



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

Internet: ct.gov/csc

Daniel F. Caruso

Chairman

May 27, 2010

Thomas J. Regan, Esq.
Brown Rudnick LLP
CityPlace I, 185 Asylum Street
Hartford, CT 06103

RE: **EM-CLEARWIRE-034-100318** – Clear Wireless LLC notice of intent to modify an existing telecommunications facility located at 45 Newtown Road, Danbury, Connecticut.

Dear Attorney Regan:

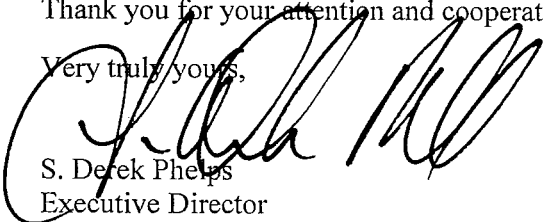
The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies.

The proposed modifications are to be implemented as specified here and in your notice dated March 18, 2010, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. 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. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,



S. Derek Phelps
Executive Director

SDP/MP/CDM/laf

c: The Honorable Mark D. Boughton, Mayor, City of Danbury
Dennis Elpern, City Planner, City of Danbury
48 Newtown Road Corporation



CITY OF DANBURY

OFFICE OF THE MAYOR
155 DEER HILL AVENUE
DANBURY, CONNECTICUT 06810

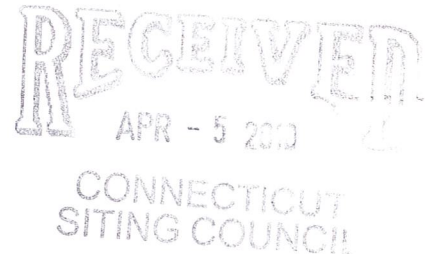
MARK D. BOUGHTON
MAYOR

(203) 797-4511
FAX (203) 796-1666
m.boughton@ci.danbury.ct.us

ORIGINAL

March 31, 2010

Hon. Daniel F. Caruso, Chairman
and Members of the Siting Council
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051



Re: EM-Clearwire-034-100318
Clearwire Corporation
Notice of Intent to modify an existing telecommunications facility
located at 45 Newtown Road, Danbury

Dear Chairman Caruso and Members of the Council:

I write in response to correspondence to me dated March 22, 2010 from S. Derek Phelps, Executive Director, requesting the City's comments regarding the above mentioned proposal. I respectfully request that the Council's consider the following:

1. In October 2009, the Siting Council approved a tower modification for this site to allow MetroPCS, New York, LLC to increase the tower height to 110 feet and add its antennae at 108 feet. The approved 14 foot extension to the previously existing 96 foot tower permitted carriers at 78 feet, 88 feet, 96 feet, and MetroPCS at 108 feet. A condition of that approval required submission of a letter "signed by a professional engineer duly licensed in Connecticut...certifying that the structural modifications have been completed and that the tower is within 100% of its structural capacity." The Council may wish to determine if it is in receipt of the required letter.
2. The current application by Clearwire is to replace antennae and add antenna and a microwave dish at 78 feet. In support of its request, Clearwire included information in its application indicating the tower extension as "proposed." The Council may wish to request clarification as to whether the tower was modified as approved and if so, as indicated above, a post-construction structural certification should be submitted. The Council may wish to require the Clearwire application, including the supporting structural analysis, to reflect actual conditions.
3. The structural analysis prepared by Structural Components for Clearwire dated March 4, 2010 was based on TIA-222-F. The structural analysis for MetroPCS dated October 6, 2009, also prepared by Structural Components, was based on TIA-222-G as the design standard. As we understand, standard "G" provides, among other things, for structural analysis based on greater wind speed and ice accumulation. Since Clearwire is proposing additional antennae, it certainly seems that the utilization of the more stringent design standard would afford greater protection to those in the vicinity of the tower as well as a more conservative analysis.

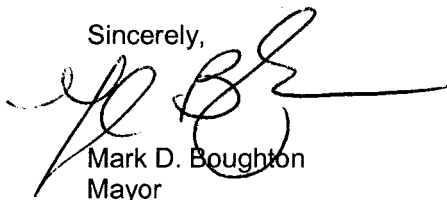
4. I am concerned that the applicant has not sufficiently demonstrated that the structural integrity of the tower will not be compromised by the addition of its equipment. This concern is based on various applicants using different design standards. To exacerbate this particular concern, there are two reports from the same firm using different design standards to substantiate the different applications. The Council may wish to seek to clarify and consolidate the information submitted as it pertains to the same tower.

5. I also bring to your attention the handwritten notation on the bottom of p. 7 of the Engineered Endeavors Inc. report which states "existing base pl fails". The Council may wish to seek clarification of this notation.

6. On a clerical note, the City notes that several documents for Clearwire utilize different address locations. The Council may wish to request that Clearwire review the address location and verify same.

I respectfully request that the Council require the applicant to provide any assurances it deems necessary to address the matters mentioned above and ensure the structural integrity and safety of the tower. Thank you for your consideration of the City's concerns and attention to this matter.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mark D. Boughton', with a long horizontal flourish extending to the right.

Mark D. Boughton
Mayor

cc: Dennis I. Elpern, Planning Director
Sharon B. Calitro, Deputy Planning Director

Em - Clearwire - 034 - 100318



THOMAS J. REGAN
Direct Dial: (860) 509-6522
tregan@brownrudnick.com

CityPlace I
185 Asylum
Street
Hartford
Connecticut
06103
tel 860.509.6500
fax 860.509.6501

ORIGINAL

Via Hand Delivery

March 18, 2010

RECEIVED
MAR 18 2010
CONNECTICUT
SITING COUNCIL

Daniel F. Caruso, Chairman
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RE: Clear Wireless, LLC – Notice of Exempt Modification

Dear Mr. Caruso:

On behalf of Clear Wireless, LLC, enclosed for filing you will find an original and five (5) copies of a "Notice of Exempt Modification" regarding a site located at 48 Newtown Road, Danbury. The \$625.00 filing fee is also enclosed. ⁴⁵

I would appreciate it if you could please date stamp the copy of this transmittal letter and return it to the courier delivering this package.

