	2.300 3.132	2.300 3.132	0.041 0.057
(4) 8'x2 1/2" Pipe Mount (Nextel - Existing)	C	From Face	3.000 0.000 0.000	0.000	165.000	No Ice 1/2" Ice	2.300 3.132	2.300 3.132	0.041 0.057
DB844H90E-M (Nextel - Existing)	A	From Face	3.000 2.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	A	From Face	3.000 -2.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	A	From Face	3.000 -6.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	B	From Face	3.000 2.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	B	From Face	3.000 -2.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	B	From Face	3.000 -6.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	C	From Face	3.000 2.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	C	From Face	3.000 -2.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
DB844H90E-M (Nextel - Existing)	C	From Face	3.000 -6.000 0.000	0.000	167.000	No Ice 1/2" Ice	2.867 3.177	3.967 4.337	0.010 0.036
LLPX310R (Clearwire - Existing)	A	From Face	3.000 6.000 0.000	0.000	167.000	No Ice 1/2" Ice	4.830 5.183	1.945 2.214	0.029 0.055
LLPX310R (Clearwire - Existing)	B	From Face	3.000 6.000 0.000	0.000	167.000	No Ice 1/2" Ice	4.830 5.183	1.945 2.214	0.029 0.055
LLPX310R (Clearwire - Existing)	C	From Face	3.000 6.000 0.000	0.000	167.000	No Ice 1/2" Ice	4.830 5.183	1.945 2.214	0.029 0.055
RRU (Clearwire - Existing)	A	From Face	3.000 0.000 0.000	0.000	167.000	No Ice 1/2" Ice	1.804 2.000	0.778 0.920	0.033 0.045
RRU (Clearwire - Existing)	A	From Face	3.000 0.000 0.000	0.000	167.000	No Ice 1/2" Ice	1.804 2.000	0.778 0.920	0.033 0.045
RRU (Clearwire - Existing)	A	From Face	3.000 0.000 0.000	0.000	167.000	No Ice 1/2" Ice	1.804 2.000	0.778 0.920	0.033 0.045
GPS (Clearwire - Existing)	A	From Face	2.000 0.000 0.000	0.000	168.000	No Ice 1/2" Ice	1.000 1.500	1.000 1.500	0.010 0.015

RISATower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job	11074.CO31 - Orange 1	Page	5 of 22
	Project	160-ft Valmont Monopole - 525 Orange Center Rd., Orange, CT	Date	11:11:39 11/23/11
	Client	Verizon Wireless	Designed by	TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
13' Platform w/Rails (Verizon - Existing)	C	None		0.000	156.000	No Ice 23.900	23.900	2.000
LPA-80060-6CF (Verizon - Proposed)	A	From Face	3.000 6.000 0.000	0.000	158.000	1/2" Ice 30.800 No Ice 6.527 1/2" Ice 6.987	30.800 6.758 7.233	3.000 0.022 0.072
BXA-171063-12BF (Verizon - Proposed)	A	From Face	3.000 4.000 0.000	0.000	158.000	No Ice 4.734 1/2" Ice 5.180	3.572 4.007	0.015 0.042
BXA-70063/6CF (Verizon - Proposed)	A	From Face	3.000 0.000 0.000	0.000	158.000	No Ice 7.731 1/2" Ice 8.268	4.158 4.595	0.017 0.059
LPA-80060-6CF (Verizon - Proposed)	A	From Face	3.000 -6.000 0.000	0.000	158.000	No Ice 6.527 1/2" Ice 6.987	6.758 7.233	0.022 0.072
LPA-80060-6CF (Verizon - Proposed)	B	From Face	3.000 6.000 0.000	0.000	158.000	No Ice 6.527 1/2" Ice 6.987	6.758 7.233	0.022 0.072
BXA-171063-12BF (Verizon - Proposed)	B	From Face	3.000 4.000 0.000	0.000	158.000	No Ice 4.734 1/2" Ice 5.180	3.572 4.007	0.015 0.042
BXA-70063/6CF (Verizon - Proposed)	B	From Face	3.000 0.000 0.000	0.000	158.000	No Ice 7.731 1/2" Ice 8.268	4.158 4.595	0.017 0.059
LPA-80060-6CF (Verizon - Proposed)	B	From Face	3.000 -6.000 0.000	0.000	158.000	No Ice 6.527 1/2" Ice 6.987	6.758 7.233	0.022 0.072
LPA-80060-6CF (Verizon - Proposed)	C	From Face	3.000 6.000 0.000	0.000	158.000	No Ice 6.527 1/2" Ice 6.987	6.758 7.233	0.022 0.072
BXA-171063-12BF (Verizon - Proposed)	C	From Face	3.000 4.000 0.000	0.000	158.000	No Ice 4.734 1/2" Ice 5.180	3.572 4.007	0.015 0.042
BXA-70063/6CF (Verizon - Proposed)	C	From Face	3.000 0.000 0.000	0.000	158.000	No Ice 7.731 1/2" Ice 8.268	4.158 4.595	0.017 0.059
LPA-80060-6CF (Verizon - Proposed)	C	From Face	3.000 -6.000 0.000	0.000	158.000	No Ice 6.527 1/2" Ice 6.987	6.758 7.233	0.022 0.072
(2) FD9R6004/2C-3L Diplexer (Verizon - Proposed)	A	From Face	3.000 0.000 0.000	0.000	158.000	No Ice 0.367 1/2" Ice 0.451	0.085 0.136	0.003 0.005
(2) FD9R6004/2C-3L Diplexer (Verizon - Proposed)	B	From Face	3.000 0.000 0.000	0.000	158.000	No Ice 0.367 1/2" Ice 0.451	0.085 0.136	0.003 0.005
(2) FD9R6004/2C-3L Diplexer (Verizon - Proposed)	C	From Face	3.000 0.000 0.000	0.000	158.000	No Ice 0.367 1/2" Ice 0.451	0.085 0.136	0.003 0.005
13' Platform w/Rails (AT&T - Existing)	C	None		0.000	146.000	No Ice 17.200	17.200	2.000
7770.00 (AT&T - Existing)	A	From Face	3.000 6.000 0.000	0.000	148.000	1/2" Ice 22.300 No Ice 5.882 1/2" Ice 6.314	22.300 2.928 3.273	3.000 0.035 0.068
7770.00 (AT&T - Existing)	A	From Face	3.000 -6.000 0.000	0.000	148.000	No Ice 5.882 1/2" Ice 6.314	2.928 3.273	0.035 0.068
7770.00 (AT&T - Existing)	B	From Face	3.000 6.000	0.000	148.000	No Ice 5.882 1/2" Ice 6.314	2.928 3.273	0.035 0.068

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	Project		Date
	160-ft Valmont Monopole - 525 Orange Center Rd., Orange, CT		11:11:39 11/23/11
	Client		Designed by
	Verizon Wireless		TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
7770.00 (AT&T - Existing)	B	From Face	0.000 3.000 -6.000 0.000	0.000	148.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
7770.00 (AT&T - Existing)	C	From Face	0.000 3.000 6.000 0.000	0.000	148.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
7770.00 (AT&T - Existing)	C	From Face	0.000 3.000 -6.000 0.000	0.000	148.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
(2) LGP21401 TMA (AT&T - Existing)	A	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.953 1.093	0.367 0.480	0.018 0.023
(2) LGP21401 TMA (AT&T - Existing)	B	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.953 1.093	0.367 0.480	0.018 0.023
(2) LGP21401 TMA (AT&T - Existing)	C	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.953 1.093	0.367 0.480	0.018 0.023
(2) LGP21901 Diplexer (AT&T - Existing)	A	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.233 0.302	0.117 0.166	0.006 0.008
(2) LGP21901 Diplexer (AT&T - Existing)	B	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.233 0.302	0.117 0.166	0.006 0.008
(2) LGP21901 Diplexer (AT&T - Existing)	C	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.233 0.302	0.117 0.166	0.006 0.008
Smart Bias T (AT&T - Existing)	C	From Face	0.000 3.000 0.000 0.000	0.000	148.000	No Ice 1/2" Ice	0.156 0.212	0.078 0.121	0.002 0.003
13' Platform w/Rails (Sprint - Existing)	C	None		0.000	136.000	No Ice 1/2" Ice	17.200 22.300	17.200 22.300	2.000 3.000
(2) DB980H90E-M (Sprint - Existing)	A	From Face	0.000 3.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	3.799 4.178	2.194 2.556	0.009 0.029
(2) DB980H90E-M (Sprint - Existing)	B	From Face	0.000 3.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	3.799 4.178	2.194 2.556	0.009 0.029
(2) DB980H90E-M (Sprint - Existing)	C	From Face	0.000 3.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	3.799 4.178	2.194 2.556	0.009 0.029
13' Platform w/Rails (T-Mobile - Existing)	C	None		0.000	121.000	No Ice 1/2" Ice	17.200 22.300	17.200 22.300	2.000 3.000
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	A	From Face	0.000 3.000 2.000 0.000	0.000	123.000	No Ice 1/2" Ice	7.065 7.516	2.150 2.490	0.041 0.074
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	B	From Face	0.000 3.000 2.000 0.000	0.000	123.000	No Ice 1/2" Ice	7.065 7.516	2.150 2.490	0.041 0.074
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	C	From Face	0.000 3.000 2.000 0.000	0.000	123.000	No Ice 1/2" Ice	7.065 7.516	2.150 2.490	0.041 0.074
(2) RR90-17-02DP (T-Mobile - Existing)	A	From Face	0.000 3.000 0.000 0.000	0.000	123.000	No Ice 1/2" Ice	4.356 4.775	1.974 2.312	0.018 0.040
(2) RR90-17-02DP	B	From Face	0.000 3.000	0.000	123.000	No Ice	4.356	1.974	0.018

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	Project		Date
	160-ft Valmont Monopole - 525 Orange Center Rd., Orange, CT		11:11:39 11/23/11
	Client		Designed by
	Verizon Wireless		TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 4.775	2.312	0.040
(2) RR90-17-02DP	C	From Face	3.000	0.000	123.000	No Ice 4.356	1.974	0.018
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 4.775	2.312	0.040
(2) G3SS TMA	A	From Face	3.000	0.000	123.000	No Ice 0.885	0.379	0.015
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 1.019	0.487	0.021
(2) G3SS TMA	B	From Face	3.000	0.000	123.000	No Ice 0.885	0.379	0.015
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 1.019	0.487	0.021
(2) G3SS TMA	C	From Face	3.000	0.000	123.000	No Ice 0.885	0.379	0.015
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 1.019	0.487	0.021
7"x7"x3" TMA	A	From Face	3.000	0.000	123.000	No Ice 0.476	0.204	0.010
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 0.571	0.273	0.014
7"x7"x3" TMA	B	From Face	3.000	0.000	123.000	No Ice 0.476	0.204	0.010
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 0.571	0.273	0.014
7"x7"x3" TMA	C	親観缺 Face	3.000	0.000	123.000	No Ice 0.476	0.204	0.010
(T-Mobile - Existing)			0.000 0.000			1/2" Ice 0.571	0.273	0.014
Valmont Uni-Tri Bracket	C	From Face	1.000	0.000	113.000	No Ice 1.750	1.750	0.290
(MetroPCS - Existing)			0.000 0.000			1/2" Ice 1.940	1.940	0.306
1' x 1' Panel	C	From Face	1.000	0.000	114.000	No Ice 1.400	0.350	0.018
(MetroPCS - Existing)			0.000 0.000			1/2" Ice 1.560	0.452	0.026
APXV18-206517S	A	From Face	1.000	0.000	113.000	No Ice 5.167	3.038	0.027
(MetroPCS - Existing)			0.000 0.000			1/2" Ice 5.618	3.469	0.054
APXV18-206517S	B	From Face	1.000	0.000	113.000	No Ice 5.167	3.038	0.027
(MetroPCS - Existing)			0.000 0.000			1/2" Ice 5.618	3.469	0.054
APXV18-206517S	C	From Face	1.000	0.000	113.000	No Ice 5.167	3.038	0.027
(MetroPCS - Existing)			0.000 0.000			1/2" Ice 5.618	3.469	0.054
Stand-off	C	From Face	1.000	0.000	75.000	No Ice 0.750	0.750	0.027
			0.000 0.000			1/2" Ice 0.950	0.950	0.036
Stand-off	A	From Face	1.000	0.000	75.000	No Ice 0.750	0.750	0.027
			0.000 0.000			1/2" Ice 0.950	0.950	0.036
GPS	A	From Face	2.000	0.000	76.000	No Ice 1.000	1.000	0.010
(Sprint - Existing)			0.000 0.000			1/2" Ice 1.500	1.500	0.015

Dishes

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	Client	Verizon Wireless	Designed by	TJL

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight K
VHLP2-11-DW1 (Clearwire - Existing)	A	Paraboloid w/Radome	From Face	3.000 -2.000 0.000	Worst		164.000	2.000	No Ice 1/2" Ice	3.142 3.409 0.035 0.017
VHLP2-11-DW1 (Clearwire - Existing)	C	Paraboloid w/Radome	From Face	3.000 -2.000 0.000	Worst		164.000	2.000	No Ice 1/2" Ice	3.142 3.409 0.035 0.017

Tower Pressures - No Ice

$$G_H = 1.690$$

Section Elevation ft	z ft	K _z	q _z ksf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L1 160.000-123.330	140.642	1.513	0.031	80.460	A	0.000	80.460	80.460	100.00	0.000	0.000
30					B	0.000	80.460		100.00	0.000	0.000
L2 123.330-86.170	104.095	1.389	0.029	112.199	C	0.000	80.460		100.00	0.000	0.000
0					A	0.000	112.199	112.199	100.00	0.000	0.000
L3 86.170-37.170	61.198	1.193	0.025	194.385	B	0.000	112.199		100.00	0.000	7.292
					C	0.000	112.199		100.00	0.000	0.000
					A	0.000	194.385	194.385	100.00	0.000	0.000
					B	0.000	194.385		100.00	0.000	9.702
L4 37.170-0.000	18.036	1	0.021	182.112	C	0.000	194.385		100.00	0.000	0.000
					A	0.000	182.112	182.112	100.00	0.000	0.000
					B	0.000	182.112		100.00	0.000	6.766
					C	0.000	182.112		100.00	0.000	0.000

Tower Pressure - With Ice

$$G_H = 1.690$$

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		ksf	in	ft ²		ft ²	ft ²	ft ²			ft ²
L1 160.000-123.330	140.642	1.513	0.024	0.500	83.516	A	0.000	83.516	83.516	100.00	0.000	0.000
						B	0.000	83.516		100.00	0.000	0.000
						C	0.000	83.516		100.00	0.000	0.000
L2 123.330-86.170	104.095	1.389	0.022	0.500	115.296	A	0.000	115.296	115.296	100.00	0.000	0.000
						B	0.000	115.296		100.00	0.000	10.975
						C	0.000	115.296		100.00	0.000	0.000
L3 86.170-37.170	61.198	1.193	0.018	0.500	198.469	A	0.000	198.469	198.469	100.00	0.000	0.000
						B	0.000	198.469		100.00	0.000	14.602
						C	0.000	198.469		100.00	0.000	0.000
L4 37.170-0.000	18.036	1	0.016	0.500	185.210	A	0.000	185.210	185.210	100.00	0.000	0.000
						B	0.000	185.210		100.00	0.000	10.183
						C	0.000	185.210		100.00	0.000	0.000

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Tower Pressure - Service

$$G_H = 1.690$$

Section Elevation	z	K _z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1	140.642	1.513	0.010	80.460	A	0.000	80.460	80.460	100.00	0.000	0.000
160.000-123.3					B	0.000	80.460		100.00	0.000	0.000
30					C	0.000	80.460		100.00	0.000	0.000
L2	104.095	1.389	0.009	112.199	A	0.000	112.199	112.199	100.00	0.000	0.000
123.330-86.17					B	0.000	112.199		100.00	0.000	7.292
0					C	0.000	112.199		100.00	0.000	0.000
L3	61.198	1.193	0.008	194.385	A	0.000	194.385	194.385	100.00	0.000	0.000
86.170-37.170					B	0.000	194.385		100.00	0.000	9.702
					C	0.000	194.385		100.00	0.000	0.000
L4	18.036	1	0.006	182.112	A	0.000	182.112	182.112	100.00	0.000	0.000
37.170-0.000					B	0.000	182.112		100.00	0.000	6.766
					C	0.000	182.112		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	4.391	0.120	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	5.969	0.161	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	8.711	0.178	C
86.170-37.170			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4	2.356	13.103	A	1	1.03	1	1	1	182.112	6.810	0.183	C
37.170-0.000			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	1894.887 kip-ft	25.882		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	4.391	0.120	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	5.969	0.161	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	8.711	0.178	C

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
86.170-37.170			B	1	1.03	1	1	1	194.385			
L4	2.356	13.103	C	1	1.03	1	1	1	194.385			
37.170-0.000			A	1	1.03	1	1	1	182.112	6.810	0.183	C
			B	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152	C	1	1.03	1	1	1	182.112			
								OTM	1894.887	25.882		
									kip-ft			

Tower Forces - No Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	4.391	0.120	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	5.969	0.161	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	8.711	0.178	C
86.170-37.170			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4	2.356	13.103	A	1	1.03	1	1	1	182.112	6.810	0.183	C
37.170-0.000			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	1894.887	25.882		
									kip-ft			

Tower Forces - No Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	4.391	0.120	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	5.969	0.161	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	8.711	0.178	C
86.170-37.170			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4	2.356	13.103	A	1	1.03	1	1	1	182.112	6.810	0.183	C
37.170-0.000			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	1894.887	25.882		
									kip-ft			

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Tower Forces - With Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.914	A	1	1.03	1	1	1	83.516	3.418	0.093	C
160.000-123.3			B	1	1.03	1	1	1	83.516			
30			C	1	1.03	1	1	1	83.516			
L2	2.812	6.410	A	1	1.03	1	1	1	115.296	4.727	0.127	C
123.330-86.17			B	1	1.03	1	1	1	115.296			
0			C	1	1.03	1	1	1	115.296			
L3	3.820	13.673	A	1	1.03	1	1	1	198.469	6.817	0.139	C
86.170-37.170			B	1	1.03	1	1	1	198.469			
			C	1	1.03	1	1	1	198.469			
L4	2.666	14.483	A	1	1.03	1	1	1	185.210	5.282	0.142	C
37.170-0.000			B	1	1.03	1	1	1	185.210			
			C	1	1.03	1	1	1	185.210			
Sum Weight:	10.576	37.478						OTM	1485.303 kip-ft	20.244		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.914	A	1	1.03	1	1	1	83.516	3.418	0.093	C
160.000-123.3			B	1	1.03	1	1	1	83.516			
30			C	1	1.03	1	1	1	83.516			
L2	2.812	6.410	A	1	1.03	1	1	1	115.296	4.727	0.127	C
123.330-86.17			B	1	1.03	1	1	1	115.296			
0			C	1	1.03	1	1	1	115.296			
L3	3.820	13.673	A	1	1.03	1	1	1	198.469	6.817	0.139	C
86.170-37.170			B	1	1.03	1	1	1	198.469			
			C	1	1.03	1	1	1	198.469			
L4	2.666	14.483	A	1	1.03	1	1	1	185.210	5.282	0.142	C
37.170-0.000			B	1	1.03	1	1	1	185.210			
			C	1	1.03	1	1	1	185.210			
Sum Weight:	10.576	37.478						OTM	1485.303 kip-ft	20.244		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.914	A	1	1.03	1	1	1	83.516	3.418	0.093	C
160.000-123.3			B	1	1.03	1	1	1	83.516			
30			C	1	1.03	1	1	1	83.516			
L2	2.812	6.410	A	1	1.03	1	1	1	115.296	4.727	0.127	C
123.330-86.17			B	1	1.03	1	1	1	115.296			

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
0			C	1	1.03	1	1	1	115.296			
L3	3.820	13.673	A	1	1.03	1	1	1	198.469	6.817	0.139	C
86.170-37.170			B	1	1.03	1	1	1	198.469			
			C	1	1.03	1	1	1	198.469			
L4	2.666	14.483	A	1	1.03	1	1	1	185.210	5.282	0.142	C
37.170-0.000			B	1	1.03	1	1	1	185.210			
			C	1	1.03	1	1	1	185.210			
Sum Weight:	10.576	37.478						OTM	1485.303 kip-ft	20.244		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.914	A	1	1.03	1	1	1	83.516	3.418	0.093	C
160.000-123.3			B	1	1.03	1	1	1	83.516			
30			C	1	1.03	1	1	1	83.516			
L2	2.812	6.410	A	1	1.03	1	1	1	115.296	4.727	0.127	C
123.330-86.17			B	1	1.03	1	1	1	115.296			
0			C	1	1.03	1	1	1	115.296			
L3	3.820	13.673	A	1	1.03	1	1	1	198.469	6.817	0.139	C
86.170-37.170			B	1	1.03	1	1	1	198.469			
			C	1	1.03	1	1	1	198.469			
L4	2.666	14.483	A	1	1.03	1	1	1	185.210	5.282	0.142	C
37.170-0.000			B	1	1.03	1	1	1	185.210			
			C	1	1.03	1	1	1	185.210			
Sum Weight:	10.576	37.478						OTM	1485.303 kip-ft	20.244		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	1.355	0.037	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	1.842	0.050	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	2.689	0.055	C
86.170-37.170			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4	2.356	13.103	A	1	1.03	1	1	1	182.112	2.102	0.057	C
37.170-0.000			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	584.842 kip-ft	7.988		

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Tower Forces - Service - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	1.355	0.037	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	1.842	0.050	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	2.689	0.055	C
86.170-37.170			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4	2.356	13.103	A	1	1.03	1	1	1	182.112	2.102	0.057	C
37.170-0.000			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	584.842 kip-ft	7.988		

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	1.355	0.037	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			
L2	2.478	5.555	A	1	1.03	1	1	1	112.199	1.842	0.050	C
123.330-86.17			B	1	1.03	1	1	1	112.199			
0			C	1	1.03	1	1	1	112.199			
L3	3.376	12.197	A	1	1.03	1	1	1	194.385	2.689	0.055	C
86.170-37.170			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4	2.356	13.103	A	1	1.03	1	1	1	182.112	2.102	0.057	C
37.170-0.000			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	584.842 kip-ft	7.988		

Tower Forces - Service - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.278	2.298	A	1	1.03	1	1	1	80.460	1.355	0.037	C
160.000-123.3			B	1	1.03	1	1	1	80.460			
30			C	1	1.03	1	1	1	80.460			