If you have any questions, please feel free to contact me.

Very truly yours,

BROWN RUDNICK LLP

By: Thomas J. Regan
Thomas J. Regan

Enclosures
cc/encl: Mayor Mark D. Boughton

40270723 v1 - REGANTJ - 025064/0017

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Daniel F. Caruso, Chairman
March 18, 2010
RE: Clear Wireless, LLC -- Notice of Exempt Modification
Page 2

cc/encls: via 1st Class Mail

City of Danbury
City Hall
Mayor Mark D. Boughton
155 Deer Hill Avenue
Danbury, CT 06810

CON EM-CLEARWIRE-034-100318

RECEIVED
MAR 18 2010
CONNECTICUT
COUNCIL

In re:

Clear Wireless LLC's Notice to Make an Exempt Modification to an Existing Facility at 45 Newtown Road, Danbury, Connecticut. : EXEMPT MODIFICATION NO. _____
: March 18, 2010

ORIGINAL

NOTICE OF EXEMPT MODIFICATION

Pursuant to Conn. Agencies Regs. §§ 16-50j-73 and 16-50j-72(b), Clear Wireless LLC ("Clearwire") hereby gives notice to the Connecticut Siting Council ("Council") and the City of Danbury of Clearwire's intent to make an exempt modification to a monopole tower (the "Tower") at 45 Newtown Road in Danbury, Connecticut. Specifically, Clearwire plans to remove and replace 3 antennas, add 3 Samsung Remote Radio Heads and add 2 Dragonwave dishes required for backhaul. Under the Council's regulations (Conn. Agencies Regs. § 16-50j-72(b)), Clearwire's plans do not constitute a modification subject to the Council's review because Clearwire will not change the height of the tower, will not extend the boundaries of the compound, will not increase the noise levels at the site, and will not increase the total radio frequency electromagnetic radiation power density at the site to levels above applicable standards.

Clearwire is currently developing a 4G wireless broadband network to provide high-speed wireless data and VoIP service within the State of Connecticut. Clearwire's 4G service leverages its WiMAX technology to enable enhanced wireless data communications. In order to accomplish the upgrade at this site, Clearwire plans to remove and replace 3 antennas, add 3 Remote Radio Heads, add 2 dishes and install additional WiMAX-related electronic equipment at the base of the Tower.

The Tower is a 110-foot (including the 10-foot extension) monopole tower located at 45 Newtown Road in Danbury, Connecticut (latitude 41° 23' 12", longitude -73° 25' 29.53"). The Tower is owned by 48 Newtown Road Corporation. Multiple carriers are currently located on the

Tower. Presently, Sprint Nextel Corporation (“Sprint”) has 12 CDMA antennas spread over three sectors with an antenna centerline at 78 feet. Sprint’s base station equipment is located adjacent to the base of the Tower. A site plan with the Tower specifications is attached.¹

Clearwire plans to remove and replace 3 existing antennas with 3 WiMAX antennas (one per sector). Clearwire also plans to add 3 Remote Radio Heads and 2 Dragonwave dishes. The new antennas, Remote Radio Heads and Dragonwave dishes will have the same centerline as the existing antennas – 78 feet. Six cables, 5/16” in diameter, will run to the new WiMAX antennas (two per panel). Additionally, 2 cables, 1/2” in diameter, will run to the new Dragonwave dishes (one per dish). To confirm that the Tower can support these changes, Clearwire commissioned Structural Components, LLC to perform a structural analysis of the Tower (attached). According to the structural analysis dated March 4, 2010, “... with the proposed loading ... and the existing loads, the tower and foundations satisfy the structural strength requirements...” (Page 1, Structural Analysis).

Clearwire will install its WiMAX equipment cabinet within the existing equipment building which is located within the existing compound. The dimensions of Clearwire’s equipment cabinet are as follows: 30-inches by 31-inches by 76-inches. Hence, no increase in the size of the boundaries of the site is necessary. Excluding brief, minor, construction-related noise during the addition of the antennas, Dragonwave dishes and the installation of the equipment cabinets, the proposed changes to the Tower will not increase noise levels at the site.

The addition of the new WiMAX antennas, Remote Radio Heads and Dragonwave dishes will not adversely impact the health and safety of the surrounding community or the people

¹ Please disregard the references to MetroPCS’s proposed installation. MetroPCS’s installation was previously approved under Petition No. 917.

working on the Tower. The total radio frequency exposure measured around the Tower will be well below the National Council on Radiation Protection and Measurements' ("NCRP") standard adopted by the Federal Communications Commission ("FCC"). The worst-case power density analysis for the antennas, measured at the base of the Tower, indicates that the proposed antennas will emit .000833% of the NCRP's standard for maximum permissible exposure. A cumulative power density analysis indicates that together, all of the antennas on the Tower will emit 55.42% of the NCRP's standard for maximum permissible exposure. Therefore, the power density levels will be well below the FCC mandated radio frequency exposure limits in all locations around the Tower, even with extremely conservative assumptions. The power density analysis is attached.

In conclusion, Clearwire's proposed plan to remove 3 existing antennas and install 3 WiMAX antennas, add 3 Remote Radio Heads, add 2 Dragonwave dishes and install WiMAX associated base station equipment does not constitute a modification subject to the Council's jurisdiction because Clearwire will not increase the height of the Tower, will not extend the boundaries of the site, will not increase the noise levels at the site, and the total radio frequency electromagnetic radiation power density will stay within all applicable standards. *See Conn. Agencies Regs. § 16-50j-72.*

Clear Wireless LLC

By: Thomas J. Regan
Thomas J. Regan
Brown Rudnick LLP
185 Asylum Street, CityPlace I
Hartford, CT 06103-3402
Email - tregan@brownrudnick.com
Phone - 860.509.6522
Fax - 860.509.6622

Certificate of Service

This is to certify that on this 18th day of March, 2010, the foregoing Notice of Exempt Modification was sent, via first class mail, to the following:

City of Danbury
City Hall
Mayor Mark D. Boughton
155 Deer Hill Avenue
Danbury, CT 06810

By: Thomas J. Regan
Thomas J. Regan

40270351 v1 - 025064/0017

clearwire

4400 CARILLON POINT
KIRKLAND, WA 98033

TRANSCEND WIRELESS, LLC
10 INDUSTRIAL AVENUE
MAHWAH, NJ 07430

A&E FIRM

URS CORPORATION A/E/S

500 ENTERPRISE DRIVE, SUITE 3B
ROCKY HILL, CONNECTICUT
1-(860)-529-8882

NO.	DATE	REVISIONS	BY	CHK/APP'D
A	10/26/09	FINAL	KAP	JCF ICA
A	10/06/09	REVIEW	PD	JCF ICA

NOT TO SCALE DESIGNED BY: JCF DRAWN BY: PD

A&E SEAL



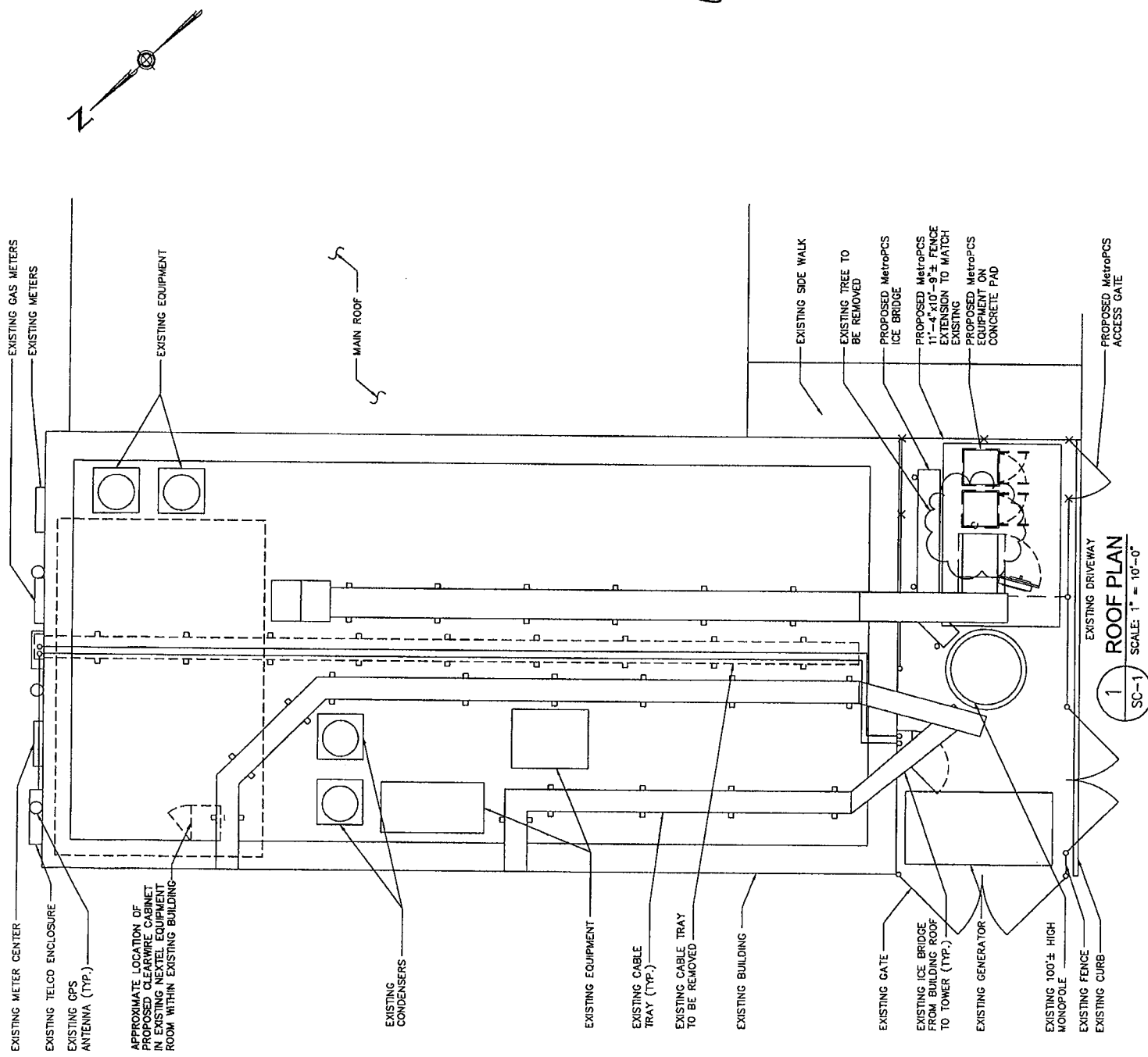
LATITUDE: 41°-24'-12.53"
LONGITUDE: 73°-25'-27.9"

DANBURY SOUTH

CT-BDR001B

**45 NEWTOWN ROAD
DANBURY, CT 06105**

PROJECT NO.	DRAWING NAME	DATE	SHEET NO./REV
TW3-021	SC-1	10/06/09	1 OF 2
36924371			0



1
SC-1
ROOF PLAN
SCALE: 1" = 10'-0"



To: HPC
From: Julius De La Cruz – Radio Frequency Engineer
Cc: Micah Hawthorne
Subject: Power Density Report for CT-BDR0018
Date: March 12, 2010

1. Introduction:

This report is the result of Electromagnetic Field Intensities (EMF – Power Densities) study for the Clearwire broadband antenna installation on a self-support tower at 48 Newton Road, Danbury, CT 06810. This study incorporates the most conservative consideration for determining the practical combined worst case power density levels that would be theoretically encountered from locations surrounding the transmitting location:

2: Discussion:

The following assumptions were used in the calculations:

- 1) The emissions from Clearwire transmitters are in the (2496 – 2690) Frequency Band
- 2) The emissions from the Clearwire microwave dishes are in the 11 GHz Frequency Band
- 3) The model number for Clearwire antenna is Kathrein 840-10054
- 4) The model number for the microwave dish is Dragonwave A-ANT-28G-2-C
- 5) The Clearwire panel antenna centerline is 78 feet.
- 6) The Clearwire microwave dish centerline is 78 feet.
- 7) The Maximum Transmit Power from any Clearwire panel antenna is 251 Watts Effective Isotropic Radiated Power (EIRP) assuming 2 channels per sector.
- 8) The Maximum Transmit Power from any Clearwire microwave dish is 346 Watts Effective Isotropic Radiated Power (EiRP) assuming 1 channel per dish.
- 9) All antennas are simultaneously transmitting and receiving 24 hours per day.
- 10) The average ground level of the studied area does not change significantly with respect to the transmitting location.