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	k/ft	
L2 123.330-86.17	2.478	5.555	A	1	1.03	1	1	1	112.199	1.842	0.050	C
0			B	1	1.03	1	1	1	112.199			
L3 86.170-37.170	3.376	12.197	C	1	1.03	1	1	1	112.199			
			A	1	1.03	1	1	1	194.385	2.689	0.055	C
			B	1	1.03	1	1	1	194.385			
			C	1	1.03	1	1	1	194.385			
L4 37.170-0.000	2.356	13.103	A	1	1.03	1	1	1	182.112	2.102	0.057	C
			B	1	1.03	1	1	1	182.112			
			C	1	1.03	1	1	1	182.112			
Sum Weight:	9.489	33.152						OTM	584.842 kip-ft	7.988		

Force Totals

Load Case	Vertical Forces	Sum of Forces X	Sum of Forces Z	Sum of Overturning Moments, M _x	Sum of Overturning Moments, M _z	Sum of Torques
	K	K	K	kip-ft	kip-ft	kip-ft
Leg Weight	33.152					
Bracing Weight	0.000					
Total Member Self-Weight	33.152			0.692	0.540	
Total Weight	52.949			0.692	0.540	
Wind 0 deg - No Ice		-0.074	-43.595	-4515.227	12.936	-1.160
Wind 30 deg - No Ice		21.748	-37.717	-3904.010	-2250.543	-0.779
Wind 45 deg - No Ice		30.794	-30.774	-3183.779	-3189.388	-0.502
Wind 60 deg - No Ice		37.742	-21.733	-2246.532	-3910.846	-0.190
Wind 90 deg - No Ice		43.624	0.074	13.089	-4523.096	0.451
Wind 120 deg - No Ice		37.817	21.862	2269.387	-3923.242	0.970
Wind 135 deg - No Ice		30.899	30.879	3202.695	-3206.919	1.139
Wind 150 deg - No Ice		21.876	37.791	3917.791	-2272.014	1.230
Wind 180 deg - No Ice		0.074	43.595	4516.611	-11.857	1.160
Wind 210 deg - No Ice		-21.748	37.717	3905.394	2251.622	0.779
Wind 225 deg - No Ice		-30.794	30.774	3185.163	3190.468	0.502
Wind 240 deg - No Ice		-37.742	21.733	2247.916	3911.925	0.190
Wind 270 deg - No Ice		-43.624	-0.074	-11.704	4524.176	-0.451
Wind 300 deg - No Ice		-37.817	-21.862	-2268.003	3924.322	-0.970
Wind 315 deg - No Ice		-30.899	-30.879	-3201.310	3207.999	-1.139
Wind 330 deg - No Ice		-21.876	-37.791	-3916.406	2273.093	-1.230
Member Ice	4.326					
Total Weight Ice	64.163			0.616	0.669	
Wind 0 deg - Ice		-0.059	-35.792	-3783.906	10.456	-1.076
Wind 30 deg - Ice		17.856	-30.967	-3271.983	-1886.130	-0.772
Wind 45 deg - Ice		25.283	-25.267	-2668.525	-2672.733	-0.535
Wind 60 deg - Ice		30.987	-17.845	-1883.170	-3277.149	-0.262
Wind 90 deg - Ice		35.814	0.059	10.403	-3789.880	0.319
Wind 120 deg - Ice		31.045	17.947	1901.353	-3286.936	0.815
Wind 135 deg - Ice		25.366	25.350	2683.598	-2686.574	0.987
Wind 150 deg - Ice		17.958	31.026	3283.002	-1903.081	1.092
Wind 180 deg - Ice		0.059	35.792	3785.139	-9.117	1.076
Wind 210 deg - Ice		-17.856	30.967	3273.215	1887.468	0.772
Wind 225 deg - Ice		-25.283	25.267	2669.757	2674.072	0.535
Wind 240 deg - Ice		-30.987	17.845	1884.402	3278.488	0.262
Wind 270 deg - Ice		-35.814	-0.059	-9.171	3791.218	-0.319
Wind 300 deg - Ice		-31.045	-17.947	-1900.121	3288.274	-0.815
Wind 315 deg - Ice		-25.366	-25.350	-2682.366	2687.912	-0.987
Wind 330 deg - Ice		-17.958	-31.026	-3281.770	1904.419	-1.092

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Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Total Weight	52.949			0.692	0.540	
Wind 0 deg - Service		-0.023	-13.455	-1393.110	4.366	-0.358
Wind 30 deg - Service		6.712	-11.641	-1204.463	-694.239	-0.241
Wind 45 deg - Service		9.504	-9.498	-982.169	-984.006	-0.155
Wind 60 deg - Service		11.649	-6.708	-692.895	-1206.678	-0.059
Wind 90 deg - Service		13.464	0.023	4.518	-1395.644	0.139
Wind 120 deg - Service		11.672	6.747	700.907	-1210.504	0.299
Wind 135 deg - Service		9.537	9.530	988.965	-989.417	0.352
Wind 150 deg - Service		6.752	11.664	1209.673	-700.866	0.380
Wind 180 deg - Service		0.023	13.455	1394.494	-3.286	0.358
Wind 210 deg - Service		-6.712	11.641	1205.847	695.318	0.241
Wind 225 deg - Service		-9.504	9.498	983.554	985.085	0.155
Wind 240 deg - Service		-11.649	6.708	694.280	1207.758	0.059
Wind 270 deg - Service		-13.464	-0.023	-3.134	1396.724	-0.139
Wind 300 deg - Service		-11.672	-6.747	-699.522	1211.584	-0.299
Wind 315 deg - Service		-9.537	-9.530	-987.580	990.496	-0.352
Wind 330 deg - Service		-6.752	-11.664	-1208.289	701.945	-0.380

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+ Wind 0 deg - No Ice
3	Dead+ Wind 30 deg - No Ice
4	Dead+ Wind 45 deg - No Ice
5	Dead+ Wind 60 deg - No Ice
6	Dead+ Wind 90 deg - No Ice
7	Dead+ Wind 120 deg - No Ice
8	Dead+ Wind 135 deg - No Ice
9	Dead+ Wind 150 deg - No Ice
10	Dead+ Wind 180 deg - No Ice
11	Dead+ Wind 210 deg - No Ice
12	Dead+ Wind 225 deg - No Ice
13	Dead+ Wind 240 deg - No Ice
14	Dead+ Wind 270 deg - No Ice
15	Dead+ Wind 300 deg - No Ice
16	Dead+ Wind 315 deg - No Ice
17	Dead+ Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp

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Comb. No.	Description
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	160 - 123.33	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-15.494	0.532	0.208
			Max. Mx	14	-9.236	462.185	3.029
			Max. My	2	-9.247	3.364	458.503
			Max. Vy	14	-18.597	462.185	3.029
			Max. Vx	10	18.514	-2.551	-458.369
			Max. Torque	2			1.002
L2	123.33 - 86.17	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-27.959	0.532	-0.594
			Max. Mx	14	-19.252	1335.742	5.075
			Max. My	10	-19.257	-5.310	-1330.799
			Max. Vy	14	-27.935	1335.742	5.075
			Max. Vx	10	27.903	-5.310	-1330.799
			Max. Torque	17			1.126
L3	86.17 - 37.17	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-44.332	0.669	-0.616
			Max. Mx	14	-34.358	2859.885	8.704
			Max. My	10	-34.361	-8.861	-2853.388
			Max. Vy	14	-36.186	2859.885	8.704
			Max. Vx	10	36.156	-8.861	-2853.388
			Max. Torque	17			1.302
L4	37.17 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-64.163	0.669	-0.616
			Max. Mx	14	-52.929	4635.911	12.062
			Max. My	10	-52.929	-12.220	-4628.083
			Max. Vy	14	-43.648	4635.911	12.062
			Max. Vx	10	43.619	-12.220	-4628.083
			Max. Torque	17			1.301

Maximum Reactions

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Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	31	64.163	35.814	0.059
	Max. H _x	14	52.949	43.624	0.074
	Max. H _z	2	52.949	0.074	43.595
	Max. M _x	2	4626.644	0.074	43.595
	Max. M _z	6	4634.782	-43.624	-0.074
	Max. Torsion	17	1.300	21.876	37.791
	Min. Vert	1	52.949	0.000	0.000
	Min. H _x	6	52.949	-43.624	-0.074
	Min. H _z	10	52.949	-0.074	-43.595
	Min. M _x	10	-4628.083	-0.074	-43.595
	Min. M _z	14	-4635.911	43.624	0.074
	Min. Torsion	9	-1.225	-21.876	-37.791

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	52.949	0.000	0.000	0.692	0.540	0.000
Dead+Wind 0 deg - No Ice	52.949	-0.074	-43.595	-4626.644	13.343	-1.225
Dead+Wind 30 deg - No Ice	52.949	21.748	-37.717	-4000.324	-2306.068	-0.795
Dead+Wind 45 deg - No Ice	52.949	30.794	-30.774	-3262.297	-3268.119	-0.488
Dead+Wind 60 deg - No Ice	52.949	37.742	-21.733	-2301.897	-4007.407	-0.152
Dead+Wind 90 deg - No Ice	52.949	43.624	0.074	13.501	-4634.782	0.503
Dead+Wind 120 deg - No Ice	52.949	37.817	21.862	2325.446	-4020.139	0.998
Dead+Wind 135 deg - No Ice	52.949	30.899	30.879	3281.765	-3286.148	1.148
Dead+Wind 150 deg - No Ice	52.949	21.876	37.791	4014.495	-2328.178	1.225
Dead+Wind 180 deg - No Ice	52.949	0.074	43.595	4628.083	-12.220	1.152
Dead+Wind 210 deg - No Ice	52.949	-21.748	37.717	4001.765	2307.193	0.797
Dead+Wind 225 deg - No Ice	52.949	-30.794	30.774	3263.738	3269.245	0.532
Dead+Wind 240 deg - No Ice	52.949	-37.742	21.733	2303.339	4008.534	0.227
Dead+Wind 270 deg - No Ice	52.949	-43.624	-0.074	-12.062	4635.911	-0.431
Dead+Wind 300 deg - No Ice	52.949	-37.817	-21.862	-2324.009	4021.267	-1.000
Dead+Wind 315 deg - No Ice	52.949	-30.899	-30.879	-3280.329	3287.275	-1.193
Dead+Wind 330 deg - No Ice	52.949	-21.876	-37.791	-4013.059	2329.302	-1.300
Dead+Ice+Temp	64.163	0.000	0.000	0.616	0.669	0.000
Dead+Wind 0 deg+Ice+Temp	64.163	-0.059	-35.792	-3915.041	10.926	-1.134
Dead+Wind 30 deg+Ice+Temp	64.163	17.856	-30.967	-3385.340	-1951.471	-0.797
Dead+Wind 45 deg+Ice+Temp	64.163	25.283	-25.267	-2760.946	-2765.377	-0.539
Dead+Wind 60 deg+Ice+Temp	64.163	30.987	-17.845	-1948.351	-3390.773	-0.248
Dead+Wind 90 deg+Ice+Temp	64.163	35.814	0.059	10.863	-3921.314	0.350
Dead+Wind 120 deg+Ice+Temp	64.163	31.045	17.947	1967.323	-3400.959	0.835
Dead+Wind 135 deg+Ice+Temp	64.163	25.366	25.350	2776.660	-2779.795	0.999
Dead+Wind 150 deg+Ice+Temp	64.163	17.958	31.026	3396.823	-1969.147	1.098
Dead+Wind 180 deg+Ice+Temp	64.163	0.059	35.792	3916.338	-9.504	1.085
Dead+Wind 210 deg+Ice+Temp	64.163	-17.856	30.967	3386.641	1952.895	0.799
Dead+Wind 225 deg+Ice+Temp	64.163	-25.283	25.267	2762.246	2766.803	0.570
Dead+Wind 240 deg+Ice+Temp	64.163	-30.987	17.845	1949.651	3392.201	0.298
Dead+Wind 270 deg+Ice+Temp	64.163	-35.814	-0.059	-9.567	3922.743	-0.301
Dead+Wind 300 deg+Ice+Temp	64.163	-31.045	-17.947	-1966.030	3402.386	-0.837
Dead+Wind 315 deg+Ice+Temp	64.163	-25.366	-25.350	-2775.368	2781.220	-1.029
Dead+Wind 330 deg+Ice+Temp	64.163	-17.958	-31.026	-3395.529	1970.570	-1.148
Dead+Wind 0 deg - Service	52.949	-0.023	-13.455	-1428.656	4.517	-0.373
Dead+Wind 30 deg - Service	52.949	6.712	-11.641	-1235.181	-711.940	-0.247
Dead+Wind 45 deg - Service	52.949	9.504	-9.498	-1007.208	-1009.114	-0.157
Dead+Wind 60 deg - Service	52.949	11.649	-6.708	-710.546	-1237.480	-0.055
Dead+Wind 90 deg - Service	52.949	13.464	0.023	4.672	-1431.286	0.149

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Load Combination	Vertical	Shear _x	Shear _y	Overturning Moment, M _x	Overturning Moment, M _y	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 120 deg - Service	52.949	11.672	6.747	718.831	-1241.429	0.310
Dead+Wind 135 deg - Service	52.949	9.537	9.530	1014.236	-1014.699	0.362
Dead+Wind 150 deg - Service	52.949	6.752	11.664	1240.573	-718.780	0.389
Dead+Wind 180 deg - Service	52.949	0.023	13.455	1430.100	-3.383	0.366
Dead+Wind 210 deg - Service	52.949	-6.712	11.641	1236.625	713.074	0.248
Dead+Wind 225 deg - Service	52.949	-9.504	9.498	1008.653	1010.249	0.161
Dead+Wind 240 deg - Service	52.949	-11.649	6.708	711.991	1238.615	0.063
Dead+Wind 270 deg - Service	52.949	-13.464	-0.023	-3.227	1432.421	-0.142
Dead+Wind 300 deg - Service	52.949	-11.672	-6.747	-717.387	1242.563	-0.311
Dead+Wind 315 deg - Service	52.949	-9.537	-9.530	-1012.792	1015.833	-0.366
Dead+Wind 330 deg - Service	52.949	-6.752	-11.664	-1239.129	719.914	-0.396

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.000	-52.949	0.000	0.000	52.949	0.000	0.000%
2	-0.074	-52.949	-43.595	0.074	52.949	43.595	0.000%
3	21.748	-52.949	-37.717	-21.748	52.949	37.717	0.000%
4	30.794	-52.949	-30.774	-30.794	52.949	30.774	0.000%
5	37.742	-52.949	-21.733	-37.742	52.949	21.733	0.000%
6	43.624	-52.949	0.074	-43.624	52.949	-0.074	0.000%
7	37.817	-52.949	21.862	-37.817	52.949	-21.862	0.000%
8	30.899	-52.949	30.879	-30.899	52.949	-30.879	0.000%
9	21.876	-52.949	37.791	-21.876	52.949	-37.791	0.000%
10	0.074	-52.949	43.595	-0.074	52.949	-43.595	0.000%
11	-21.748	-52.949	37.717	21.748	52.949	-37.717	0.000%
12	-30.794	-52.949	30.774	30.794	52.949	-30.774	0.000%
13	-37.742	-52.949	21.733	37.742	52.949	-21.733	0.000%
14	-43.624	-52.949	-0.074	43.624	52.949	0.074	0.000%
15	-37.817	-52.949	-21.862	37.817	52.949	21.862	0.000%
16	-30.899	-52.949	-30.879	30.899	52.949	30.879	0.000%
17	-21.876	-52.949	-37.791	21.876	52.949	37.791	0.000%
18	0.000	-64.163	0.000	0.000	64.163	0.000	0.000%
19	-0.059	-64.163	-35.792	0.059	64.163	35.792	0.000%
20	17.856	-64.163	-30.967	-17.856	64.163	30.967	0.000%
21	25.283	-64.163	-25.267	-25.283	64.163	25.267	0.000%
22	30.987	-64.163	-17.845	-30.987	64.163	17.845	0.000%
23	35.814	-64.163	0.059	-35.814	64.163	-0.059	0.000%
24	31.045	-64.163	17.947	-31.045	64.163	-17.947	0.000%
25	25.366	-64.163	25.350	-25.366	64.163	-25.350	0.000%
26	17.958	-64.163	31.026	-17.958	64.163	-31.026	0.000%
27	0.059	-64.163	35.792	-0.059	64.163	-35.792	0.000%
28	-17.856	-64.163	30.967	17.856	64.163	-30.967	0.000%
29	-25.283	-64.163	25.267	-25.283	64.163	25.267	0.000%
30	-30.987	-64.163	17.845	30.987	64.163	-17.845	0.000%
31	-35.814	-64.163	-0.059	35.814	64.163	0.059	0.000%
32	-31.045	-64.163	-17.947	31.045	64.163	17.947	0.000%
33	-25.366	-64.163	-25.350	25.366	64.163	25.350	0.000%
34	-17.958	-64.163	-31.026	17.958	64.163	31.026	0.000%
35	-0.023	-52.949	-13.455	0.023	52.949	13.455	0.000%
36	6.712	-52.949	-11.641	-6.712	52.949	11.641	0.000%
37	9.504	-52.949	-9.498	-9.504	52.949	9.498	0.000%
38	11.649	-52.949	-6.708	-11.649	52.949	6.708	0.000%
39	13.464	-52.949	0.023	-13.464	52.949	-0.023	0.000%
40	11.672	-52.949	6.747	-11.672	52.949	-6.747	0.000%
41	9.537	-52.949	9.530	-9.537	52.949	-9.530	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
42	6.752	-52.949	11.664	-6.752	52.949	-11.664	0.000%
43	0.023	-52.949	13.455	-0.023	52.949	-13.455	0.000%
44	-6.712	-52.949	11.641	6.712	52.949	-11.641	0.000%
45	-9.504	-52.949	9.498	9.504	52.949	-9.498	0.000%
46	-11.649	-52.949	6.708	11.649	52.949	-6.708	0.000%
47	-13.464	-52.949	-0.023	13.464	52.949	0.023	0.000%
48	-11.672	-52.949	-6.747	11.672	52.949	6.747	0.000%
49	-9.537	-52.949	-9.530	9.537	52.949	9.530	0.000%
50	-6.752	-52.949	-11.664	6.752	52.949	11.664	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00026808
3	Yes	5	0.00000001	0.00017053
4	Yes	5	0.00000001	0.00019136
5	Yes	5	0.00000001	0.00017337
6	Yes	4	0.00000001	0.00015183
7	Yes	5	0.00000001	0.00017867
8	Yes	5	0.00000001	0.00019426
9	Yes	5	0.00000001	0.00017224
10	Yes	4	0.00000001	0.00015895
11	Yes	5	0.00000001	0.00017534
12	Yes	5	0.00000001	0.00019173
13	Yes	5	0.00000001	0.00017271
14	Yes	4	0.00000001	0.00006382
15	Yes	5	0.00000001	0.00017306
16	Yes	5	0.00000001	0.00019423
17	Yes	5	0.00000001	0.00017928
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00011739
20	Yes	5	0.00000001	0.00040038
21	Yes	5	0.00000001	0.00045630
22	Yes	5	0.00000001	0.00040556
23	Yes	5	0.00000001	0.00011663
24	Yes	5	0.00000001	0.00041524
25	Yes	5	0.00000001	0.00046322
26	Yes	5	0.00000001	0.00040557
27	Yes	5	0.00000001	0.00011679
28	Yes	5	0.00000001	0.00040895
29	Yes	5	0.00000001	0.00045733
30	Yes	5	0.00000001	0.00040404
31	Yes	5	0.00000001	0.00011651
32	Yes	5	0.00000001	0.00040727
33	Yes	5	0.00000001	0.00046343
34	Yes	5	0.00000001	0.00041666
35	Yes	4	0.00000001	0.00004246
36	Yes	4	0.00000001	0.00028960
37	Yes	4	0.00000001	0.00034412
38	Yes	4	0.00000001	0.00030072
39	Yes	4	0.00000001	0.00003122
40	Yes	4	0.00000001	0.00031903
41	Yes	4	0.00000001	0.00035391
42	Yes	4	0.00000001	0.00029314

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43	Yes	4	0.00000001	0.00003878
44	Yes	4	0.00000001	0.00031021
45	Yes	4	0.00000001	0.00034685
46	Yes	4	0.00000001	0.00029901
47	Yes	4	0.00000001	0.00002921
48	Yes	4	0.00000001	0.00029604
49	Yes	4	0.00000001	0.00035384
50	Yes	4	0.00000001	0.00032195

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 123.33	26.145	48	1.642	0.004
L2	128 - 86.17	16.065	48	1.289	0.001
L3	92 - 37.17	7.895	48	0.846	0.001
L4	44.5 - 0	1.790	48	0.366	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
168.000	GPS	48	26.145	1.642	0.004	23219
167.000	DB844H90E-M	48	26.145	1.642	0.004	23219
165.000	(4) 8"x2 1/2" Pipe Mount	48	26.145	1.642	0.004	23219
164.000	VHLP2-11-DW1	48	26.145	1.642	0.004	23219
158.000	LPA-80060-6CF	48	25.479	1.621	0.003	23219
156.000	13' Platform w/Rails	48	24.815	1.600	0.003	23219
148.000	7770.00	48	22.183	1.514	0.003	9674
146.000	13' Platform w/Rails	48	21.535	1.493	0.002	8292
138.000	(2) DB980H90E-M	48	19.010	1.405	0.002	5276
136.000	13' Platform w/Rails	48	18.400	1.382	0.002	4836
123.000	APX16DWV-16DWVS-E-A20	48	14.707	1.229	0.001	3810
121.000	13' Platform w/Rails	48	14.187	1.204	0.001	3889
114.000	1' x 1' Panel	48	12.460	1.117	0.001	4192
113.000	Valmont Uni-Tri Bracket	48	12.225	1.105	0.001	4239
76.000	GPS	48	5.276	0.668	0.000	5411
75.000	Stand-off	48	5.130	0.657	0.000	5403

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 123.33	84.443	15	5.303	0.012
L2	128 - 86.17	51.937	15	4.169	0.004
L3	92 - 37.17	25.539	15	2.737	0.002
L4	44.5 - 0	5.792	15	1.185	0.001

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Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
168.000	GPS	15	84.443	5.303	0.012	7320
167.000	DB844H90E-M	15	84.443	5.303	0.012	7320
165.000	(4) 8"x2 1/2" Pipe Mount	15	84.443	5.303	0.012	7320
164.000	VHLP2-11-DW1	15	84.443	5.303	0.012	7320
158.000	LPA-80060-6CF	15	82.299	5.235	0.011	7320
156.000	13' Platform w/Rails	15	80.157	5.167	0.011	7320
148.000	7770.00	15	71.669	4.892	0.008	3049
146.000	13' Platform w/Rails	15	69.581	4.823	0.008	2613
138.000	(2) DB980H90E-M	15	61.438	4.539	0.006	1661
136.000	13' Platform w/Rails	15	59.469	4.467	0.005	1522
123.000	APX16DWV-16DWVS-E-A20	15	47.554	3.974	0.003	1196
121.000	13' Platform w/Rails	15	45.873	3.895	0.003	1220
114.000	1' x 1' Panel	15	40.295	3.614	0.002	1312
113.000	Valmont Uni-Tri Bracket	15	39.536	3.574	0.002	1326
76.000	GPS	15	17.068	2.161	0.001	1679
75.000	Stand-off	15	16.599	2.127	0.001	1676

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L _n	Kl/r	F _a	A	Actual P	Allow. P _a	Ratio P/P _a
	ft		ft	ft		ksi	in ²	K	K	
L1	160 - 123.33 (1)	TP31.46x21.2x0.219	36.670	0.000	0.0	36.424	21.109	-9.229	768.877	0.012
L2	123.33 - 86.17 (2)	TP41.44x29.715x0.344	41.830	0.000	0.0	39.000	43.711	-19.247	1704.730	0.011
L3	86.17 - 37.17 (3)	TP54.46x39.118x0.438	54.830	0.000	0.0	39.000	73.298	-34.356	2858.610	0.012
L4	37.17 - 0 (4)	TP64x51.533x0.469	44.500	0.000	0.0	36.617	95.943	-52.929	3513.170	0.015

Pole Bending Design Data

Section No.	Elevation	Size	Actual M _x	Actual f _{bx}	Allow. F _{bx}	Ratio f _{bx} /F _{bx}	Actual M _y	Actual f _{by}	Allow. F _{by}	Ratio f _{by} /F _{by}
	ft		kip-ft	ksi	ksi		kip-ft	ksi	ksi	
L1	160 - 123.33 (1)	TP31.46x21.2x0.219	463.882	36.013	36.424	0.989	0.000	0.000	36.424	0.000
L2	123.33 - 86.17 (2)	TP41.44x29.715x0.344	1339.00	38.133	39.000	0.978	0.000	0.000	39.000	0.000
L3	86.17 - 37.17 (3)	TP54.46x39.118x0.438	2865.92	36.947	39.000	0.947	0.000	0.000	39.000	0.000
L4	37.17 - 0 (4)	TP64x51.533x0.469	4644.52	37.382	36.617	1.021	0.000	0.000	36.617	0.000

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Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	160 - 123.33 (1)	TP31.46x21.2x0.219	18.643	0.883	26.000	0.069	0.681	0.025	26.000	0.001
L2	123.33 - 86.17 (2)	TP41.44x29.715x0.344	27.994	0.640	26.000	0.050	0.920	0.012	26.000	0.000
L3	86.17 - 37.17 (3)	TP54.46x39.118x0.438	36.245	0.494	26.000	0.039	1.000	0.006	26.000	0.000
L4	37.17 - 0 (4)	TP64x51.533x0.469	43.705	0.456	26.000	0.036	1.000	0.004	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	160 - 123.33 (1)	0.012	0.989	0.000	0.069	0.001	1.002 ✓	1.333	H1-3+VT ✓
L2	123.33 - 86.17 (2)	0.011	0.978	0.000	0.050	0.000	0.990 ✓	1.333	H1-3+VT ✓
L3	86.17 - 37.17 (3)	0.012	0.947	0.000	0.039	0.000	0.960 ✓	1.333	H1-3+VT ✓
L4	37.17 - 0 (4)	0.015	1.021	0.000	0.036	0.000	1.036 ✓	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF * P_{allow}$ K	% Capacity	Pass Fail
L1	160 - 123.33	Pole	TP31.46x21.2x0.219	1	-9.229	1024.913	75.2	Pass
L2	123.33 - 86.17	Pole	TP41.44x29.715x0.344	2	-19.247	2272.405	74.2	Pass
L3	86.17 - 37.17	Pole	TP54.46x39.118x0.438	3	-34.356	3810.527	72.0	Pass
L4	37.17 - 0	Pole	TP64x51.533x0.469	4	-52.929	4683.055	77.7	Pass
							Summary	
							Pole (L4)	77.7 Pass
							RATING =	77.7 Pass

Anchor Bolt and Base Plate Analysis:**Input Data:**Tower Reactions:

Overturing Moment =	OM := 4645-ft-kips	(Input From RisaTower)
Shear Force =	Shear := 44-kips	(Input From RisaTower)
Axial Force =	Axial := 53-kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 24	(User Input)
Diameter of Bolt Circle =	D _{bc} := 72.76-in	(User Input)
Bolt "Column" Distance =	l := 3.0-in	(User Input)
Bolt Ultimate Strenght =	F _u := 100-ksi	(User Input)
Bolt Yeild Strenght =	F _y := 75-ksi	(User Input)
Bolt Modulus =	E := 29000-ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25-in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 Mod 60

Plate Yield Strength =	F _{ybp} := 60-ksi	(User Input)
Base Plate Thickness =	t _{bp} := 3.0-in	(User Input)
Base Plate Diameter =	D _{bp} := 78.76-in	(User Input)
Outer Pole Diameter =	D _{pole} := 64.0-in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =:

$$R_{bc} := \frac{D_{bc}}{2} = 36.38 \text{ in}$$

Distance to Bolts =

$$i := 1..N$$

$$d_i := \begin{cases} \theta \leftarrow 2\pi \cdot \left(\frac{i}{N}\right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{cases}$$

$$d_1 = 9.42 \text{ in}$$

$$d_7 = 35.14 \text{ in}$$

$$d_2 = 18.19 \text{ in}$$

$$d_8 = 31.51 \text{ in}$$

$$d_3 = 25.72 \text{ in}$$

$$d_9 = 25.72 \text{ in}$$

$$d_4 = 31.51 \text{ in}$$

$$d_{10} = 18.19 \text{ in}$$

$$d_5 = 35.14 \text{ in}$$

$$d_{11} = 9.42 \text{ in}$$

$$d_6 = 36.38 \text{ in}$$

etc.

Critical Distances For Bending in Plate:

Outer Pole Radius =

$$R_{pole} := \frac{D_{pole}}{2} = 32 \text{ in}$$

Moment Arms of Bolts about Neutral Axis =

$$MA_i := \text{if}(d_i \geq R_{pole}, d_i - R_{pole}, 0 \text{ in})$$

$$MA_1 = 0.00 \text{ in}$$

$$MA_7 = 3.14 \text{ in}$$

$$MA_2 = 0.00 \text{ in}$$

$$MA_8 = 0.00 \text{ in}$$

$$MA_3 = 0.00 \text{ in}$$

$$MA_9 = 0.00 \text{ in}$$

$$MA_4 = 0.00 \text{ in}$$

$$MA_{10} = 0.00 \text{ in}$$

$$MA_5 = 3.14 \text{ in}$$

$$MA_{11} = 0.00 \text{ in}$$

$$MA_6 = 4.38 \text{ in}$$

etc

Effective Width of Baseplate for Bending =

$$B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 36.7 \text{ in}$$

Anchor Bolt Analysis:Calculated Anchor Bolt Properties:

Polar Moment of Inertia =

$$I_p := \sum_i (d_i)^2 = 1.588 \times 10^4 \cdot \text{in}^2$$

Gross Area of Bolt =

$$A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot \text{in}^2$$

Net Area of Bolt =

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 3.248 \cdot \text{in}^2$$

Net Diameter =

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot \text{in}$$

Radius of Gyration of Bolt =

$$r := \frac{D_n}{4} = 0.508 \cdot \text{in}$$

Section Modulus of Bolt =

$$S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot \text{in}^3$$

Check Anchor Bolt Tension Force:

Maximum Tensile Force =

$$T_{\text{Max}} := OM \cdot \frac{R_{bc}}{I_p} - \frac{\text{Axial}}{N} = 125.5 \cdot \text{kips}$$

Allowable Tensile Force =

$$T_{\text{ALL.Gross}} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 174.9 \cdot \text{kips} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

$$T_{\text{ALL.Net}} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) = 194.812 \cdot \text{kips} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Bolt Tension % of Capacity =

$$\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} = 64.4\% \quad \text{Bolts are "upset bolts". Use net area per AISC}$$

Condition1 =

$$\text{Condition1} := \text{if} \left(\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$$

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment =

$$M_x := \left(\frac{\text{Shear}}{N} \right) \cdot l = 0.458 \cdot \text{ft} \cdot \text{kips}$$

Maximum Bending Stress =

$$f_{bx} := \frac{M_x}{S_x} = 6.7 \cdot \text{ksi}$$

Allowable Bending Stress =

$$F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot \text{ksi} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n = 0 \text{ in} \\ 0 & \text{otherwise} \end{cases}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n = 0 \text{ ksi} \\ 0 & \text{otherwise} \end{cases}$$

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{l_p} + \frac{Axial}{N} = 129.9 \text{ kips}$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 40 \text{ ksi}$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \frac{\left[1 - \frac{\left(\frac{K \cdot l}{r} \right)^2}{2 \cdot C_c^2} \right] \cdot F_y}{\frac{5}{3} + \frac{3 \left(\frac{K \cdot l}{r} \right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot l}{r} \right)^3}{8 \cdot C_c^3}} \cdot F_y & \text{if } \frac{K \cdot l}{r} \leq C_c = 45 \text{ ksi} \\ \frac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r} \right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases}$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \text{ ksi} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \right) = 66.7\%$$

Condition 2 =

$$\text{Condition2} := \text{if } \left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$$

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts =

$$C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$$

$$C_1 = 35.3\text{-kips}$$

$$C_7 = 125.5\text{-kips}$$

$$C_2 = 66.0\text{-kips}$$

$$C_8 = 112.8\text{-kips}$$

$$C_3 = 92.5\text{-kips}$$

$$C_9 = 92.5\text{-kips}$$

$$C_4 = 112.8\text{-kips}$$

$$C_{10} = 66.0\text{-kips}$$

$$C_5 = 125.5\text{-kips}$$

$$C_{11} = 35.3\text{-kips}$$

$$C_6 = 129.9\text{-kips}$$

etc.

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{(B_{eff} t_{bp})^2} = 24.6\text{-ksi}$$

Allowable Bending Stress in Plate =

$$F_{bp} := 1.33 \cdot 0.75 \cdot F_{ybp} = 59.9\text{-ksi}$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} = 41.2\%$$

Condition3 =

$$\text{Condition3} := \text{if} \left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right)$$

Condition3 = "Ok"

Subject:

FOUNDATION ANALYSIS

Location:

160-ft Valmont Monopole
Orange, CT

Rev. 0: 11/23/11

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 11074.CO31**Standard Monopole Foundation:****Input Data:**Tower Data

Overturning Moment =	OM := 4645-ft-kips	(User Input from RISATower)
Shear Force =	Shear := 44-kip	(User Input from RISATower)
Axial Force =	Axial := 53-kip	(User Input from RISATower)
Tower Height =	H _t := 160-ft	(User Input)

Footing Data:

Overall Depth of Footing =	D _f := 14-ft	(User Input)
Length of Pier =	L _p := 10-ft	(User Input)
Extension of Pier Above Grade =	L _{pag} := 0.5-ft	(User Input)
Diameter of Pier =	d _p := 8-ft	(User Input)
Thickness of Footing =	T _f := 4-ft	(User Input)
Width of Footing =	W _f := 22-ft	(User Input)

Anchor Bolt Data:

Length of Anchor Bolts =	L _{st} := 132-in	(User Input)
Projection of Anchor Bolts Above Pier =	A _{BP} := 10-in	(User Input)
Anchor Bolt Diameter =	d _{anchor} := 2.25-in	(User Input)
Base Plate Bolt Circle =	MP := 72.76-in	(User Input)

Material Properties:

Concrete Compressive Strength =	f _c := 4000-psi	(User Input)
Steel Reinforcement Yield Strength =	f _y := 60000-psi	(User Input)
Anchor Bolt Yield Strength =	f _{ya} := 75000-psi	(User Input)
Internal Friction Angle of Soil =	Φ _s := 36-deg	(User Input)
Allowable Soil Bearing Capacity =	q _s := 10000-psf	(User Input)
Unit Weight of Soil =	γ _{soil} := 125-pcf	(User Input)
Unit Weight of Concrete =	γ _{conc} := 150-pcf	(User Input)
Foundation Bouyancy =	Bouyancy := 0	(User Input) (Yes=1 / No=0)
Depth to Neglect =	n := 0-ft	(User Input)
Cohesion of Clay Type Soil =	c := 0-ksf	(User Input) (Use 0 for Sandy Soil)
Seismic Zone Factor =	Z := 2	(User Input) (UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	μ := 0.45	(User Input)

Pier Reinforcement:

Bar Size =	BS _{pier} := 11	(User Input)	
Bar Diameter =	d _{bpier} := 1.41-in	(User Input)	
Number of Bars =	NB _{pier} := 31	(User Input)	
Clear Cover of Reinforcement =	Cvr _{pier} := 3-in	(User Input)	
Reinforcement Location Factor =	α _{pier} := 1.0	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	β _{pier} := 1.0	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	λ _{pier} := 1.0	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	γ _{pier} := 1.0	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	d _{Tie} := 3-in	(User Input)	

Pad Reinforcement:

Bar Size =	BS _{top} := 9	(User Input)	(Top of Pad)
Bar Diameter =	d _{btop} := 1.128-in	(User Input)	(Top of Pad)
Number of Bars =	NB _{top} := 35	(User Input)	(Top of Pad)
Bar Size =	BS _{bot} := 10	(User Input)	(Bottom of Pad)
Bar Diameter =	d _{bbot} := 1.27-in	(User Input)	(Bottom of Pad)
Number of Bars =	NB _{bot} := 35	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	Cvr _{pad} := 3.0-in	(User Input)	
Reinforcement Location Factor =	α _{pad} := 1.0	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	β _{pad} := 1.0	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	λ _{pad} := 1.0	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	γ _{pad} := 1.0	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =	$A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 1.561 \cdot \text{in}^2$	
Pad Top Reinforcement Bar Area =	$A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.999 \cdot \text{in}^2$	
Pad Bottom Reinforcement Bar Area =	$A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 1.267 \cdot \text{in}^2$	
Coefficient of Lateral Soil Pressure =	$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3.852$	
Load Factor =	$LF := \begin{cases} 1.333 & \text{if } H_t \leq 700\text{-ft} \\ 1.7 & \text{if } H_t \geq 1200\text{-ft} \\ 1.333 + \left(\frac{H_t - 700\text{ft}}{1200\text{ft} - 700\text{ft}} \right) \cdot 0.4 & \text{otherwise} \end{cases}$	= 1.333

Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{conc}} - 62.4 \text{pcf}, \gamma_{\text{conc}}) = 150 \text{pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{soil}} - 62.4 \text{pcf}, \gamma_{\text{soil}}) = 125 \text{pcf}$$

Passive Pressure =

$$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0 \text{ksf}$$

$$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 4.815 \text{ksf}$$

$$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}] = 4.815 \text{ksf}$$

$$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 6.741 \text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 5.778 \text{ksf}$$

$$T_p := \text{if}[n < (D_f - T_f), T_f, (D_f - n)] = 4$$

$$A_p := W_f \cdot T_p = 88$$

Ultimate Shear =

$$S_u := P_{ave} \cdot A_p = 508.443 \text{kip}$$

Weight of Concrete Pad =

$$WT_c := \left[(W_f^2 \cdot T_f) + \frac{d_p^2 \cdot \pi}{4} L_p \right] \cdot \gamma_c = 365.798 \text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left(W_f^2 - \frac{d_p^2 \cdot \pi}{4} \right) \cdot (L_p - L_{pag} - n) \right] \cdot \gamma_s = 515.06 \text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\Phi_s)}{2} \cdot W_f \right) \cdot \gamma_s = 195.803 \text{kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2 \cdot \left[\left(D_f \right)^3 \cdot \frac{\tan(\Phi_s)}{3} \right] \cdot \gamma_s = 166.136 \text{kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 933.858 \text{kip}$$

Resisting Moment =

$$M_r := (WT_{tot}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + \left[(WT_{s2} + WT_{s3}) \cdot \left(W_f + \frac{D_f \tan(\Phi_s)}{3} \right) \right] = 20140 \text{kip-ft}$$

Overturning Moment =

$$M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 5261 \text{kip-ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 3.83$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$\text{OverTurning_Moment_Check} := \text{if}(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"})$$

$$\text{OverTurning_Moment_Check} = \text{"Okay"}$$

Shear Capacity in Pier:

Shear Resistance of Pier =

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot W_{T_{tot}}}{FS_{req}} = 464.339 \text{ kips}$$

$$\text{Shear_Check} := \text{if}(S_p > \text{Shear}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Shear_Check} = \text{"Okay"}$$

Bearing Pressure Caused by Footing:

Area of the Mat =

$$A_{mat} := W_f^2 = 484$$

Section Modulus of Mat =

$$S := \frac{W_f^3}{6} = 1774.67 \text{ ft}^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{W_{T_{tot}}}{A_{mat}} + \frac{M_{ot}}{S} = 4.894 \text{ ksf}$$

$$\text{Max_Pressure_Check} := \text{if}(P_{max} < q_s, \text{"Okay"}, \text{"No Good"})$$

$$\text{Max_Pressure_Check} = \text{"Okay"}$$

Minimum Pressure in Mat =

$$P_{min} := \frac{W_{T_{tot}}}{A_{mat}} - \frac{M_{ot}}{S} = -1.035 \text{ ksf}$$

$$\text{Min_Pressure_Check} := \text{if}((P_{min} \geq 0) \cdot (P_{min} < q_s), \text{"Okay"}, \text{"No Good"})$$

$$\text{Min_Pressure_Check} = \text{"No Good"}$$

Distance to Resultant of Pressure Distribution =

$$X_p := \frac{\frac{P_{max}}{P_{max} - P_{min}} \cdot \frac{1}{3}}{\frac{W_f}{W_f}} = 6.053$$

Distance to Kern =

$$X_k := \frac{W_f}{6} = 3.667$$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity =

$$e := \frac{M_{ot}}{W_{T_{tot}}} = 5.634$$

Adjusted Soil Pressure =

$$P_a := \frac{2 \cdot W_{T_{tot}}}{3 \cdot W_f \left(\frac{W_f}{2} - e \right)} = 5.273 \text{ ksf}$$

$$q_{adj} := \text{if}(P_{min} < 0, P_a, P_{max}) = 5.273 \text{ ksf}$$

$$\text{Pressure_Check} := \text{if}(q_{adj} < q_s, \text{"Okay"}, \text{"No Good"})$$

$$\text{Pressure_Check} = \text{"Okay"}$$

Concrete Bearing Capacity:

Strength Reduction Factor =

$$\Phi_c := 0.65 \quad (\text{ACI-2008 9.3.2.2})$$

Bearing Strength Between Pier and Pad =

$$P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 1.6 \times 10^4 \cdot \text{kips} \quad (\text{ACI-2008 10.14})$$

$$\text{Bearing_Check} := \text{if}(P_b > \text{LF} \cdot \text{Axial}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Bearing_Check} = \text{"Okay"}$$

Shear Strength of Concrete:

Beam Shear:

(Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$$\phi_c := 0.85 \quad (\text{ACI 9.3.2.5})$$

$$d := T_f - C_{vr_{pad}} - d_{bbot}$$

$$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$$

$$d_2 := d_1 - d$$

$$L := \left(\frac{W_f}{2} - e \right) \cdot 3$$

$$\text{Slope} := \text{if} \left(L > W_f, \frac{P_{\max} - P_{\min}}{W_f}, \frac{q_{adj}}{L} \right)$$

$$V_{req} := \text{LF} \cdot \left[(q_{adj} - \text{Slope} \cdot d_1) + \left(\frac{\text{Slope} \cdot d_1}{2} \right) \right] \cdot W_f \cdot d_1$$

$$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot \text{psi}} \cdot W_f \cdot d \quad (\text{ACI-2008 11.2.1.1})$$

$$\text{Beam_Shear_Check} := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Beam_Shear_Check} = \text{"Okay"}$$

Punching Shear:

(Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear =

$$b_o := (d_p + d) \cdot \pi = 36.6$$

Area Included Inside Perimeter =

$$A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 106.5$$

Area Outside of Perimeter =

$$A_{out} := A_{mat} - A_{bo} = 377.5$$

Guess Value =

$$v_u := 1 \text{ ksf}$$

(From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given

$$d^2 + d_p \cdot d = \frac{W_{T_{tot}}}{\pi \cdot v_u}$$

$$v_u := \text{Find}(v_u) = 7 \text{ ksf}$$

$$V_u := v_u \cdot d \cdot W_f = 561.6 \text{ kips}$$

Required Shear Strength =

$$V_{req} := LF \cdot V_u = 748.6 \text{ kips}$$

Available Shear Strength =

$$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot \text{psi}} \cdot b_o \cdot d = 4127.9 \text{ kip} \quad (\text{ACI-2008 11.11.2.1})$$

$$\text{Punching_Shear_Check} := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Punching_Shear_Check} = \text{"Okay"}$$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor =

$$\phi_m := .90 \quad (\text{ACI-2008 9.3.2.1})$$

$$q_b := q_{adj} - d_1 \cdot \text{Slope} = 2.98 \text{ ksf}$$

Maximum Bending at Face of Pier =

$$M_n := \frac{1}{LF \cdot \phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 2025.8 \text{ kip-ft}$$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \text{ psi} \leq f_c \leq 4000 \text{ psi} \\ 0.65 & \text{if } f_c > 8000 \text{ psi} \end{cases} = 0.85$$

$$\left[\left[0.85 - \left[\frac{\left(\frac{f_c}{\text{psi}} - 4000 \right)}{1000} \right] \cdot 0.5 \right] \right] \quad \text{otherwise} \quad (\text{ACI-2008 10.2.7.3})$$

$$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2} = 53.5 \text{ psi}$$

$$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f_c}} \right) = 0.0009$$

$$\rho_{min} := 1.333 \cdot \rho = 0.0012$$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \text{ psi} \\ .0020 & \text{otherwise} \end{cases} \quad (\text{ACI -2008 7.12.2.1})$$