Equations given in “FCC OET Bulletin 65, Edition 97-01” were used with the above information to perform the calculations.

3: Conclusion:

Based on the above worst case assumptions, the power density calculation from the Clearwire antenna installation on a self-support tower at 48 Newton Road, Danbury, CT 06810 is 0.0000083 mW/cm². This value represents 0.000833% of the Maximum Permissible Exposure (MPE) standard of 1 milliwatt per square centimeter (mW/cm²) set forth in the FCC/ANSI/IEEE C95-1-1991. Furthermore, the proposed antenna location for Clearwire will not interfere with existing public safety communications, AM or FM radio broadcasts, TV, Police Communications, HAM Radio communications or any other signals in the area.

The combined Power Density from all other carriers is 55.42%. The combined Power Density for this site is 55.420833% of the M.P.E. standard.

Julius De La Cruz
RF Engineer



Structural Components, LLC
1617 Pearl Street, Unit A
Boulder, CO 80302

Voice: 866-386-7622
Fax: 303-962-3577

March 4, 2010

Joe Falivene
URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067

Re: Structural Analysis Report
Structure: 110' Monopole
Site Address: 48 Newtown Road, Danbury, CT
Site Name: Danbury South
Site Number: NY6314
SC Number: 100048
Status: **Passes**

Dear Mr. Falivene:

Per your request, Structural Components, LLC, has completed a structural analysis of the modified 110' Monopole named Danbury South, located in Danbury, Fairfield County, Connecticut, to verify the tower's compliance to the TIA-222-F Structural Standard for Steel Antenna Towers and Antenna Supporting Structures for the proposed antenna additions.

We are pleased to inform you that with the proposed loading for Sprint/Nextel at 78.0 feet and the existing loads, the tower and foundations satisfy the structural strength requirements of the TIA-222-F standard using a 85 mph fastest-mile basic wind speed with no ice and a 74 mph fastest-mile basic wind speed with 1/2" ice. Please refer to the following report for detailed loading descriptions.

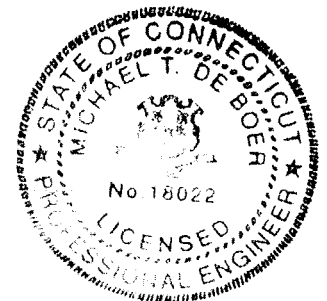
Please refer to the following structural analysis report, which gives complete details of the analysis including data used, assumptions made, loading considered, and results.

We trust you find this report satisfactory. Please do not hesitate to contact us if you should have any questions or concerns.

Best Regards,
Structural Components LLC

Lee Maggert
Structural Engineering Dept.

Michael T. DeBoer P.E.
Connecticut PE: 0018022
Expires: 01/31/2011



1 INTRODUCTION

Structural Components, LLC, has structurally analyzed the following tower at the request of Joe Falivene of URS Corporation, to determine whether the tower complies with applicable building codes and design standards for the proposed loading configuration.

Tower Information	
Type	Monopole
Height	110ft

Site Information	
Site Name	Danbury South
Site Number	NY6314
Street Address / Lat. & Long.	48 Newton Rd.
County	Fairfield
City, State	Danbury, CT

The analysis was performed using RISATower v5.4, a structural analysis program developed by Risa Technologies, LLC specifically for the communication tower industry.

Information about the tower was provided by URS Corporation. Structural Components, LLC visited the site on 09/09/2009 to perform a tower and antenna mapping.

2 INFORMATION USED IN THE ANALYSIS

The following information was either provided to us or gathered by us for use in the structural analysis.

Data	Document	Author	Date	File
Tower	Structural Analysis	Engineered Endeavors, Inc.	07/07/2009	15947-E01
	Tower Mapping	Structural Components, LLC	09/09/2009	090239
	Modification Drawings	Structural Components, LLC	02/16/2010	100014
Existing Loading	Structural Analysis	Engineered Endeavors, Inc.	07/07/2009	15947-E01
	Tower Mapping	Structural Components, LLC	09/09/2009	090239
Proposed Loading	Email	URS Corporation	02/19/2010	---
Foundation	Structural Analysis	Engineered Endeavors, Inc	07/07/2009	15947-E01
Soils	Structural Analysis	Engineered Endeavors, Inc	07/07/2009	15947-E01

The following assumptions were made in order to complete the analysis. These assumptions must be checked. If they do not accurately represent the existing or proposed tower, foundation, soil, and loading conditions, we must be notified so that we can make the appropriate changes to our analysis, conclusions, and recommendations.

1. The tower and foundation are constructed as shown in the provided drawings, previous structural analysis reports, mapping reports, photos, and/or other documents.
2. All information obtained during the 09/09/2009 site visit performed by Structural Components, LLC takes precedence over conflicting information in the provided documents.
3. The tower and foundation are in good condition with no corrosion or damage and there have been no fatiguing issues with the base plate, anchor rods, or pole witch may reduce the towers carrying capacity.
4. The tower and foundation have not been modified except as indicated in the provided information or in this report.
5. The existing foundation has been designed and installed in accordance with applicable building codes and standards for the original design loading.

3 DESIGN STANDARD

The tower analysis was performed in accordance with the following design criteria.