Check Bottom Bars:

$$A_s := \max(\rho, \rho_{min}, \rho_{sh}) \cdot W_f \cdot d = 20.8 \cdot \text{in}^2$$

$$A_{s_{prov}} := A_{bbot} \cdot NB_{bot} = 44.3 \cdot \text{in}^2$$

$$Pad_Reinforcement_Bot := \text{if}(A_{s_{prov}} > A_s, \text{"Okay"}, \text{"No Good"})$$

$$Pad_Reinforcement_Bot = \text{"Okay"}$$

Check top Bars:

$$A_s := \rho_{sh} \cdot (W_f \cdot d) = 20.8 \cdot \text{in}^2$$

$$A_{s_{prov}} := A_{btop} \cdot NB_{top} = 35 \cdot \text{in}^2$$

$$Pad_Reinforcement_Top := \text{if}(A_{s_{prov}} > A_s, \text{"Okay"}, \text{"No Good"})$$

$$Pad_Reinforcement_Top = \text{"Okay"}$$

Development Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot C_{vr_{pad}} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 6.28 \cdot \text{in}$$

Spacing or Cover Dimension =

$$c := \text{if}\left(C_{vr_{pad}} < \frac{B_{sPad}}{2}, C_{vr_{pad}}, \frac{B_{sPad}}{2}\right) = 3 \cdot \text{in}$$

Transverse Reinforcement Index =

$$k_{tr} := 0 \quad (\text{ACI-2008 12.2.3})$$

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot \text{psi}} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 38.3 \cdot \text{in}$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot \text{in} \quad (\text{ACI-2008 12.2.1})$$

$$L_{dbtCheck} := \text{if}(L_{dbt} \geq L_{dbmin}, \text{"Use L.dbt"}, \text{"Use L.dbmin"})$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - C_{vr_{pad}} = 81 \cdot \text{in}$$

$$L_{pad_Check} := \text{if}(L_{Pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$$

$$L_{pad_Check} = \text{"Okay"}$$

Development Length Pier Reinforcement:

Available Length in Foundation:

$$L_{\text{pier}} := L_p - \text{Cvr}_{\text{pier}} = 117\text{-in}$$

$$L_{\text{pad}} := T_f - \text{Cvr}_{\text{pad}} = 45\text{-in}$$

Tension:

(ACI-2008 12.2.3)

Spacing or Cover Dimension =

$$c := \text{if} \left(\text{Cvr}_{\text{pier}} < \frac{B_{\text{sPier}}}{2}, \text{Cvr}_{\text{pier}}, \frac{B_{\text{sPier}}}{2} \right) = 3\text{-in}$$

Transverse Reinforcement =

$$k_{\text{tr}} := 0$$

(ACI-2008 12.2.3)

$$L_{\text{dbt}} := \frac{3 \cdot f_y \cdot \alpha_{\text{pier}} \cdot \beta_{\text{pier}} \cdot \gamma_{\text{pier}} \cdot \lambda_{\text{pier}}}{40 \cdot \sqrt{f_c \cdot \text{psi}} \cdot \left(\frac{c + k_{\text{tr}}}{d_{\text{bpier}}} \right)} \cdot d_{\text{bpier}} = 47.15\text{-in}$$

Minimum Development Length =

Pier reinforcement bars are standard 90 degree hooks
 and therefore development in the pad is computed
 as follows:

$$L_{\text{dh}} := \frac{1200 \cdot d_{\text{bpier}}}{\sqrt{\frac{f_c}{\text{psi}}}} \cdot .7 = 18.727\text{-in} \quad (\text{ACI } 12.2.1)$$

$$L_{\text{db}} := \max(L_{\text{dbt}}, L_{\text{dbmin}})$$

$$L_{\text{tension_Check}} := \text{if}(L_{\text{pier}} + L_{\text{pad}} > L_{\text{dbt}}, \text{"Okay"}, \text{"No Good"})$$

$$L_{\text{tension_Check}} = \text{"Okay"}$$

Compression:

(ACI-2008 12.3.2)

$$L_{\text{dbc1}} := \frac{.02 \cdot d_{\text{bpier}} \cdot f_y}{\sqrt{f_c \cdot \text{psi}}} = 26.753\text{-in}$$

$$L_{\text{dbmin}} := 0.0003 \cdot \frac{\text{in}^2}{\text{lb}} \cdot (d_{\text{bpier}} \cdot f_y) = 25.38\text{-in}$$

$$L_{\text{dbc}} := \text{if}(L_{\text{dbc1}} \geq L_{\text{dbmin}}, L_{\text{dbc1}}, L_{\text{dbmin}}) = 26.753\text{-in}$$

$$L_{\text{compression_Check}} := \text{if}(L_{\text{pier}} + L_{\text{pad}} > L_{\text{dbc}}, \text{"Okay"}, \text{"No Good"})$$

$$L_{\text{compression_Check}} = \text{"Okay"}$$

Tie Size and Spacing in Column:

Minimum Tie Size =

$$Tie_{min} := \text{if}(BS_{pier} \leq 10, 3, 4) = 4$$

Used #3 Ties

Seismic Factor =

$$z := \text{if}(Z \leq 2, 1, 0.5) = 1 \quad (\text{ACI-2008 21.10.5})$$

$$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 22.56 \text{ in}$$

$$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 18 \text{ in}$$

$$s_{lim3} := D_f \cdot z = 168 \text{ in}$$

$$s_{lim4} := 18 \text{ in}$$

Maximum Spacing =

$$s_{tie} := \min \begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix} = 18 \text{ in}$$

Number of Ties Required =

$$n_{tie} := \frac{L_{pier} - 3 \text{ in}}{s_{tie}} + 1 = 7.333$$

Check Anchor Steel Embedment:

Depth Available =

$$D_{ab} := L_{st} - A_{BP} = 10.167 \text{ ft}$$

Length of Anchor Bolt =

$$L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot \text{in}}{\sqrt{f_c \cdot \text{psi}}} = 10.87 \text{ ft}$$

$$\text{Depth_Check} := \text{if}(D_{ab} \geq L_{anchor}, \text{"Okay"}, \text{"No Good"})$$

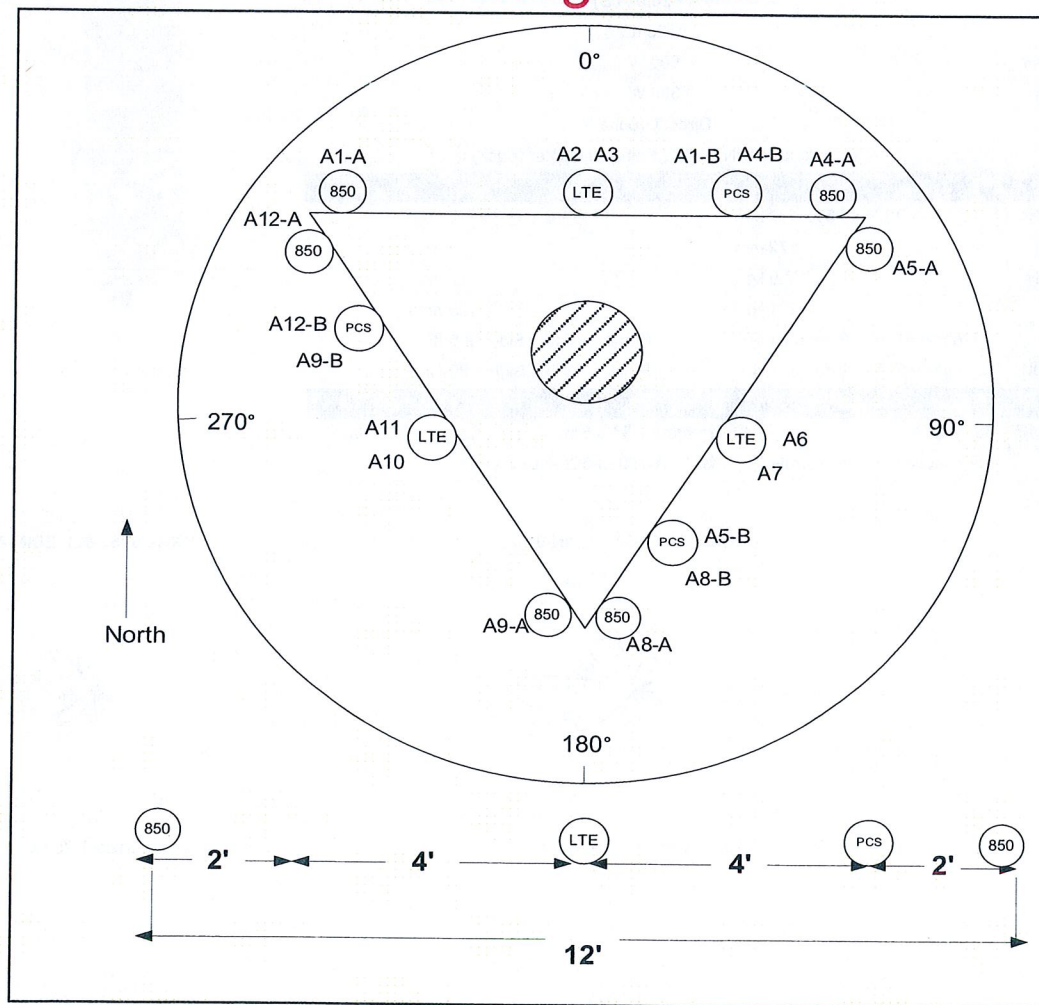
Depth_Check = "No Good"

Note: Anchor plate is provided

SITE NAME		ORANGE 1 CT		ECP - CELL #		5		9			
LATITUDE		41-16-25.35 N		LONGITUDE		73-01-07.38 W					
Additional Comments:				SAVE BUTTON							
				STRUCTURE TYPE		MONOPOLE					
700 Mhz - LTE ANTENNA ADD		ALPHA		BETA		GAMMA					
EQUIPMENT TYPE		eNodeB		eNodeB		eNodeB					
ANTENNA TYPE		BXA-70063/6CF-5°		BXA-70063/6CF-5°		BXA-70063/6CF-5°					
QTY OF ANTENNAS PER FACE		1		1		1					
ORIENTATION (DEG)		40		130		240					
DOWN TILT (MECH/DEG)		0		2		0					
RAD CTR (FT AGL)		155		155		155					
TMA - QTY / MODEL											
DIPLEXER - QTY / MODEL											
850 Cellular - Current Config		ALPHA		BETA		GAMMA					
EQUIPMENT TYPE		#N/A		#N/A		#N/A					
ANTENNA TYPE		DB846F65ZAXY_869_0		DB846F65ZAXY_869_0		DB846F65ZAXY_869_0					
QTY OF ANTENNAS PER FACE		2		2		2					
ORIENTATION (DEG)		15		115		240					
DOWN TILT (MECH/DEG)		0		8		6					
RAD CTR (FT AGL)		155		155		155					
TMA - QTY / MODEL											
DIPLEXER - QTY / MODEL											
850 Cellular - Future Config		ALPHA		BETA		GAMMA					
EQUIPMENT TYPE		#N/A		#N/A		#N/A					
ANTENNA TYPE		LPA-80060/6CF-4°		LPA-80060/6CF-4°		LPA-80060/6CF-4°					
QTY OF ANTENNAS PER FACE		2		2		2					
ORIENTATION (DEG)		40		130		240					
DOWN TILT (MECH/DEG)		0		2		2					
RAD CTR (FT AGL)		155		155		155					
TMA - QTY / MODEL											
DIPLEXER - QTY / MODEL		2 FD9R6004/2C-3L		2 FD9R6004/2C-3L		2		FD9R6004/2C-3L			
DIPLEX WITH LTE CABLE											
1900 PCS - Current Config		ALPHA		BETA		GAMMA					
EQUIPMENT TYPE		PCS Modcell 4.0		PCS Modcell 4.0		PCS Modcell 4.0					
ANTENNA TYPE		LPA-185063/8CF 2		LPA-185063/8CF 2		LPA-185063/8CF 2					
QTY OF ANTENNAS PER FACE		2		2		2					
ORIENTATION (DEG)		15		115		240					
DOWN TILT (MECH/DEG)		0		4		2					
RAD CTR (FT AGL)		155		155		155					
TMA - QTY / MODEL											
DIPLEXER - QTY / MODEL											
1900 PCS - Future Config		ALPHA		BETA		GAMMA					
EQUIPMENT TYPE		PCS Modcell 4.0		PCS Modcell 4.0		PCS Modcell 4.0					
ANTENNA TYPE		BXA-171063/12BF-2		BXA-171063/12BF-2		BXA-171063/12BF-2					
QTY OF ANTENNAS PER FACE		1		1		1					
ORIENTATION (DEG)		40		130		240					
DOWN TILT (MECH/DEG)		0		4		2					
RAD CTR (FT AGL)		155		155		155					
TMA - QTY / MODEL											
DIPLEX WITH CELLULAR CABLE		DIPLEX with Cellular Cable		DIPLEX with Cellular Cable		DIPLEX with Cellular Cable					
NUMBER OF CABLE'S NEEDED				ESTIMATED CABLE LENGTH							
MAINLINE SIZE		1 5/8"		TOTAL # OF MAINLINES		12		MAINLINE (FT)			
JUMPER SIZE		1/2 "		TOTAL # OF TOP JUMPERS		18		TOP JUMPER (FT)		12	
Equipment Cable Ordering		MAIN CABLE		12		+		TOP JUMPER #		12 + 6	
TX / RX FREQUENCIES				TX POWER OUTPUT							
Cellular A-Band		PCS F / AWS-Band		700 Mhz C - B		Cellular (Watts)		20			
TX - 869-880,890-891.5 MHz		TX - 1970-1975 / 2145-21		TX - 746-757		PCS (Watts)		16			
RX - 824-835,845-846.5 MHz		RX - 1890-1895 / 1745-17		RX - 776-787		LTE (Watts)		40			

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/WHITE	A5-B	1900	Tx2/Rx0	BLUE/WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ORANGE	A6	700	Tx2/Rx0	BLUE/ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	800	Tx6/Rx1	GREEN/GREEN
RF ENGINEER				RF MANAGER				INITIALS		DATE	
Prepared By: Dany Bustamante				Steve Weatherbee				DB		9/28/2011	

Site Configuration



BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

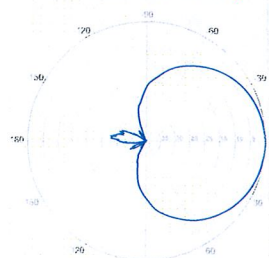
Replace "X" with desired electrical downtilt.

 Antenna is also available with NE connector(s).
 Replace "EDIN" with "NE" in the model number
 when ordering.

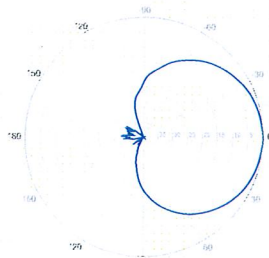
Electrical Characteristics	696-900 MHz			
Frequency bands	696-806 MHz		806-900 MHz	
Polarization	±45°			
Horizontal beamwidth	65°		63°	
Vertical beamwidth	13°		11°	
Gain	14.0 dBd (16.1 dBi)		14.5 dBd (16.6 dBi)	
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10			
Impedance	50Ω			
VSWR	≤1.35:1			
Upper sidelobe suppression (0°)	-18.3 dB		-18.2 dB	
Front-to-back ratio (+/-30°)	-33.4 dB		-36.3 dB	
Null fill	5% (-26.02 dB)			
Isolation between ports	< -25 dB			
Input power with EDIN connectors	500 W			
Input power with NE connectors	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)			
Mechanical Characteristics				
Dimensions Length x Width x Depth	1804 x 285 x 132 mm		71.0 x 11.2 x 5.2 in	
Depth with z-brackets	172 mm		6.8 in	
Weight without mounting brackets	7.9 kg		17 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.51 m ²	Side: 0.24 m ²	Front: 5.5 ft ²	Side: 2.6 ft ²
Wind load @ 161 km/hr (100 mph)	Front: 759 N	Side: 391 N	Front: 169 lbf	Side: 89 lbf
Mounting Options	Part Number	Fits Pipe Diameter		Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in		6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP			



BXA-70063-6CF-EDIN-X

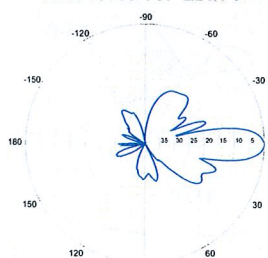


Horizontal | 750 MHz



Horizontal | 850 MHz

BXA-70063-6CF-EDIN-0

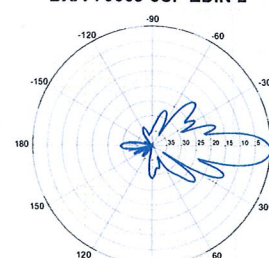


0° | Vertical | 750 MHz

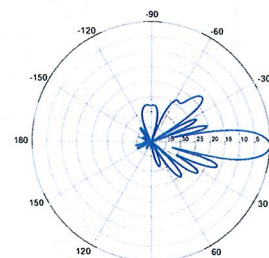


0° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-2



2° | Vertical | 750 MHz



2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

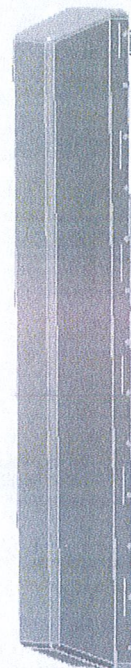
LPA-80060-6CF-EDIN-X

V-Pol | Log Periodic | 60° | 15.0 dBd

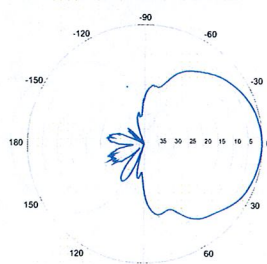
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	806-960 MHz	
Frequency bands	806-900 MHz	870-960 MHz
Polarization	Vertical	
Horizontal beamwidth	57°	55°
Vertical beamwidth	10°	9°
Gain	14.5 dBd (16.6 dBi)	15.0 dBd (17.1 dBi)
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.4:1	
Null fill	5% (-26.02 dB)	
Input power	700 W	
Lightning protection	Direct Ground	
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1805 x 235 x 246 mm	71.1 x 9.3 x 9.7 in
Depth of antenna with z-bracket	286 mm	11.3 in
Weight without mounting brackets	10 kg	22 lbs
Survival wind speed	201 km/hr	125 mph
Wind area	Front: 0.42 m ² Side: 0.44 m ²	Front: 4.57 ft ² Side: 4.76 ft ²
Wind load @ 161 km/hr (100 mph)	Front: 615 N Side: 699 N	Front: 138 lbf Side: 157 lbf
Requirements for Installation		
Elbow connectors	Due to connector placement it is necessary to use 90° elbow connectors for jumper cables as connectors are center-fed.	
Mounting Options	Part Number	Fits Pipe Diameter
3-Point Mounting & Downtilt Bracket Kit	21700000	50-102 mm 2.0-4.0 in
Lock-Down Brace	If the lock-down brace is used, the maximum diameter of the mounting pipe is 88.9 mm or 3.5 in.	

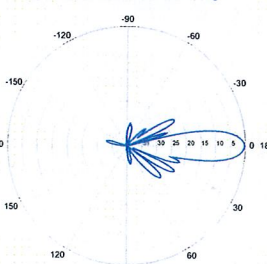


LPA-80060-6CF-EDIN-X



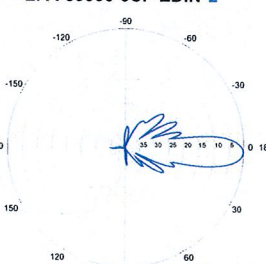
Horizontal | 850 MHz

LPA-80060-6CF-EDIN-0



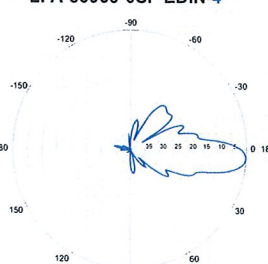
0° | Vertical | 850 MHz

LPA-80060-6CF-EDIN-2



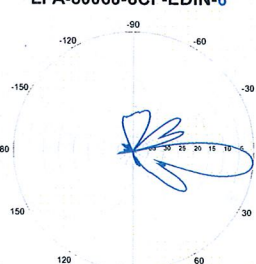
2° | Vertical | 850 MHz

LPA-80060-6CF-EDIN-4

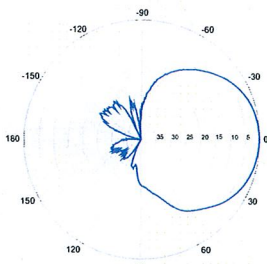


4° | Vertical | 850 MHz

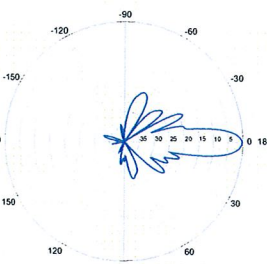
LPA-80060-6CF-EDIN-6



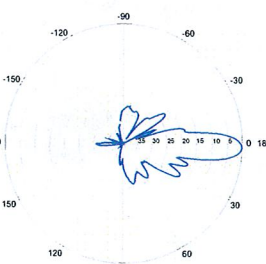
6° | Vertical | 850 MHz



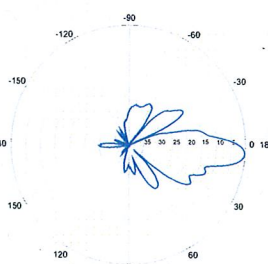
Horizontal | 950 MHz



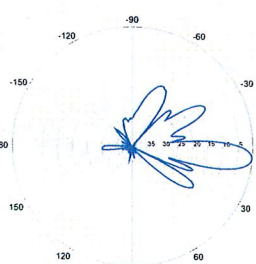
0° | Vertical | 950 MHz



2° | Vertical | 950 MHz



4° | Vertical | 950 MHz



6° | Vertical | 950 MHz

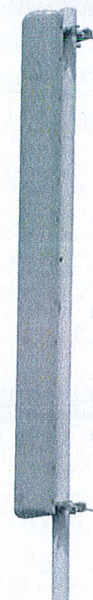
Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-12BF-EDIN-X

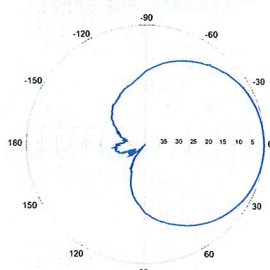
Replace "X" with desired electrical downtilt

X-Pol | FET Panel | 63° | 19.0 dBi

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1820 x 154 x 105 mm	71.7 x 6.1 x 4.1 in	
Depth with z-brackets	133 mm	5.2 in	
Weight without mounting brackets	6.8 kg	15 lbs	
Survival wind speed	> 201 km/hr		> 125 mph
Wind area	Front: 0.28 m ² Side: 0.19 m ²	Front: 3.1 ft ² Side: 2.1 ft ²	
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf	
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12BF-EDIN-X-FP		

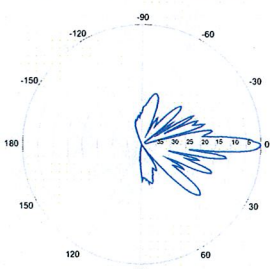


BXA-171063-12BF-EDIN-X



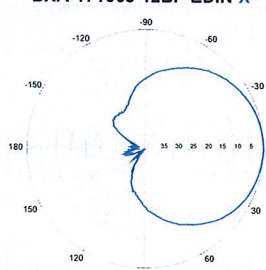
Horizontal | 1710-1880 MHz

BXA-171063-12BF-EDIN-0



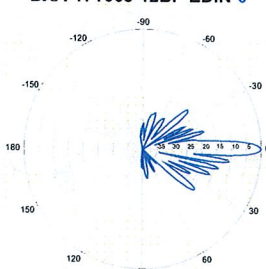
0° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-X



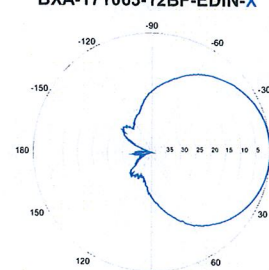
Horizontal | 1850-1990 MHz

BXA-171063-12BF-EDIN-0



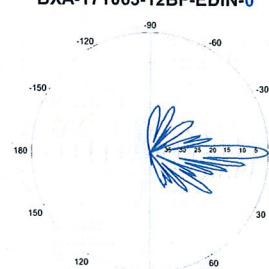
0° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-X



Horizontal | 1920-2170 MHz

BXA-171063-12BF-EDIN-0



0° | Vertical | 1920-2170 MHz

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ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Product Description

The ShareLite FD9R6004 Series of diplexers are designed to enable feeder sharing between systems in the 698-960 MHz range and in the 1710-2200 MHz range. The diplexer is equipped with in-line connector placement so it can be installed in the BTS cabinet or at the tower top. This is especially valuable in crowded sites or when the feeders are not easily accessible. Due to its wideband design, the FD9R6004 Series can accommodate many combining solutions between 698-960 MHz and 1710-2200 MHz systems such as LTE 700 MHz, Cellular 800 MHz with PCS, GSM900 with GSM1800, or GSM900 with UMTS. This diplexer features a highly selective filter. It provides a high level of isolation between ports, while keeping the insertion loss on both paths at an extremely low level. The FD9R6004 diplexers are available with various DC pass options, helpful in configurations with or without the Tower Mount Amplifiers installed.



Features/Benefits

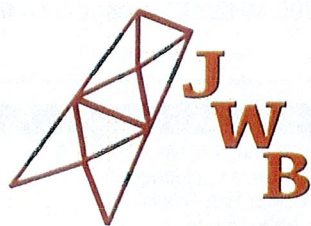
- **LTE ready design**
- **Extremely Low Insertion Loss**
- **High level of Rejection between bands – Protection against interferences**
- **Extremely High Power Handling Capability**
- **Integrated DC block/bypass versions available**
- **Very compact & small size design – Easy installation and reduced tower load**
- **In-line long-neck connectors for easy connection & waterproofing**
- **Exceptional reliability & environmental protection (IP 67)**
- **Mounting hardware for Wall and Pole mount provided (P/N SEM2-1A)**
- **Grounding already provided through the mounting bracket**
- **Kit available for easy dual mount**

Technical Specifications

Product Type	Diplexer/Cross Band Coupler
Frequency Band, MHz	698-2200
Configuration	Sharelite Single diplexer, outdoor, DC pass in the 1710 - 2170 MHz path, with mounting hardware SEM2-1A
Mounting	Wall, pole
Frequency Range Low Frequency Path, MHz	698-960
Frequency Range High Frequency Path, MHz	1710-2200
Return Loss All Ports, Min, dB	19
Power Handling Continuous, Max, W	1250 at common port; 750 in low frequency path & 500 in high frequency path
Power Handling Peak, Max, W	15000 in low frequency path & 8000 in high frequency path
Impedance, Ohms	50
Insertion Loss 698-960 MHz Path, Typ, dB	0.07
Insertion Loss 1710-2200MHz path, Typ, dB	0.13
Rejection Between Bands Min/Typ, dB	58/64@698-960MHz; 60/70@1710-2200MHz
Rejection between Bands, Min, dB	60
IMP Level at the COM Port, Typ, dBm	-112 @ 2x43
DC Pass in Low Frequency Path	No
DC Pass in High Frequency Path	Yes
Temperature Range, °C (°F)	-40 to +60 (-40 to +140)
Environmental	ETSI 300-019-2-4 Class 4.1E
Ingress Protection	IP 67
Lightning Protection	EN/IEC61000-4-5 Level 4
Connectors	In-line long-neck 7-16-Female
Weight, kg (lb)	1.2 (2.6)
Shipping Weight, kg (lb)	3.2 (7) for 2 * single units in 1 * box, 9.8 (21.6) for 6 * units = 3 * Boxes in 1 * overwrap
Application	LTE 700MHz, GSM900/3G/UMTS, GSM900/GSM1800, Cellular 800/PCS
Dimensions, H x W x D, mm (in)	147 x 164 x 37 (5.8 x 6.5 x 1.5)
Shipping Dimensions, H x W x D, mm (in)	254 x 406 x 82 (10 x 16 x 3.2) for 2 * Single Units in 1 * box, 280 x 406 x 241 (11 x 16 x 9.5) for 6 * units = 3 * Boxes in 1 * overwrap
Volume, L	0.43
Housing	Aluminum

Notes

All information contained in the present datasheet is subject to confirmation at time of ordering



JWB Tower Services, LLC
148 Governor Street
New Britain, CT 06053
(800) 819-3084
(860) 256-8175 fax

Monopole Inventory General Information

Site Name:	High Plains CC
Site Number:	
FCC Number:	
Manufacturer ID #	
Street Address:	525 Orange Center Road
City/State/Zip Code:	Orange, CT
County:	
Lat: N/S	41° 16' 25"
Long: E/W	73° 01' 08"
Performed By:	JWB
Date:	9/16/2011

Antenna Information:

CARRIER		Nextel		PIC #	
3					
MOUNT Attached to Verizon's Platform Below					
Type:	Pipe Mounts	Manf.:	Unknown		
Elev. C/L:		Bottom:	Top:	Leg:	
Face Width:	3"	Height:	8'	Projection:	
Azimuth/s:					
ANTENNA 1					
Type:	Panel	Manf.:	Andrew/Decibel	Model:	DB844H90E-M
Elev. C/L:	167'	Bottom:	Top:	Leg:	
Quantity:	9	Dim: (HxWxD)		Azimuth/s:	
ANTENNA 2					
Type:	Panel	Manf.:	Argus	Model:	LLPX310R-V1
Elev. C/L:	167'	Bottom:	Top:	Leg:	
Quantity:	3	Dim: (HxWxD)		Azimuth/s:	
ANTENNA 3					
Type:	Dish	Manf.:	Andrew	Model:	VHLP2-11-DW1
Elev. C/L:	164'	Bottom:	Top:	Leg:	
Quantity:	2	Dim: (HxWxD)	0.6 meters	Azimuth/s:	
ANTENNA 4					
Type:	GPS	Manf.:	Unkown	Model:	
Elev. C/L:	168'	Bottom:	Top:	Leg:	
Quantity:	1	Dim: (HxWxD)	5"x3"	Azimuth/s:	
RRH					
Quantity:	3	Manf.:	Samsung	Model:	RRH2WB0
COAX					
Quantity:	2	Size:	2" Flex	Jumper:	N/A
			w/ 3 fiber and 3 DC power inside		
Quantity:	9	Size:	1 1/4"	Jumper:	1/2"
Quantity:	3	Size:	1/2"	Jumper:	1/2"
				Color:	N/A
				Color:	N/A
CARRIER Verizon					
4		PIC #			
MOUNT					
Type:	Plat w/ rail	Manf.:	Valmont		
Elev. C/L:	156'	Bottom:	Top:	Leg:	
Face Width:	13'	Height:	48"	Projection:	N/A
Azimuth/s:					
ANTENNA 1					
Type:	Panel	Manf.:	Antel/Amphenol	Model:	LPA-185063/8CF
Elev. C/L:	158'	Bottom:	Top:	Leg:	
Quantity:	6	Dim: (HxWxD)		Azimuth/s:	
ANTENNA 2					
Type:	Panel	Manf.:	Andrew/Decibel	Model:	DB846F65ZAXY
Elev. C/L:	158'	Bottom:	Top:	Leg:	
Quantity:	6	Dim: (HxWxD)		Azimuth/s:	
COAX					
Quantity:	12	Size:	1 5/8"	Jumper:	1/2"
				Color:	N/A

CARRIER		AT&T		PIC #		5	
MOUNT							
Type:	Plat w/ rail	Manf.:	Valmont				
Elev. C/L:	146'	Bottom:	Top:	Leg:			
Face Width:	13'	Height:	4'	Projection:	N/A	Azimuth/s:	
ANTENNA							
Type:	Panel	Manf.:	Powerwave	Model:	7770		
Elev. C/L:	148'	Bottom:	Top:	Leg:			
Quantity:	6	Dim: (HxWxD)			Azimuth/s:		
TMA'S							
Quantity:	6	Manf.:	Powerwave	Model:	LGP21401		
Diplexer							
Quantity:	6	Manf.:	Powerwave	Model:	LGP21901		
Bias T							
Quantity:	1	Manf.:	Powerwave	Model:	Unknown		
COAX							
Quantity:	12	Size:	1 1/4"	Jumper:	1/2"	Color:	N/A

CARRIER		Sprint		PIC #		6	
MOUNT							
Type:	Plat w/ rail	Manf.:	Valmont				
Elev. C/L:	136'	Bottom:	Top:	Leg:			
Face Width:	13'	Height:	48"	Projection:	N/A	Azimuth/s:	
ANTENNA 1 - Outer							
Type:	Panel	Manf.:	Andrew/Decibel	Model:	DB980H90E-M		
Elev. C/L:	138'	Bottom:	Top:	Leg:			
Quantity:	6	Dim: (HxWxD)			Azimuth/s:		
COAX							
Quantity:	6	Size:	1 5/8"	Jumper:	1/2"	Color:	N/A

CARRIER		T-Mobile		PIC #	
				7	
MOUNT					
Type:	Plat w/ rail	Manf.:	Valmont		
Elev. C/L:	121'	Bottom:	Top:	Leg:	
Face Width:	13'	Height:	48"	Projection:	N/A
				Azimuth/s:	
ANTENNA 1					
Type:	Panel	Manf.:	EMS	Model:	RR901702DP
Elev. C/L:	123'	Bottom:	Top:	Leg:	
Quantity:	6	Dim: (HxWxD)		Azimuth/s:	
TMA 1					
Quantity:	6	Manf.:	Remec	Model:	G3SS (13"x7"x3")
COAX					
Quantity:	12	Size:	1 5/8"	Jumper:	1/2"
				Color:	N/A
ANTENNA 2					
Type:	Panel	Manf.:	RFS	Model:	APX16DWV-16DWVS
Elev. C/L:	123'	Bottom:	Top:	Leg:	
Quantity:	3	Dim: (HxWxD)		Azimuth/s:	
TMA 2					
Quantity:	3	Manf.:	Unkown	Model:	7"x7"x3"
COAX					
OUTSIDE					
Quantity:	6	Size:	1 5/8"	Jumper:	1/2"
				Color:	N/A

CARRIER		MetroPCS		PIC #	
				8	
MOUNT					
Type:	Flush	Manf.:	Unknown/Chain Mount		
Elev. C/L:	113'	Bottom:	Top:	Leg:	
Face Width:	2.5"	Height:	N/A	Projection:	N/A
				Azimuth/s:	
ANTENNA 1					
Type:	Panel	Manf.:	RFS	Model:	APXV18-206517S
Elev. C/L:	113'	Bottom:	Top:	Leg:	
Quantity:	3	Dim: (HxWxD)		Azimuth/s:	
COAX					
Quantity:	6	Size:	1 5/8"	Jumper:	1/2"
				Color:	N/A
ANTENNA 2					
Type:	Panel	Manf.:	Exalt	Model:	Unknown
Elev. C/L:	114'	Bottom:	Top:	Leg:	
Quantity:	1	Dim: (HxWxD)	12"x12"x3"	Azimuth/s:	
COAX					
Quantity:	2	Size:	Cat5 (5/16")	Jumper:	N/A
				Color:	N/A

CARRIER		Sprint		PIC #		9	
MOUNT							
Type:	Standoff	Manf.:	Unknown				
Elev. C/L:	75'	Bottom:		Top:	Leg:		
Face Width:	4"	Height:	4"	Projection:	2'	Azimuth/s:	
ANTENNA							
Type:	GPS	Manf.:	Unknown		Model:		
Elev. C/L:	76'	Bottom:		Top:	Leg:		
Quantity:	1	Dim: (HxWxD)	6"x4"		Azimuth/s:		
COAX							
Quantity:	1	Size:	1/2"	Jumper:	N/A	Color:	N/A

CARRIER		T-Mobile		PIC #		7	
MOUNT							
Type:	Plat w/ rail	Manf.:	Valmont				
Elev. C/L:	121'	Bottom:	Top:	Leg:			
Face Width:	13'	Height:	48"	Projection:	N/A	Azimuth/s:	
ANTENNA 1							
Type:	Panel	Manf.:	EMS	Model:	RR901702DP		
Elev. C/L:	123'	Bottom:	Top:	Leg:			
Quantity:	6	Dim: (HxWxD)					
TMA 1							
Quantity:	6	Manf.:	Remec	Model:	G3SS (13"x7"x3")		
COAX							
Quantity:	12	Size:	1 5/8"	Jumper:	1/2"	Color:	N/A
ANTENNA 2							
Type:	Panel	Manf.:	RFS	Model:	APX16DWV-16DWVS		
Elev. C/L:	123'	Bottom:	Top:	Leg:			
Quantity:	3	Dim: (HxWxD)					
TMA 2							
Quantity:	3	Manf.:	Unkown	Model:	7"x7"x3"		
COAX							
OUTSIDE							
Quantity:	6	Size:	1 5/8"	Jumper:	1/2"	Color:	N/A
CARRIER		MetroPCS		PIC #		8	
MOUNT							
Type:	Flush	Manf.:	Unknown/Chain Mount				
Elev. C/L:	113'	Bottom:	Top:	Leg:			
Face Width:	2.5"	Height:	N/A	Projection:	N/A	Azimuth/s:	
ANTENNA 1							
Type:	Panel	Manf.:	RFS	Model:	APXV18-206517S		
Elev. C/L:	113'	Bottom:	Top:	Leg:			
Quantity:	3	Dim: (HxWxD)					
COAX							
Quantity:	6	Size:	1 5/8"	Jumper:	1/2"	Color:	N/A
ANTENNA 2							
Type:	Panel	Manf.:	Exalt	Model:	Unknown		
Elev. C/L:	114'	Bottom:	Top:	Leg:			
Quantity:	1	Dim: (HxWxD)	12"x12"x3"	Azimuth/s:			
COAX							
Quantity:	2	Size:	Cat5 (5/16")	Jumper:	N/A	Color:	N/A

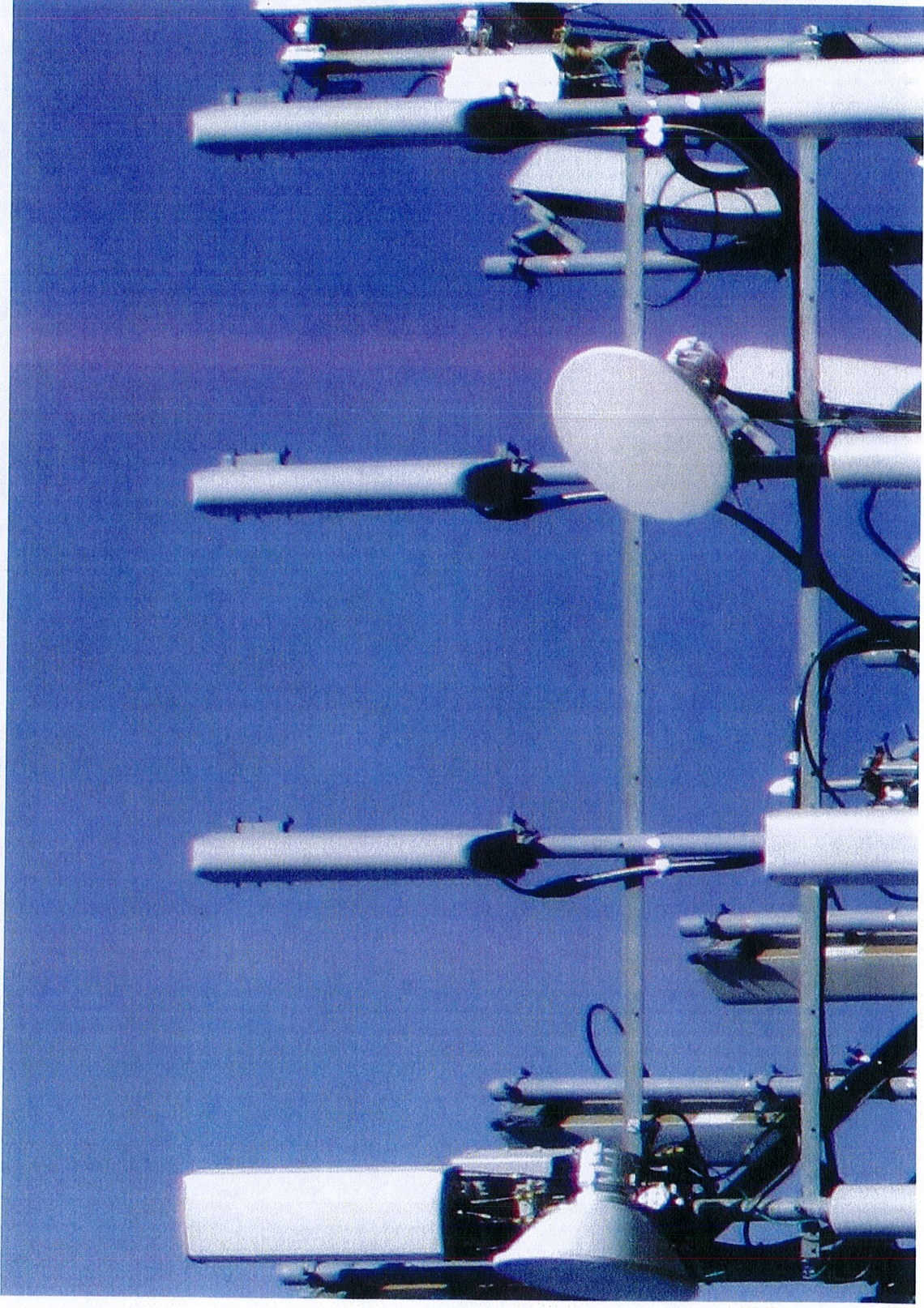
CARRIER		Sprint		PIC #		9	
MOUNT							
Type:	Standoff	Manf.:	Unknown				
Elev. C/L:	75'	Bottom:	Top:		Leg:		
Face Width:	4"	Height:	4"	Projection:	2'	Azimuth/s:	
ANTENNA							
Type:	GPS	Manf.:	Unknown		Model:		
Elev. C/L:	76'	Bottom:	Top:		Leg:		
Quantity:	1	Dim: (HxWxD)	6"x4"		Azimuth/s:		
COAX							
Quantity:	1	Size:	1/2"	Jumper:	N/A	Color:	N/A