Standard:	TIA-222-F <i>Structural Standards for Steel Antenna Towers and Antenna Supporting Structures</i>
Building Code:	2006 International Building Code
Design Basic Wind Speed without Ice:	85 mph fastest-mile
Design Basic Wind Speed with Ice:	74 mph fastest-mile
Ice Thickness:	1/2" radial

4 APPURTENANCES

The following antennas, mounts, transmission lines, and other appurtenances were considered for the structural analysis.

Elev. (ft) (i)	Appurtenance	Line ⁽²⁾	Notes
108.0	(3) Kathrein 800-10504 (3) Kathrein 742-351 (3) T-Arms	(12) 1-5/8"	MetroPCS
98.0	(6) 7770 Panel Antennas (6) TMA's (1) LP Platform w/ Hand Rails	(12) 1-5/8"	AT&T Existing
88.0	(6) 948F85T2E-M (6) 48" x 12" x 3" Panel Antennas (1) LP Platform w/ Hand Rails	(12) 1-5/8"	Verizon Existing
78.0	(9) Decibel DB844H90-XY (1) LP Profile Platform	(12) 1-1/4"	Sprint/Nextel Existing
78.0	(3) Kathrein 840 10054 (3) Samsung DAP Head (2) Dragonwave A-ANT-28G-2-C Dish Antennas	(6) 5/16" (2) 1/2"	Sprint/Nextel Proposed

Notes:

- Elevations reference centerline of panel, yagi, and dish antennas, and base of whip antennas, in relation to the steel base of the tower.
- Proposed lines to be placed inside of pole. See mapping report for existing coax line placement.

5 RESULTS

5.1 TOWER MEMBER STRESS LEVELS

The tower has the following stress ratios in its structural members.

Elev. (ft)	Member	Ratio
0 - 110	Pole	0.89
0	Base Plate	0.72
0	Anchor Bolt	0.80

Stress ratio (SR) criteria:

SR \leq 1.00 is completely within code limits.

SR > 1.00 is outside acceptable tolerance of code limits and requires structural modifications.

5.2 FOUNDATION REACTIONS

The reactions listed below are for the full design wind speed loading without ice listed in section 3.

Reaction Type	Original Design Magnitude	Current Analysis Magnitude	Foundation Status
Moment (kip - feet)	2281	1348	Passes
Shear (kips)	28.7	18.4	
Axial (kips)	31.5	22.4	

The existing foundation was also examined with the current loading scenario and found to be structurally adequate.

5.3 TOWER DEFLECTION

The deflections are listed below for critical tower elevations using the serviceability wind speed listed in section 3.

Elev. (ft)	Displacement (in)	Sway (deg)	Twist (deg)
108	24.204	1.8698	0.0032
98	20.297	1.8545	0.0029
88	16.499	1.7853	0.0025
78	12.961	1.6326	0.0021

6 CONCLUSIONS

With the proposed loadings listed in section 4, the tower and foundation satisfy the structural strength requirements of the standards and codes listed in section 3. **No structural modifications are required at this time.**

APPENDIX A
Tower Profile and Calculations

Section	1	2	3	4	5
Length (ft)	13.50	0.50	50.00	30.00	20.00
Number of Sides	1	1	18	18	18
Thickness (in)	0.3750	0.3750	0.2500	0.3125	0.3890
Socket Length (ft)			4.00		
Top Dia (in)	16.0000	16.0000	17.4900	26.6408	33.3920
Bot Dia (in)	16.0000	17.4900	27.9800	33.3920	37.0000
Grade		A36		A572-65	
Weight (lb)	845.5	32.8	3035.6	3007.6	2924.7