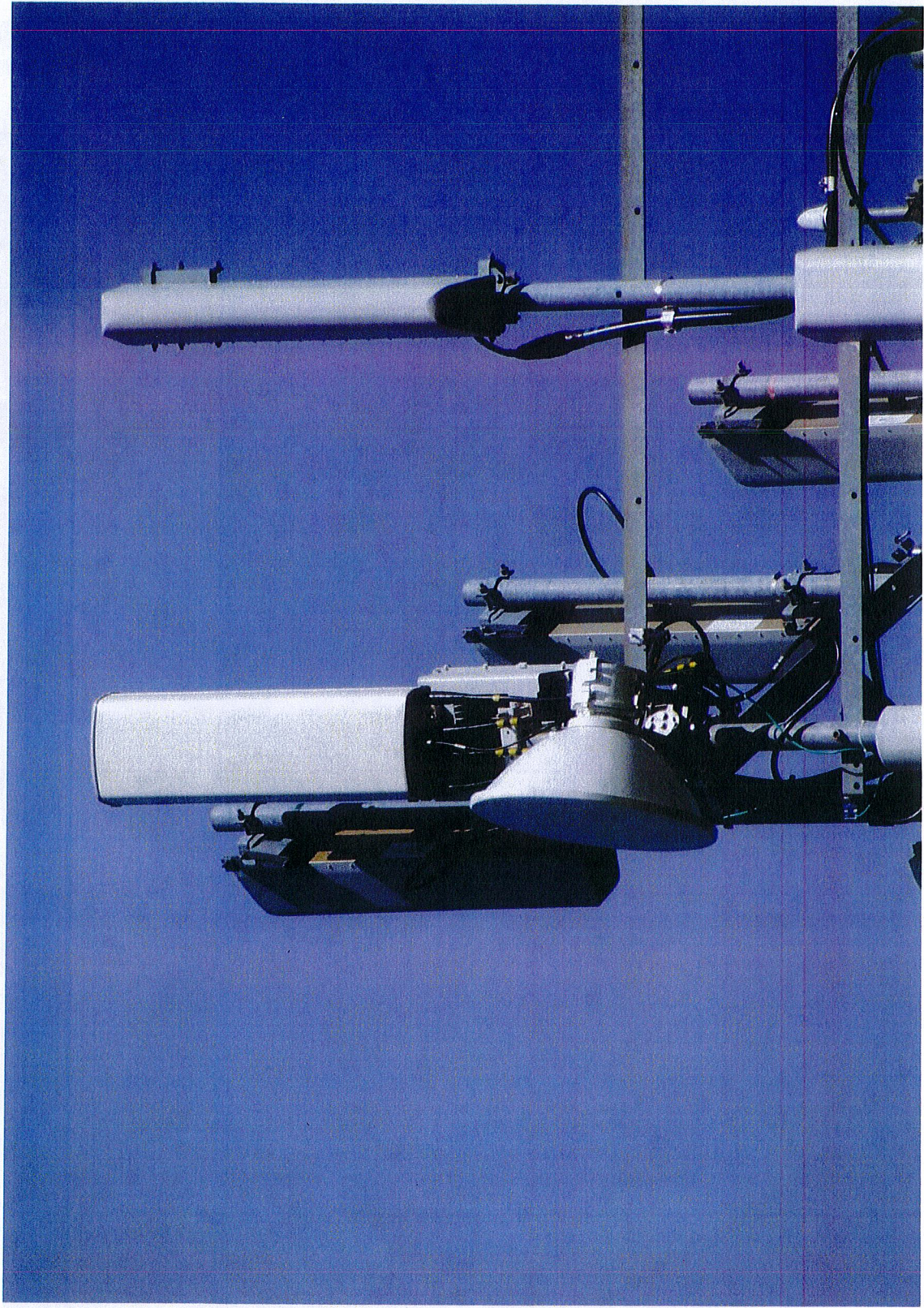
1.0 Elevation



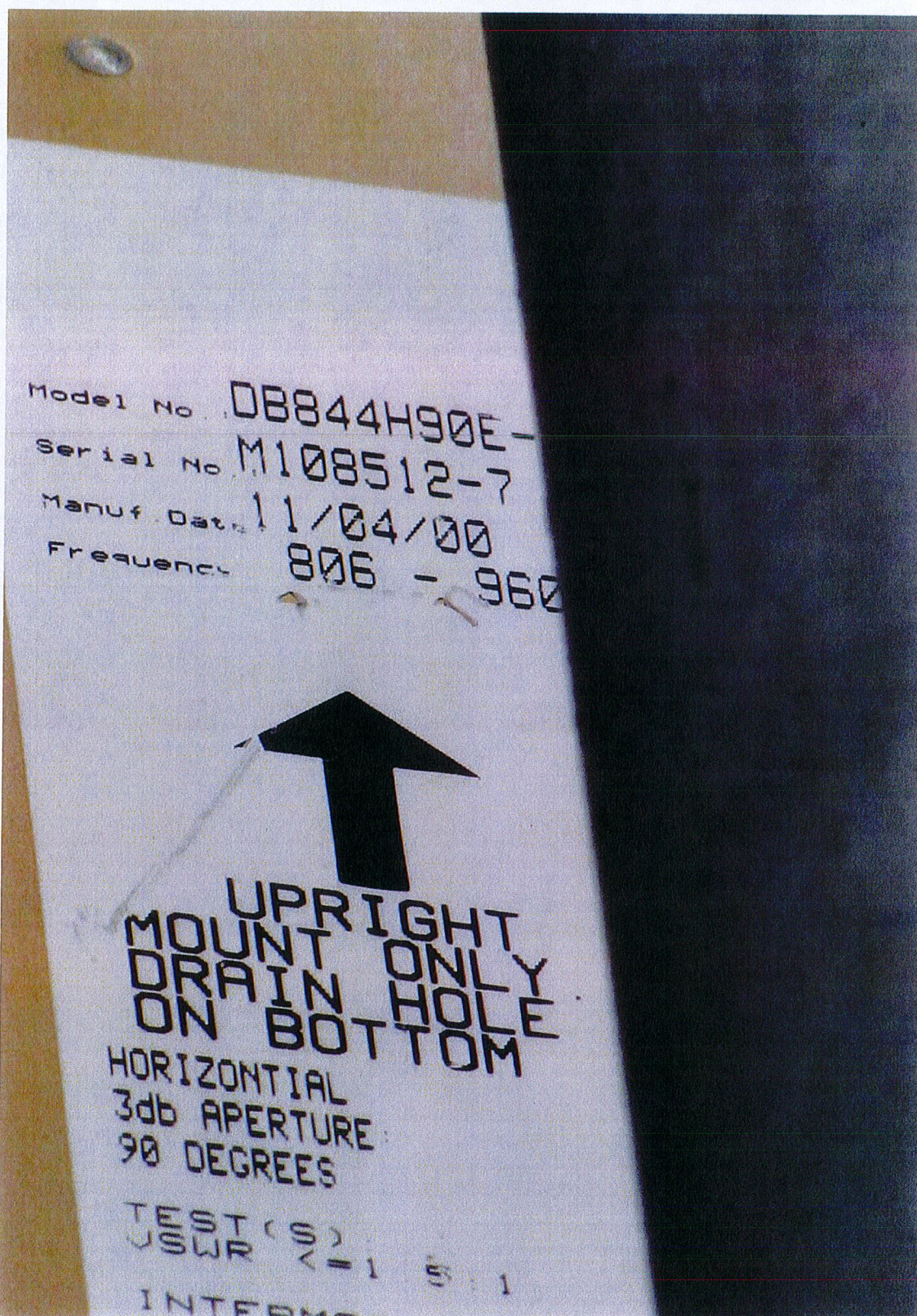
2.0 Base

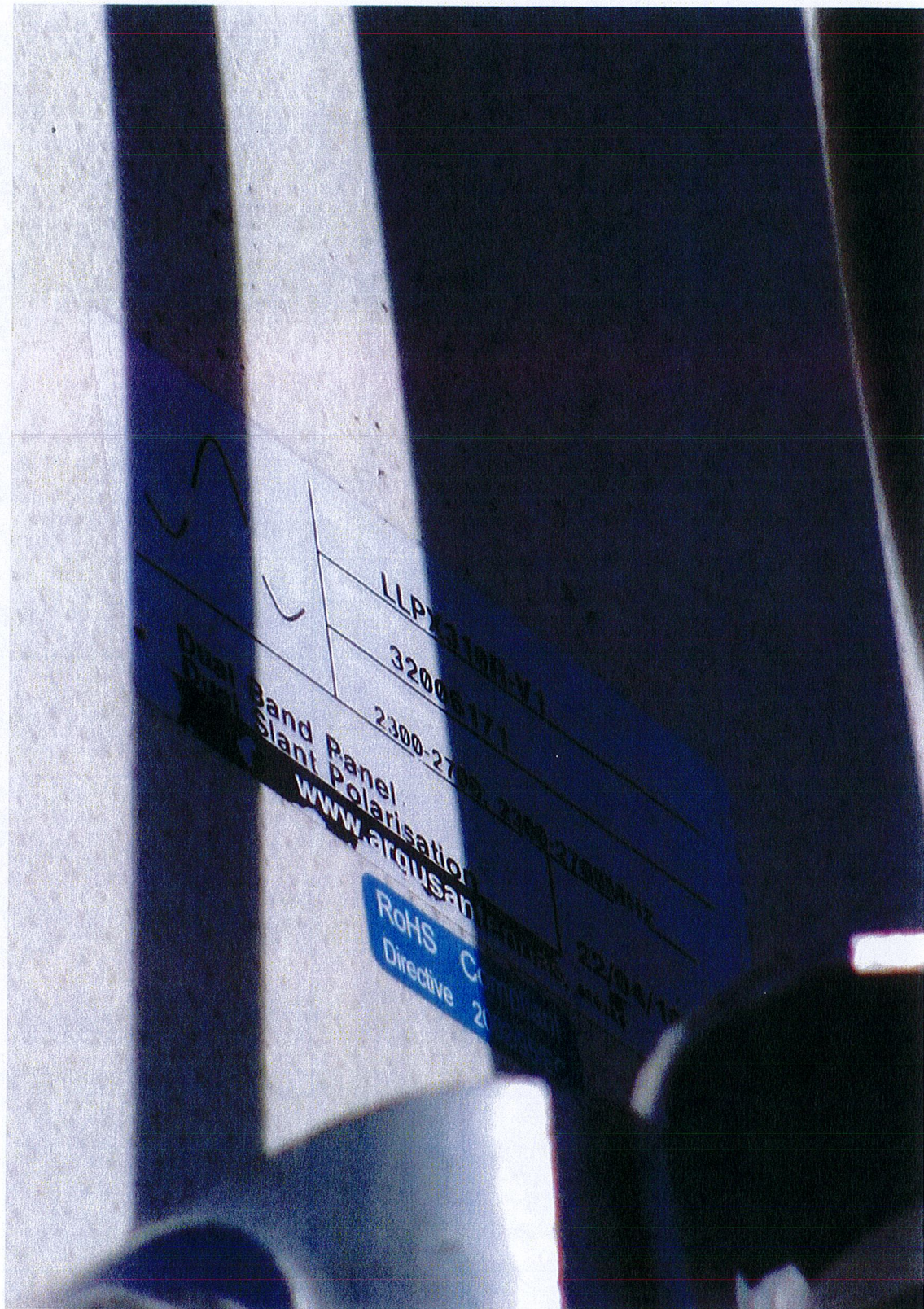


3.1 Sprint Nextel



3.2 Sprint Nextel





3.4 Sprint Nextel

#259, Gongdan-dong,

Kyung-buk, Korea
MADE IN KOREA

Product : RRH

Model : SPI-22132825WB

Serial No. : 01317

01

RRH2WB0



EP96-03123A S61Z21484



WARNING
Hot Surface

51Y7
E149091
I.T.E



Remote Radio Head

--- 48 V ; 6.25 A

LISTED

Ratings : ---

FCC 27 ID : A3LSPI-22132825WB

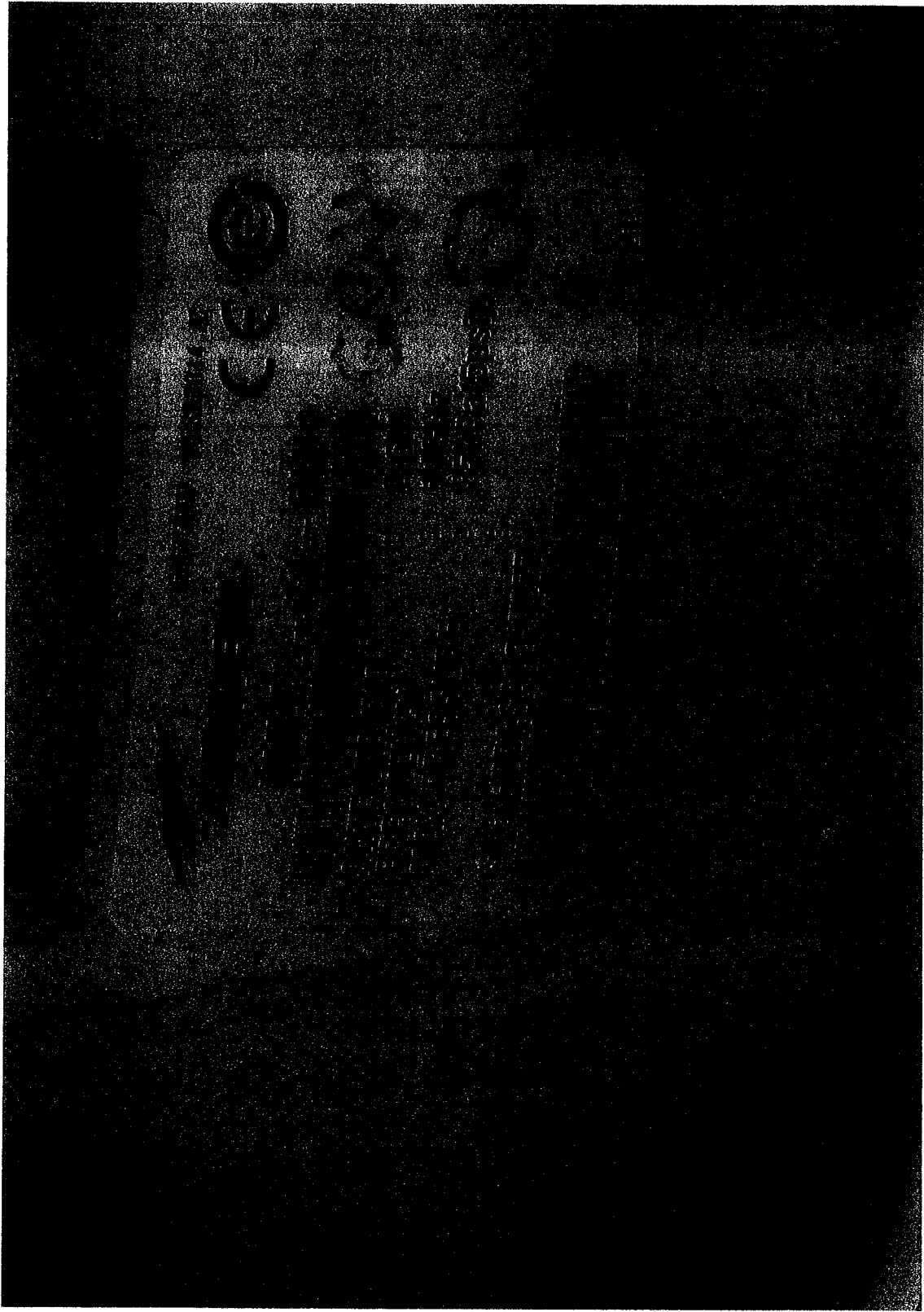
This device complies with Part 15 of the FCC Rules.

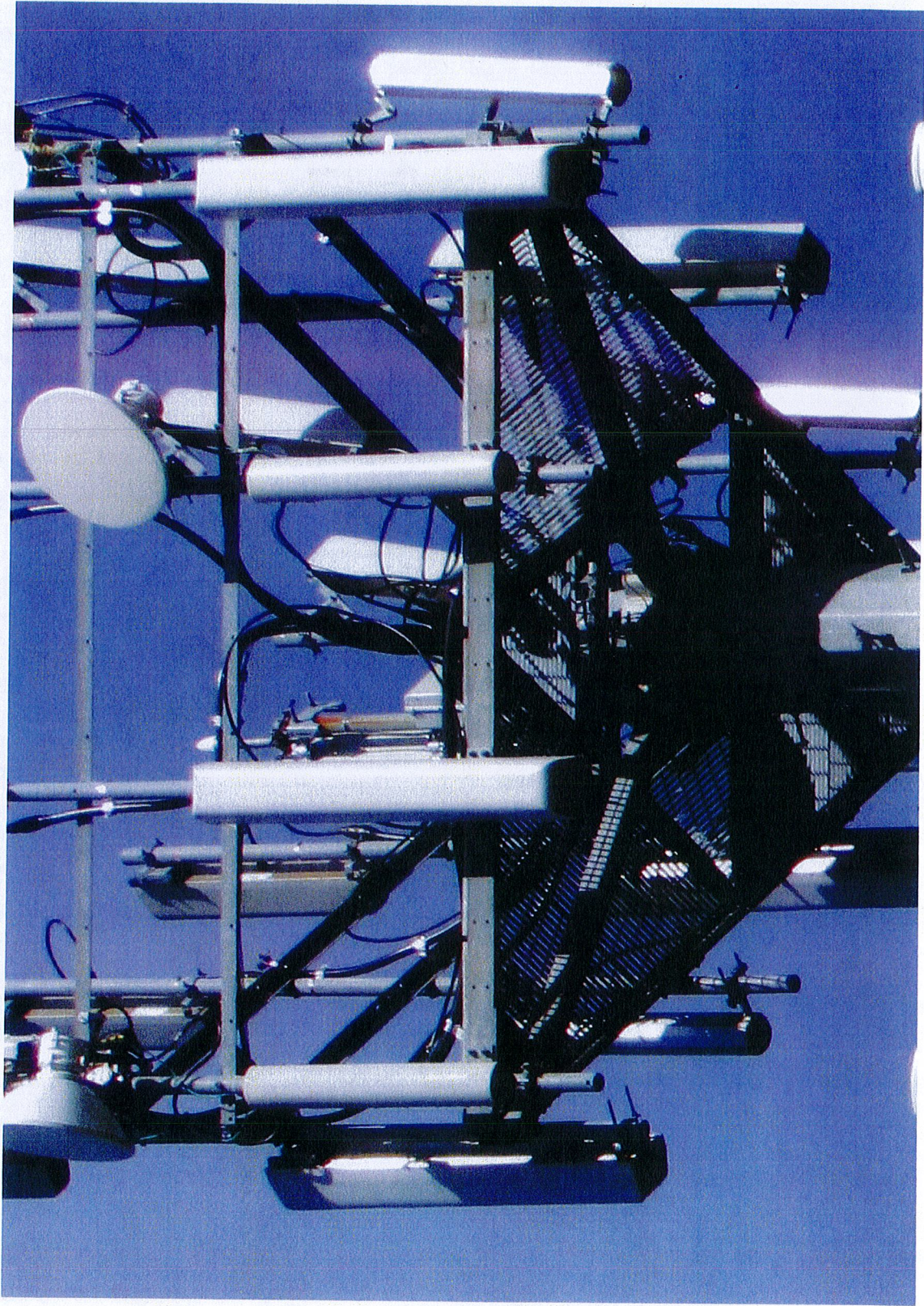
Operation is subject to the following two conditions,

(1) This device must not cause harmful interference received,

(2) this device must accept any interference caused by operation,

including interference that may cause undesired operation.





4.1 Verizon

Amphenol Antel, Inc.



SERIAL NUMBER: 404982
E-DIN 2°

TYPE: LPA 185063/8 CF 1850-1990 MHZ

FREQUENCY: 1850-1990 MHZ

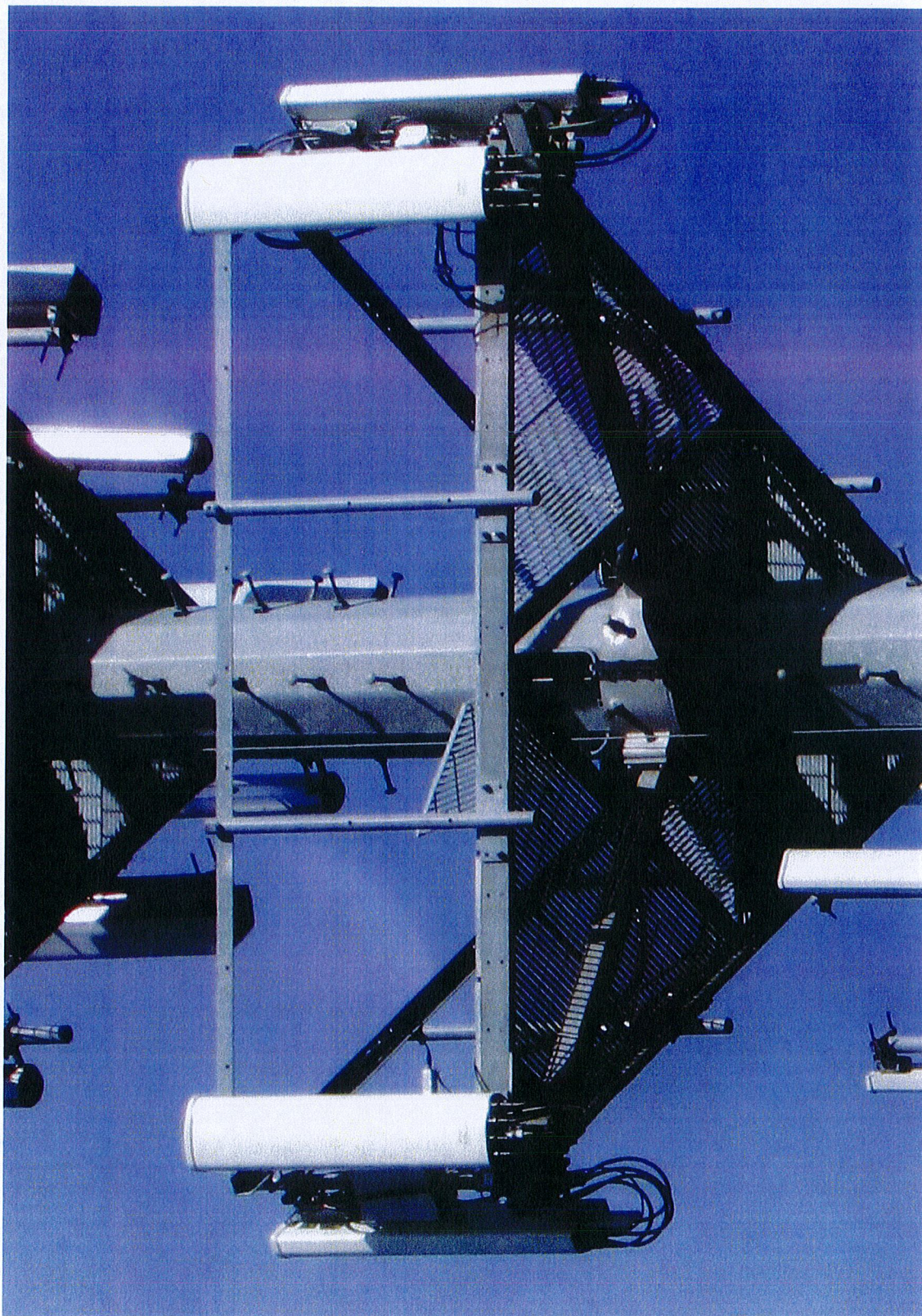
POWER: 250 WATTS

1300 CAPITAL DRIVE, ROCKFORD, IL 61109, USA

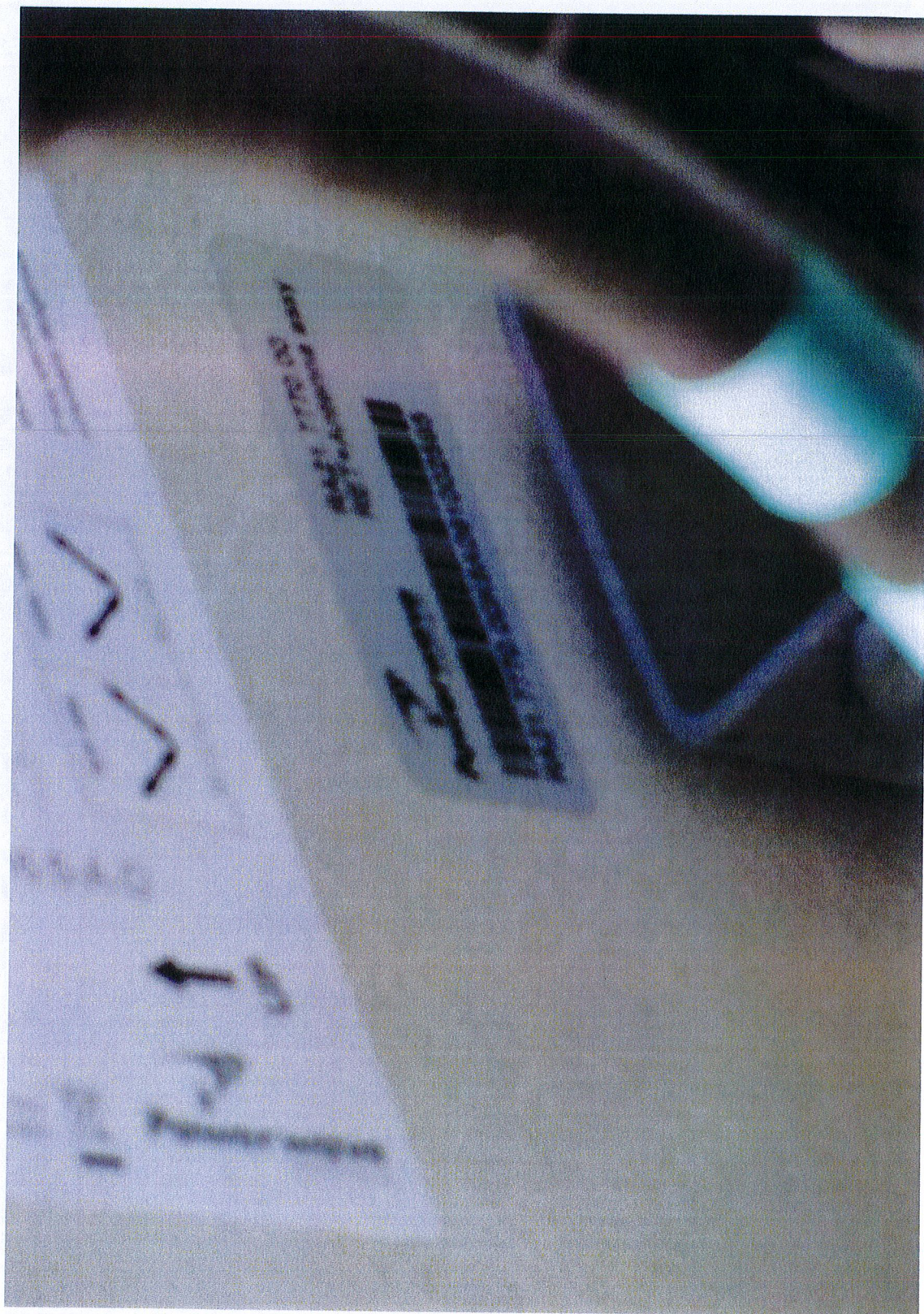
Z: 50 OHMS

ANDREW		DEBILLO SOLARY OTDESA 08123528 11/12/2007 60002598 6000 - 9600 MHz	
Model Number	Serial Number		UPRIGHT MOUNT ONLY
Serial Number	Model Code		

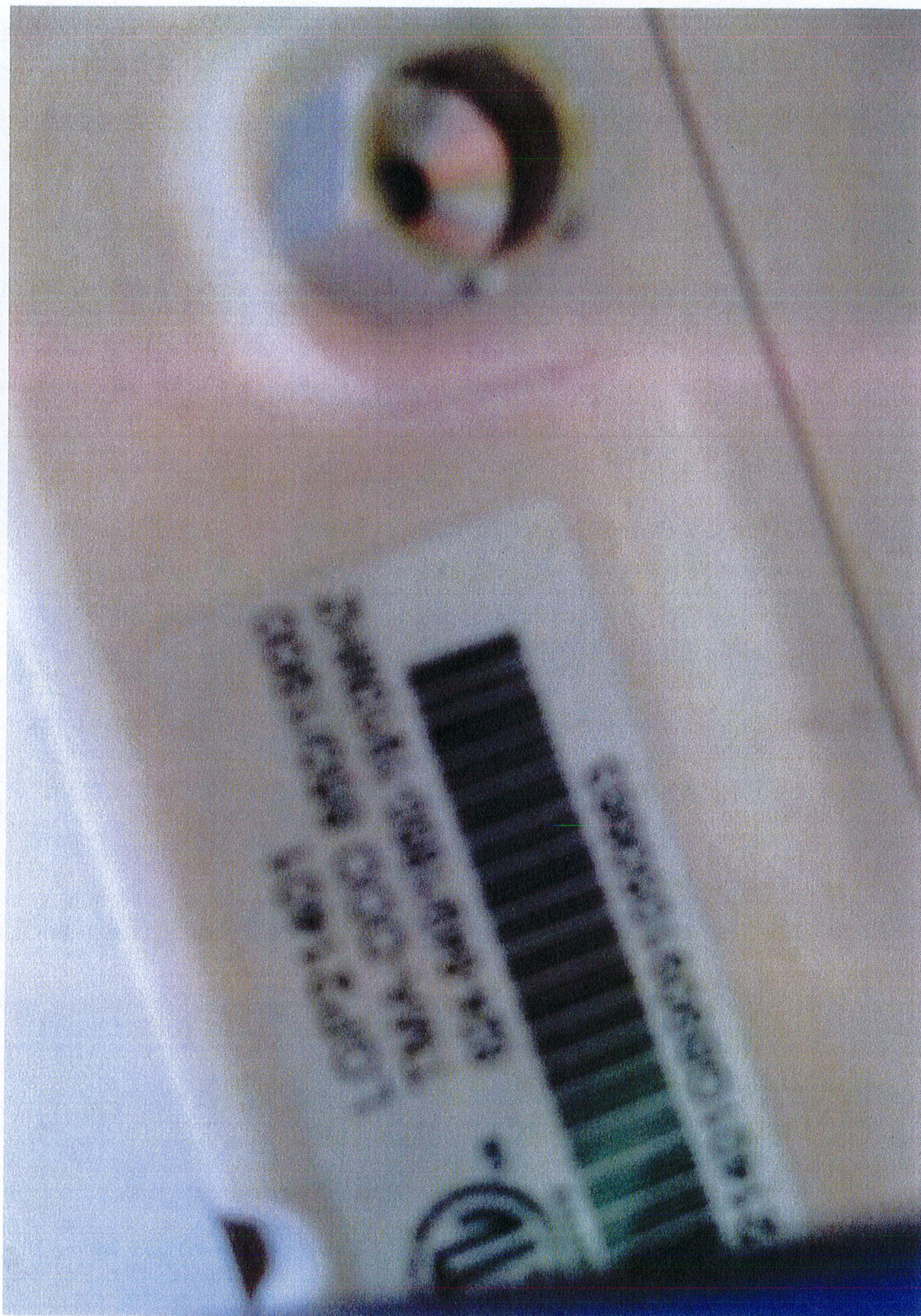
4.3 Verizon



5.1 ATT



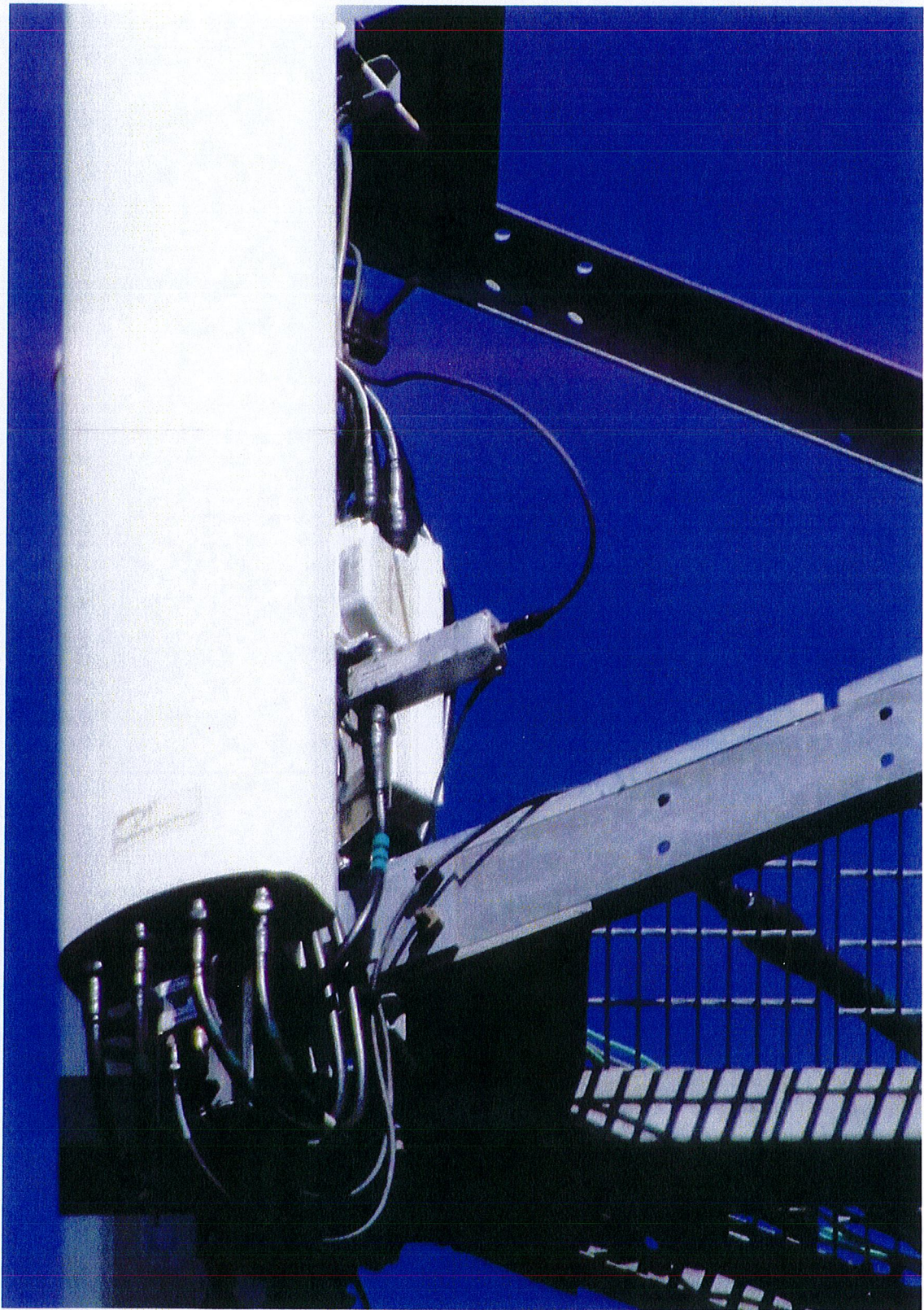
52 ATT



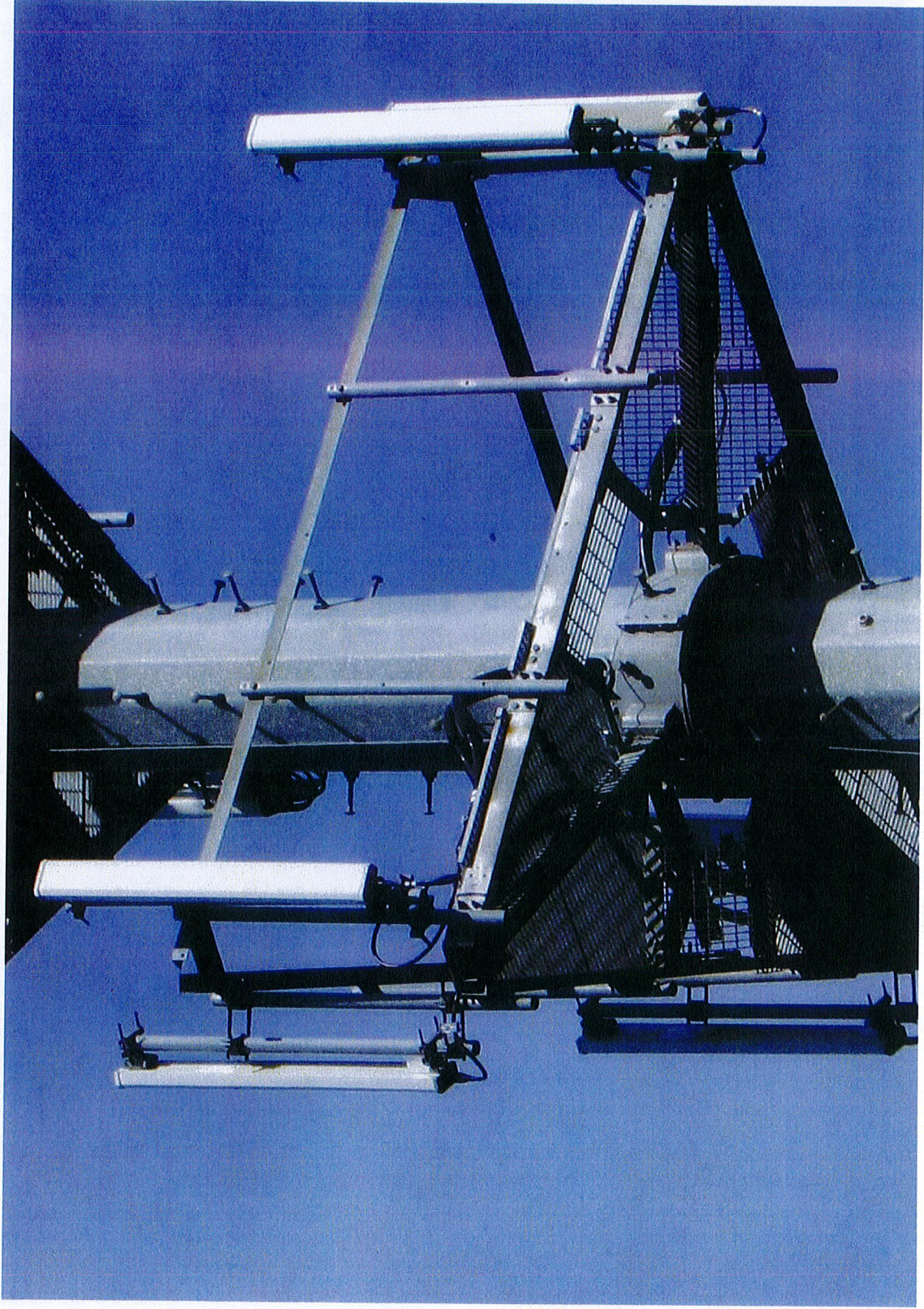
5.3 ATT



5.4 ATT



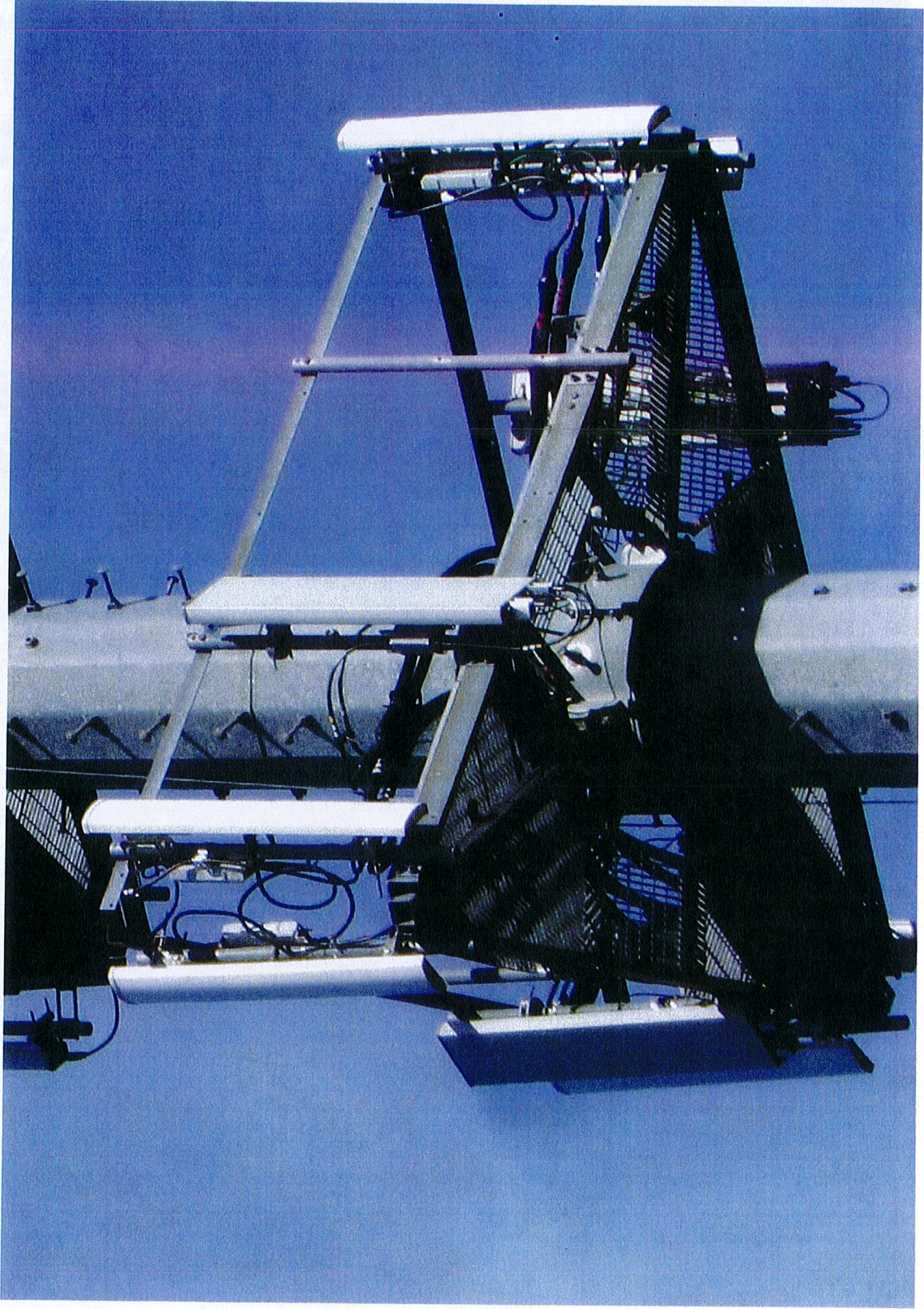
5.5 ATT



6.1 Sprint

08980190E-M
133424-5
12/98
90 Degrees
FREQ. 1850 - 1990 MHz

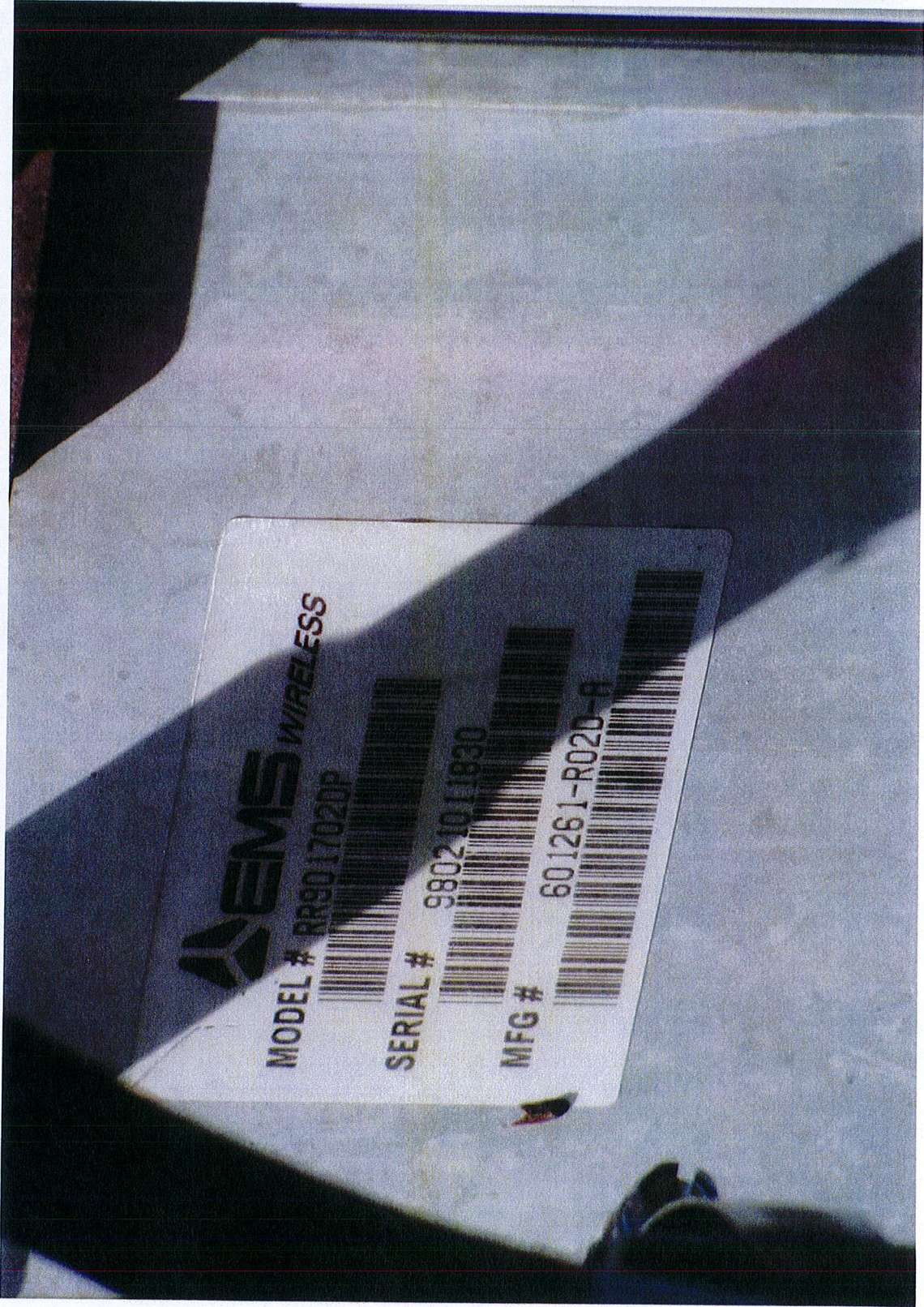
6.2 Sprint



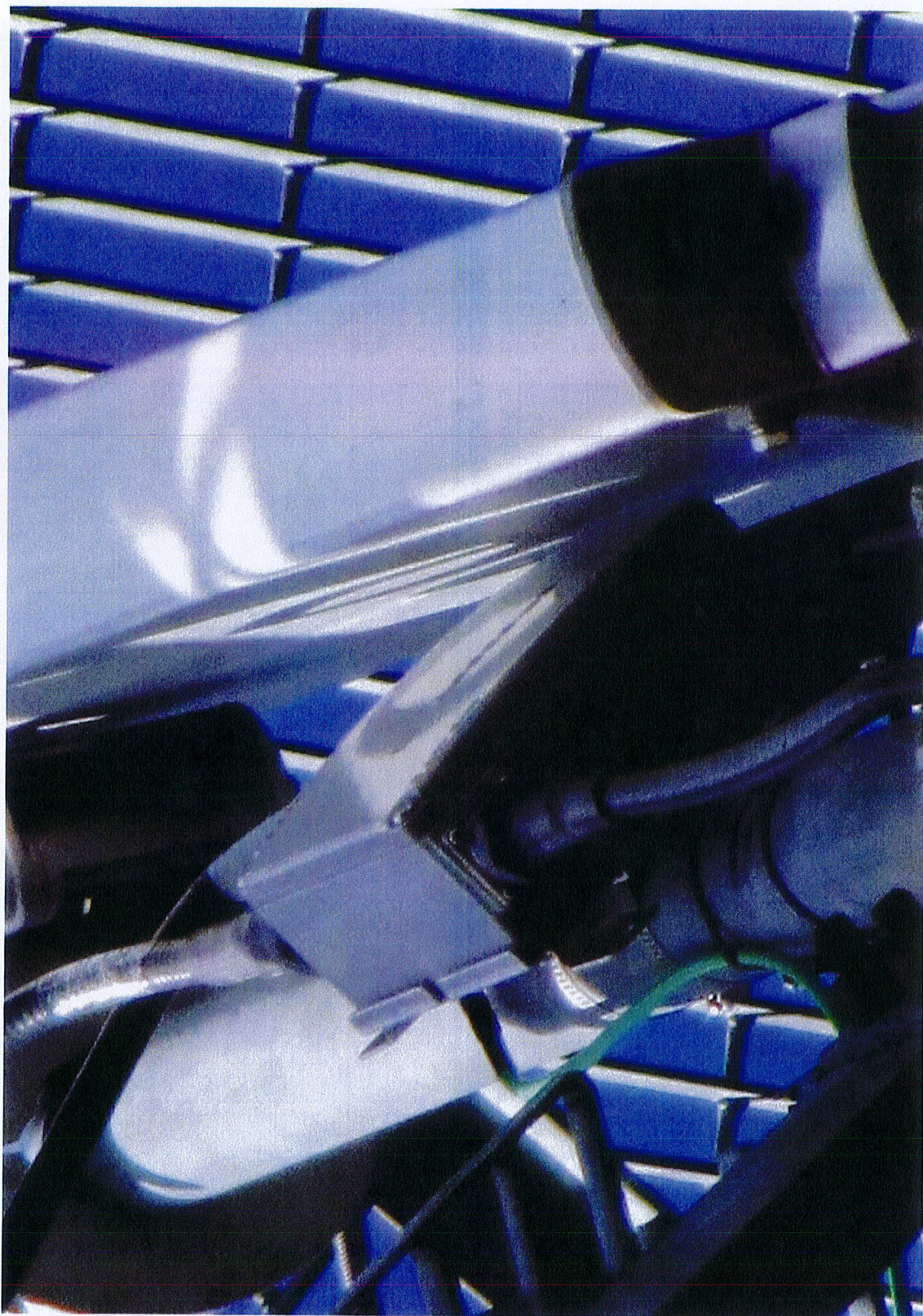