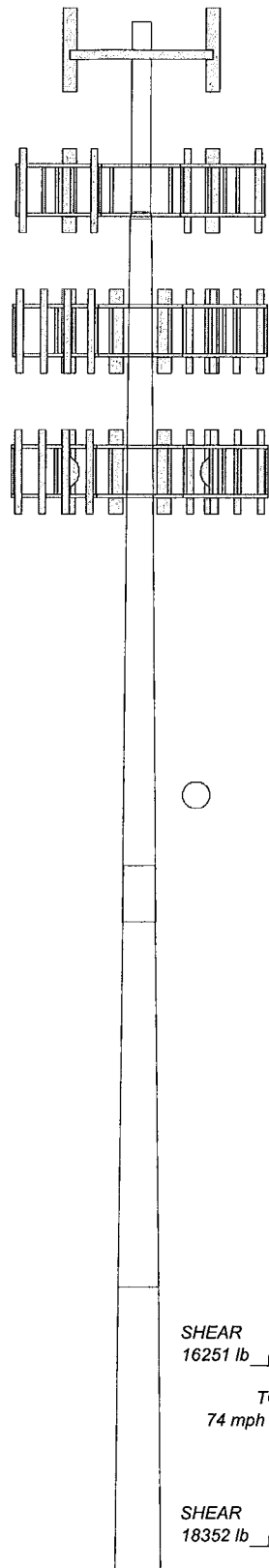
110.0 ft

96.5 ft

46.0 ft

20.0 ft

0.0 ft



DESIGNED APPURTENANCE LOADING

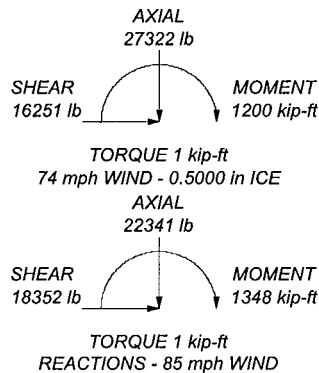
TYPE	ELEVATION	TYPE	ELEVATION
800-10504 (MetroPCS)	108	(2) 48" x 12" x 3" Panel (Verizon)	88
800-10504 w/ 4.5' Pipe (MetroPCS)	108	(2) 48" x 12" x 3" Panel (Verizon)	88
800-10504 w/ 4.5' Pipe (MetroPCS)	108	Low Profile Platform w/ Rails	88
742-351 (MetroPCS)	108	(3) DB844H90-XY w/Mount Pipe (Sprint)	78
742-351 (MetroPCS)	108	(3) DB844H90-XY w/Mount Pipe (Sprint)	78
742-351 (MetroPCS)	108	(3) DB844H90-XY w/Mount Pipe (Sprint)	78
(3) 12' T-Arms	108	(3) DB844H90-XY w/Mount Pipe (Sprint)	78
(2) 7770.xx w/ mt (ATT)	98	(3) DB844H90-XY w/Mount Pipe (Sprint)	78
(2) 7770.xx w/ mt (ATT)	98	840-10054 w/ Mount Pipe (Sprint)	78
(2) 7770.xx w/ mt (ATT)	98	840-10054 w/ Mount Pipe (Sprint)	78
(2) TYP. TMA (ATT)	98	840-10054 w/ Mount Pipe (Sprint)	78
(2) TYP. TMA (ATT)	98	Samsung DAP Head (Sprint)	78
(2) TYP. TMA (ATT)	98	Samsung DAP Head (Sprint)	78
(2) TYP. TMA (ATT)	98	Samsung DAP Head (Sprint)	78
Low Profile Platform w/ Rails (ATT)	98	Samsung DAP Head (Sprint)	78
(2) 948F85T2E-M (Verizon)	88	Low Profile Platform (Sprint)	78
(2) 948F85T2E-M (Verizon)	88	Low Profile Platform (Sprint)	78
(2) 948F85T2E-M (Verizon)	88	A-ANT-28G-2-C	78
(2) 948F85T2E-M (Verizon)	88	A-ANT-28G-2-C	78
(2) 48" x 12" x 3" Panel (Verizon)	88		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Proposed 14ft tall extension.
6. Bottom 20ft reinforced with three sides SWITCHBLADE.
7. TOWER RATING: 88.2%



Structural Components, LLC		Job: 100048	
1617 Pearl Street, Unit A Boulder, CO 80302 Phone: 866.386.7622 FAX: 720.489.3764			
Project: Danbury Tower Extension	Client: URS	Drawn by: LBM	App'd:
Code: TIA/EIA-222-F	Date: 03/04/10	Scale: NTS	Dwg No. E-1
Path:			

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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 Fairfield County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.5000 in.

Ice density of 56 pcf.

A wind speed of 74 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

Proposed 14ft tall extension..

Bottom 20ft reinforced with three sides SWITCHBLADE..

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	Retension 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	110.00-96.50	13.50	0.00	Round	16.0000	16.0000	0.3750		A36 (36 ksi)
L2	96.50-96.00	0.50	0.00	Round	16.0000	17.4900	0.3750		A36 (36 ksi)
L3	96.00-46.00	50.00	4.00	18	17.4900	27.9800	0.2500	1.0000	A572-65 (65 ksi)
L4	46.00-20.00	30.00	0.00	18	26.6408	33.3920	0.3125	1.2500	A572-65 (65 ksi)
L5	20.00-0.00	20.00		18	33.3920	37.0000	0.3890	1.5560	A572-65

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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	(65 ksi)

Tapered Pole Properties

Section	Tip Dia.	Area	I	r	C	I/C	J	I/Q	w	w/t
	in	in ²	in ⁴	in	in	in ³	in ⁴	in ²	in	
L1	16.0000	18.4078	562.1910	5.5313	8.0000	70.2739	1122.8505	9.1984	0.0000	0
	16.0000	18.4078	562.1910	5.5313	8.0000	70.2739	1122.8505	9.1984	0.0000	0
L2	16.0000	18.4078	562.1910	5.5313	8.0000	70.2739	1122.8505	9.1984	0.0000	0
	17.4900	20.1631	738.8470	6.0587	8.7450	84.4879	1475.6812	10.0755	0.0000	0
L3	17.7598	13.6799	513.6842	6.1202	8.8849	57.8153	1028.0442	6.8413	2.6382	10.553
	28.4116	22.0038	2137.6372	9.8442	14.2138	150.3912	4278.0871	11.0040	4.4845	17.938
L4	27.9658	26.1144	2286.9825	9.3465	13.5335	168.9864	4576.9743	13.0597	4.1388	13.244
	33.9071	32.8107	4535.9808	11.7432	16.9631	267.4023	9077.9301	16.4085	5.3270	17.046
L5	33.9071	40.7483	5607.3057	11.7161	16.9631	330.5583	11221.9896	20.3780	5.1924	13.348
	37.5708	45.2031	7654.7101	12.9969	18.7960	407.2521	15319.4925	22.6058	5.8274	14.98

Tower Elevation	Gusset Area	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 110.00-96.50				1	1	1		
L2 96.50-96.00				1	1	1		
L3 96.00-46.00				1	1	1		
L4 46.00-20.00				1	1	1		
L5 20.00-0.00				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	plf
LDF7-50A (1-5/8 FOAM) (MetroPCS)	A	No	CaAa (Out Of Face)	110.00 - 0.00	2	No Ice 1/2" Ice	0.20 0.30
LDF7-50A (1-5/8 FOAM) (MetroPCS)	A	No	Inside Pole	110.00 - 0.00	10	No Ice 1/2" Ice	0.00 0.00
LDF7-50A (1-5/8 FOAM) (ATT)	B	No	CaAa (Out Of Face)	98.00 - 0.00	2	No Ice 1/2" Ice	0.20 0.30
LDF7-50A (1-5/8 FOAM) (ATT)	B	No	Inside Pole	98.00 - 0.00	10	No Ice 1/2" Ice	0.00 0.00
LDF7-50A (1-5/8 FOAM) (Verizon)	B	No	Inside Pole	88.00 - 0.00	12	No Ice 1/2" Ice	0.00 0.00
LDF6-50A (1-1/4 FOAM) (Sprint)	B	No	Inside Pole	78.00 - 0.00	12	No Ice 1/2" Ice	0.00 0.00

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A		Weight
						ft ² /ft	plf	
LDF4P-50A (1/2 FOAM)	A	No	Inside Pole	78.00 - 0.00	2	No Ice	0.00	0.15
597-6013 (5/16 COPPER)	C	No	Inside Pole	78.00 - 0.00	6	1/2" Ice	0.00	0.15
						No Ice	0.00	0.03
SC Heavy Series Wave	A	No	CaAa (Out Of Face)	20.00 - 0.00	1	1/2" Ice	0.00	0.03
						No Ice	0.24	31.65
SC Heavy Series Wave	B	No	CaAa (Out Of Face)	20.00 - 0.00	1	1/2" Ice	0.34	33.39
						No Ice	0.24	31.65
SC Heavy Series Wave	C	No	CaAa (Out Of Face)	20.00 - 0.00	1	1/2" Ice	0.34	33.39
						No Ice	0.24	31.65
						1/2" Ice	0.34	33.39

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 lb
L1	110.00-96.50	A	0.000	0.000	0.000	5.346	132.84
		B	0.000	0.000	0.000	0.594	14.76
		C	0.000	0.000	0.000	0.000	0.00
L2	96.50-96.00	A	0.000	0.000	0.000	0.198	4.92
		B	0.000	0.000	0.000	0.198	4.92
		C	0.000	0.000	0.000	0.000	0.00
L3	96.00-46.00	A	0.000	0.000	0.000	19.800	501.60
		B	0.000	0.000	0.000	19.800	1158.72
		C	0.000	0.000	0.000	0.000	5.76
L4	46.00-20.00	A	0.000	0.000	0.000	10.296	263.64
		B	0.000	0.000	0.000	10.296	717.60
		C	0.000	0.000	0.000	0.000	4.68
L5	20.00-0.00	A	0.000	0.000	0.000	12.640	835.70
		B	0.000	0.000	0.000	12.640	1184.90
		C	0.000	0.000	0.000	4.720	636.50

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 lb
L1	110.00-96.50	A	0.500	0.000	0.000	0.000	8.046	173.74
		B		0.000	0.000	0.000	0.894	19.30
		C		0.000	0.000	0.000	0.000	0.00
L2	96.50-96.00	A	0.500	0.000	0.000	0.000	0.298	6.43
		B		0.000	0.000	0.000	0.298	6.43
		C		0.000	0.000	0.000	0.000	0.00
L3	96.00-46.00	A	0.500	0.000	0.000	0.000	29.800	653.09
		B		0.000	0.000	0.000	29.800	1310.21
		C		0.000	0.000	0.000	0.000	5.76
L4	46.00-20.00	A	0.500	0.000	0.000	0.000	15.496	342.42
		B		0.000	0.000	0.000	15.496	796.38
		C		0.000	0.000	0.000	0.000	4.68
L5	20.00-0.00	A	0.500	0.000	0.000	0.000	18.640	931.24
		B		0.000	0.000	0.000	18.640	1280.44
		C		0.000	0.000	0.000	6.720	671.44

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Feed Line Center of Pressure

Section	Elevation	CP _x	CP _z	CP _x Ice	CP _z Ice
	ft	in	in	in	in
L1	110.00-96.50	0.0430	-0.4218	0.0552	-0.5415
L2	96.50-96.00	0.3282	-0.1895	0.4045	-0.2335
L3	96.00-46.00	0.3628	-0.2094	0.4627	-0.2672
L4	46.00-20.00	0.3921	-0.2264	0.5153	-0.2975
L5	20.00-0.00	0.3404	-0.1965	0.4353	-0.2513

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _{Front} ft ²	C _A A _{Side} ft ²	Weight lb	
800-10504 (MetroPCS)	A	From Leg	4.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	3.34 3.69	1.86 2.18	22.00 40.00
800-10504 w/ 4.5' Pipe (MetroPCS)	B	From Leg	4.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	3.34 3.69	2.88 3.48	38.43 66.58
800-10504 w/ 4.5' Pipe (MetroPCS)	C	From Leg	4.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	3.34 3.69	2.88 3.48	38.43 66.58
742-351 (MetroPCS)	A	From Leg	4.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	5.89 6.30	1.73 2.04	29.80 57.10
742-351 (MetroPCS)	B	From Leg	4.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	5.89 6.30	1.73 2.04	29.80 57.10
742-351 (MetroPCS)	C	From Leg	4.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	5.89 6.30	1.73 2.04	29.80 57.10
(3) 12' T-Arms	C	None		0.0000	108.00	No Ice 1/2" Ice	10.00 14.00	10.00 14.00	1000.00 1100.00

(2) 7770.xx w/ mt (ATT)	A	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	6.09 6.56	4.38 5.05	65.88 113.48
(2) 7770.xx w/ mt (ATT)	B	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	6.09 6.56	4.38 5.05	65.88 113.48
(2) 7770.xx w/ mt (ATT)	C	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	6.09 6.56	4.38 5.05	65.88 113.48
(2) TYP. TMA (ATT)	A	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.70 0.82	0.35 0.45	15.00 19.80
(2) TYP. TMA (ATT)	B	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.70 0.82	0.35 0.45	15.00 19.80
(2) TYP. TMA	C	From Leg	4.00	0.0000	98.00	No Ice	0.70	0.35	15.00

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz Lateral	Vert					
			ft	ft	°	ft	ft ²	ft ²	lb
(ATT)			0.00	0.00		1/2" Ice	0.82	0.45	19.80
Low Profile Platform w/ Rails (ATT)	C	None			0.0000	98.00	No Ice	25.00	1600.00
***							1/2" Ice	28.00	2000.00
(2) 948F85T2E-M (Verizon)	A	From Leg	4.00	0.00	0.0000	88.00	No Ice	1.82	8.50
			0.00	0.00			1/2" Ice	2.11	27.19
(2) 948F85T2E-M (Verizon)	B	From Leg	4.00	0.00	0.0000	88.00	No Ice	1.82	8.50
			0.00	0.00			1/2" Ice	2.11	27.19
(2) 948F85T2E-M (Verizon)	C	From Leg	4.00	0.00	0.0000	88.00	No Ice	1.82	8.50
			0.00	0.00			1/2" Ice	2.11	27.19
(2) 48" x 12" x 3" Panel (Verizon)	A	From Leg	4.00	0.00	0.0000	88.00	No Ice	5.60	50.00
			0.00	0.00			1/2" Ice	6.19	75.00
(2) 48" x 12" x 3" Panel (Verizon)	B	From Leg	4.00	0.00	0.0000	88.00	No Ice	5.60	50.00
			0.00	0.00			1/2" Ice	6.19	75.00
(2) 48" x 12" x 3" Panel (Verizon)	C	From Leg	4.00	0.00	0.0000	88.00	No Ice	5.60	50.00
			0.00	0.00			1/2" Ice	6.19	75.00
Low Profile Platform w/ Rails	C	None			0.0000	88.00	No Ice	25.00	1600.00
***							1/2" Ice	28.00	2000.00