7.1 T-Mobile



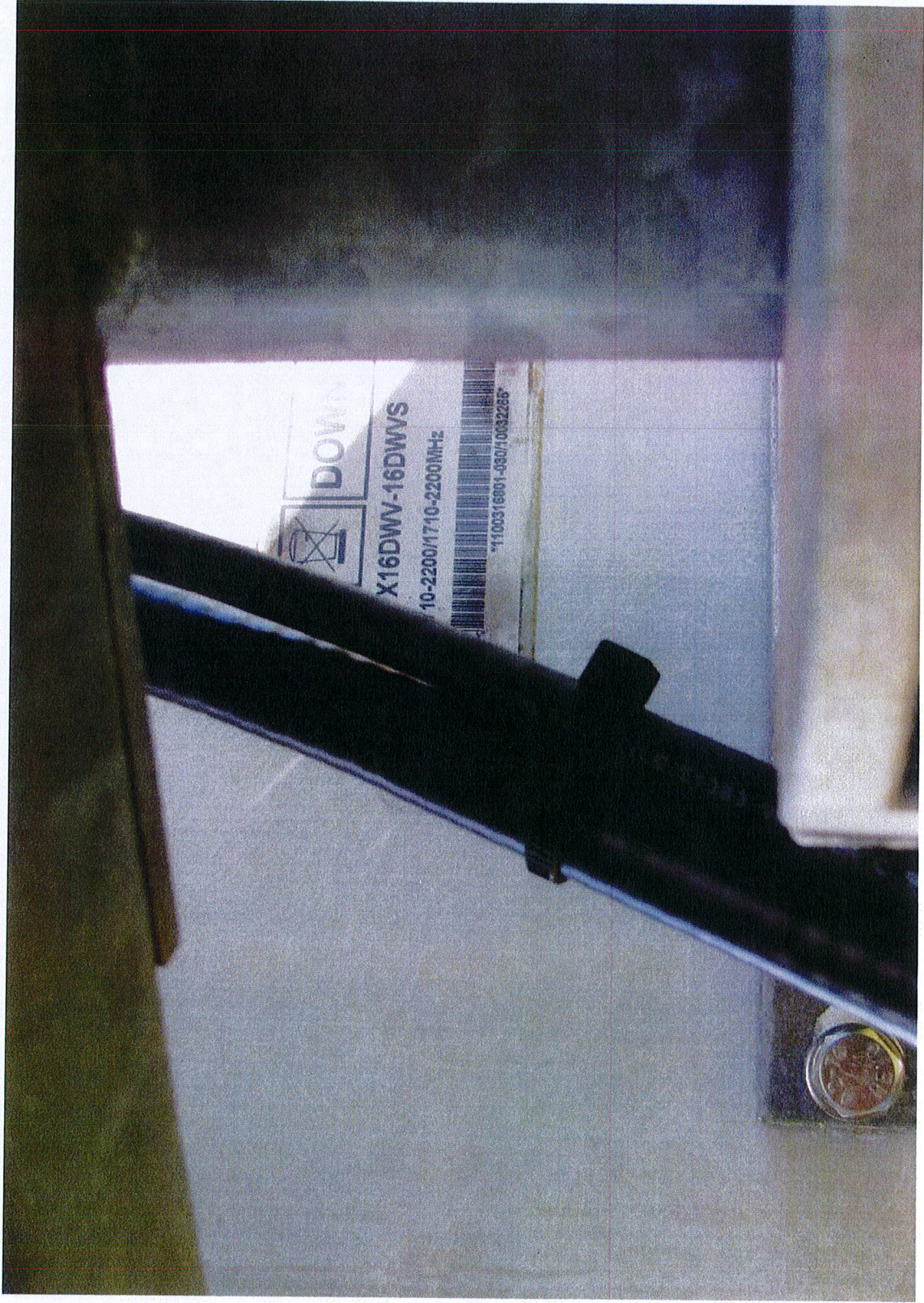
7.2 T-Mobile



7.3 T-Mobile



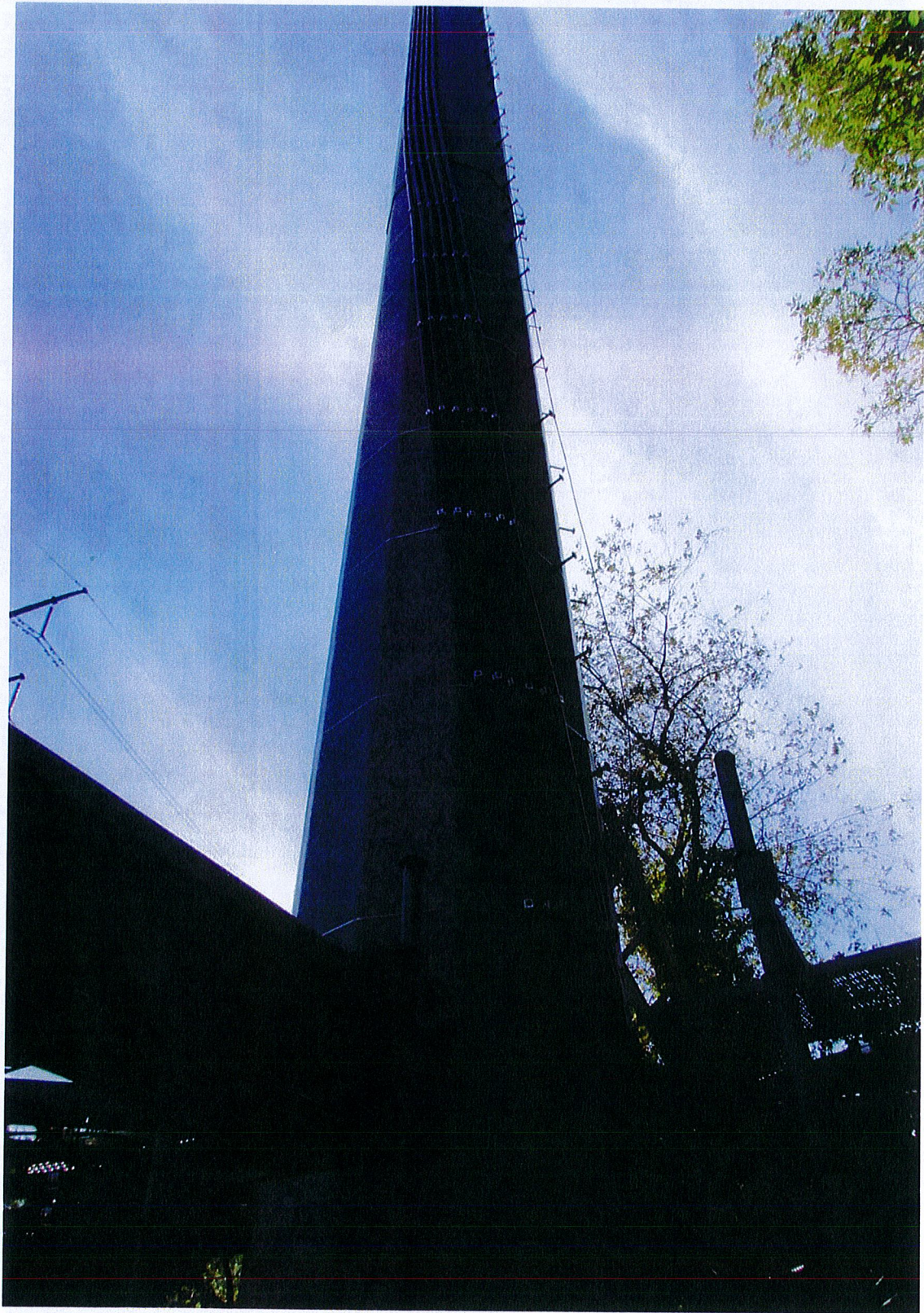
7.4 T-Mobile



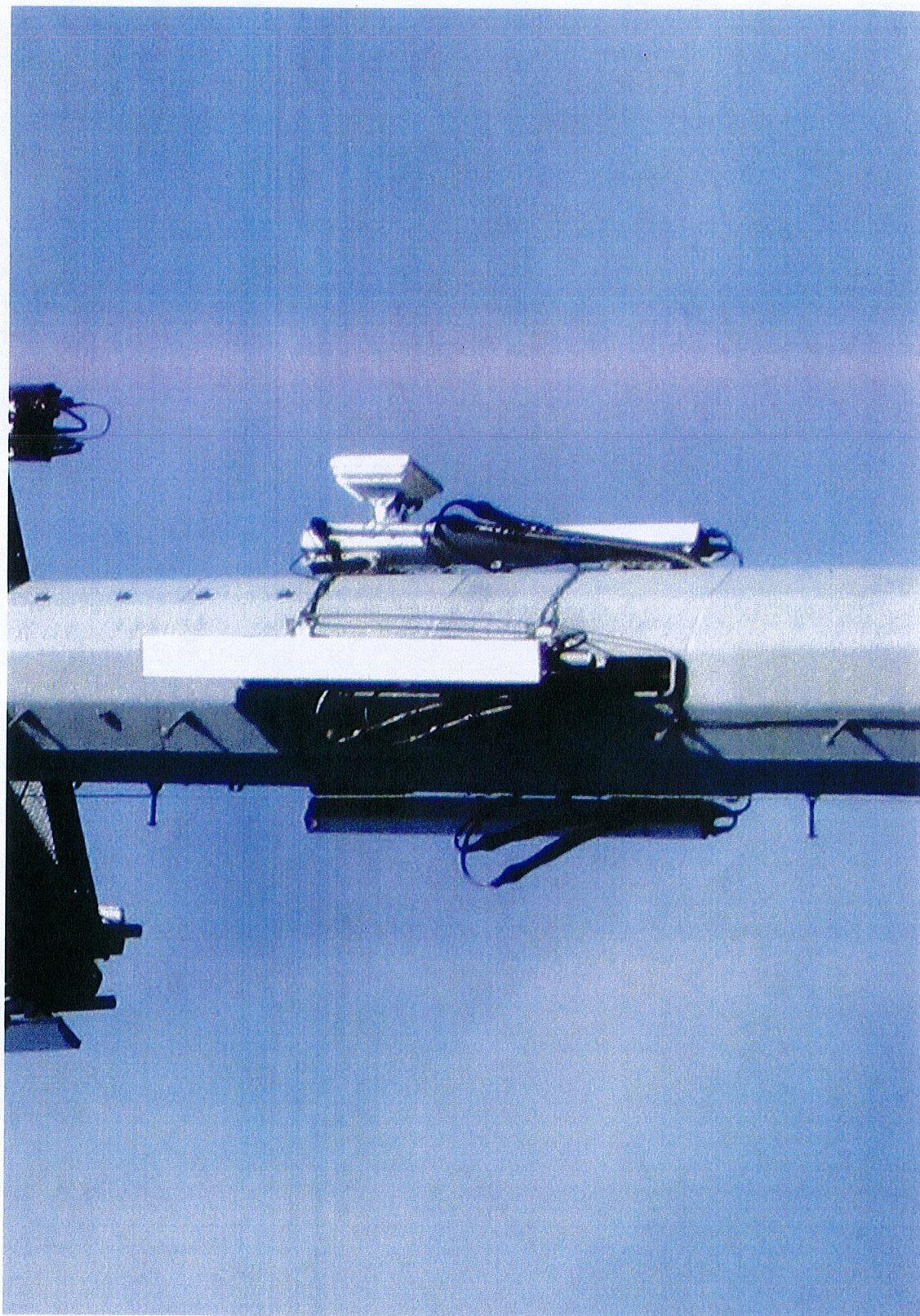
7.5 T-Mobile



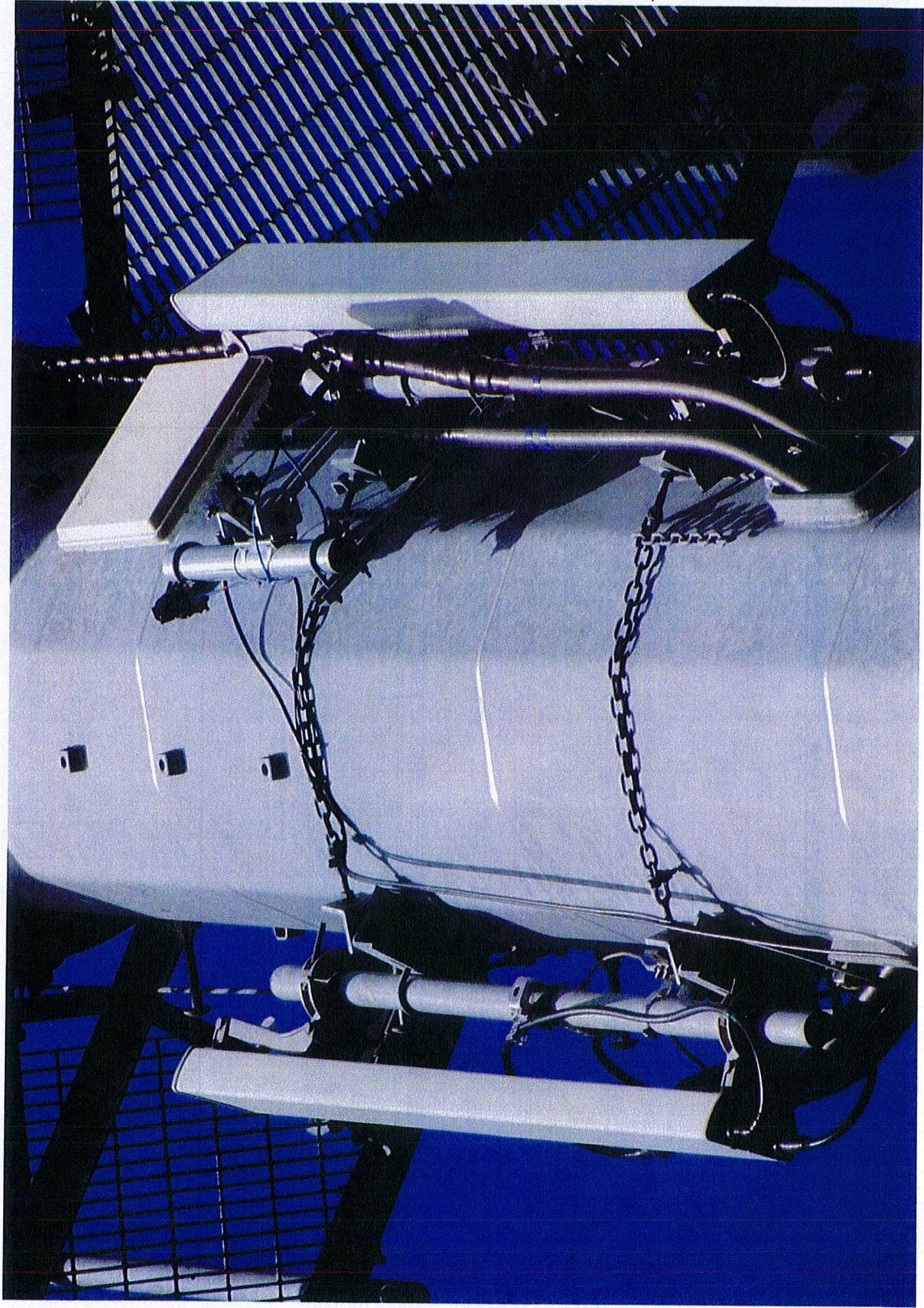
7.6 T-Mobile



7.7 T-Mobile



8.1 MetroPCS



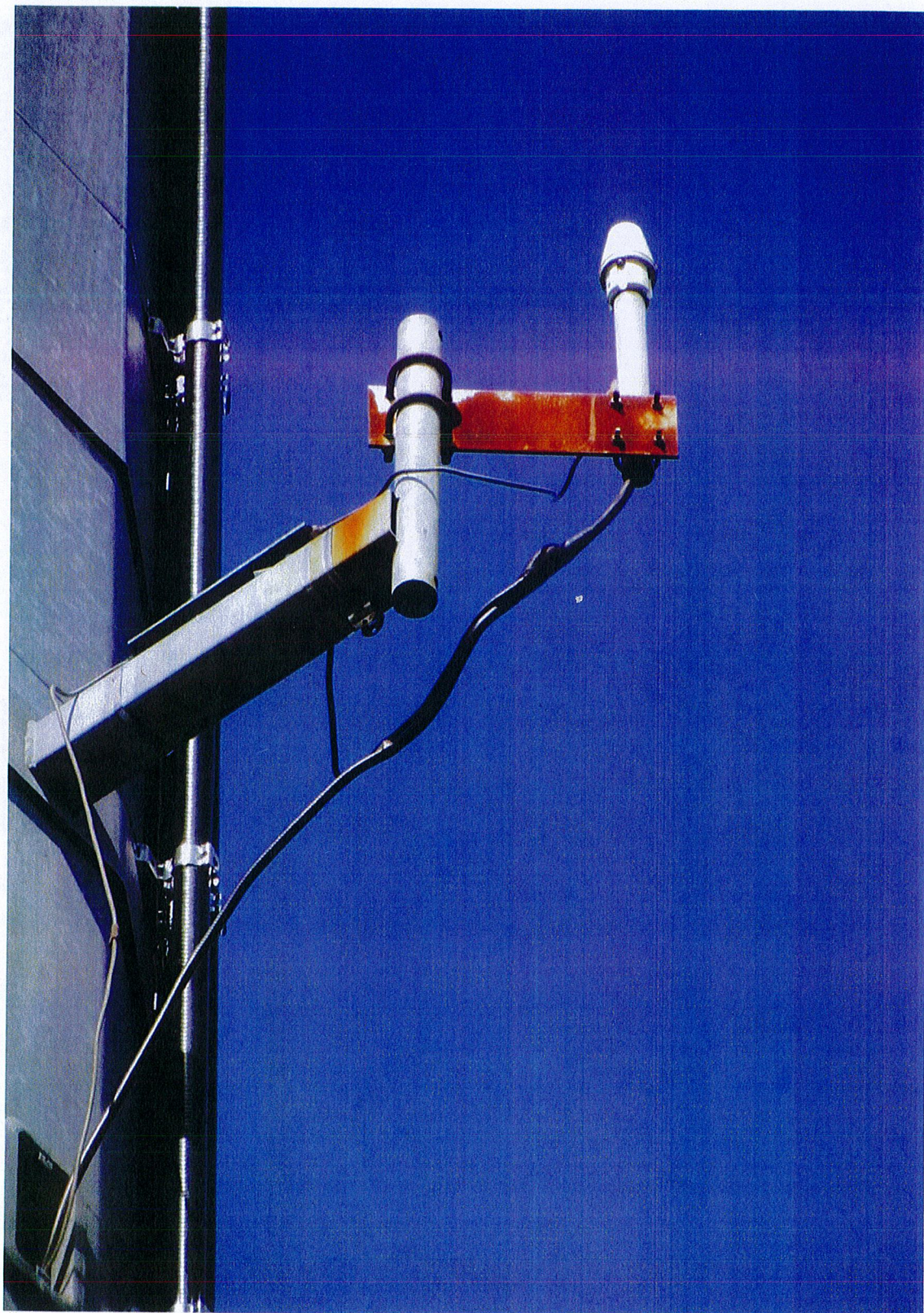
8.2 MetroPCS



8.3 MetroPCS



8.4 MetroPCS



9.0 GPS