(3) DB844H90-XY w/Mount Pipe (Sprint)	A	From Leg	4.00	0.00	0.0000	78.00	No Ice	3.58	35.55
			0.00	0.00			1/2" Ice	4.20	77.48
(3) DB844H90-XY w/Mount Pipe (Sprint)	B	From Leg	4.00	0.00	0.0000	78.00	No Ice	3.58	35.55
			0.00	0.00			1/2" Ice	4.20	77.48
(3) DB844H90-XY w/Mount Pipe (Sprint)	C	From Leg	4.00	0.00	0.0000	78.00	No Ice	3.58	35.55
			0.00	0.00			1/2" Ice	4.20	77.48
840-10054 w/ Mount Pipe (Sprint)	A	From Leg	4.00	0.00	0.0000	78.00	No Ice	5.29	49.60
			0.00	0.00			1/2" Ice	5.68	82.79
840-10054 w/ Mount Pipe (Sprint)	B	From Leg	4.00	0.00	0.0000	78.00	No Ice	5.29	49.60
			0.00	0.00			1/2" Ice	5.68	82.79
840-10054 w/ Mount Pipe (Sprint)	C	From Leg	4.00	0.00	0.0000	78.00	No Ice	5.29	49.60
			0.00	0.00			1/2" Ice	5.68	82.79
Samsung DAP Head (Sprint)	A	From Leg	4.00	0.00	0.0000	78.00	No Ice	1.80	33.00
			0.00	0.00			1/2" Ice	1.99	44.58
Samsung DAP Head (Sprint)	B	From Leg	4.00	0.00	0.0000	78.00	No Ice	1.80	33.00
			0.00	0.00			1/2" Ice	1.99	44.58
Samsung DAP Head (Sprint)	C	From Leg	4.00	0.00	0.0000	78.00	No Ice	1.80	33.00
			0.00	0.00			1/2" Ice	1.99	44.58
Low Profile Platform (Sprint)	C	None			0.0000	78.00	No Ice	15.00	1200.00
							1/2" Ice	17.50	1500.00

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Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				Horz Lateral	Vert						
				ft	°	°	ft	ft	ft ²	lb	
A-ANT-28G-2-C	B	Paraboloid w/o Radome	From Leg	4.00	0.0000	78.00	2.17	No Ice	3.72	18.00	
				0.00	0.00				1/2" Ice	4.01	20.56
A-ANT-28G-2-C	C	Paraboloid w/o Radome	From Leg	4.00	0.0000	78.00	2.17	No Ice	3.72	18.00	
				0.00	0.00				1/2" Ice	4.01	20.56

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 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service

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Comb. No.	Description
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	110 - 96.5	Pole	Max Tension	2	0.05	0.00	-0.00
			Max. Compression	14	-5418.87	-0.00	-0.08
			Max. Mx	5	-3825.55	-25.74	-0.04
			Max. My	8	-3821.67	-0.00	-26.31
			Max. Vy	5	4938.09	-25.74	-0.04
			Max. Vx	2	-4984.49	-0.00	26.20
L2	96.5 - 96	Pole	Max. Torque	5			-0.21
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-5469.82	-0.01	-0.08
			Max. Mx	5	-3865.62	-28.22	-0.04
			Max. My	8	-3861.76	-0.00	-28.81
			Max. Vy	5	4975.60	-28.22	-0.04
L3	96 - 46	Pole	Max. Vx	2	-5022.49	-0.00	28.70
			Max. Torque	5			-0.19
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-15903.46	-0.18	-0.08
			Max. Mx	5	-11612.07	-531.46	3.22
			Max. My	2	-11608.62	-0.07	533.45
L4	46 - 20	Pole	Max. Vy	5	14468.76	-531.46	3.22
			Max. Vx	2	-14496.41	-0.07	533.45
			Max. Torque	4			-0.54
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21073.24	-0.33	0.00
			Max. Mx	5	-16459.62	-996.52	6.72
L5	20 - 0	Pole	Max. My	2	-16458.39	-0.12	999.30
			Max. Vy	5	16500.68	-996.52	6.72
			Max. Vx	2	-16527.49	-0.12	999.30
			Max. Torque	4			-0.54
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-27321.72	-0.45	0.07
			Max. Mx	5	-22333.23	-1344.66	9.01
			Max. My	2	-22333.20	-0.16	1347.95
			Max. Vy	5	18335.48	-1344.66	9.01
			Max. Vx	2	-18361.40	-0.16	1347.95
			Max. Torque	3			-0.56

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	15	27321.72	0.00	16251.38
	Max. H _x	11	22341.25	18325.72	112.40
	Max. H _z	2	22341.25	-0.00	18351.61
	Max. M _x	2	1347.95	-0.00	18351.61
	Max. M _z	5	1344.66	-18325.72	112.40
	Max. Torsion	11	0.32	18325.72	112.40

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Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
	Min. Vert	1	22341.25	0.00	0.00
	Min. H _x	5	22341.25	-18325.72	112.40
	Min. H _z	8	22341.25	-0.00	-18229.80
	Min. M _x	8	-1338.28	-0.00	-18229.80
	Min. M _z	11	-1344.34	18325.72	112.40
	Min. Torsion	3	-0.56	-9229.18	15781.63

Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear _x lb	Shear _z lb	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	22341.25	0.00	0.00	0.06	-0.16	0.00
Dead+Wind 0 deg - No Ice	22341.25	0.00	-18351.61	-1347.95	-0.16	0.25
Dead+Wind 30 deg - No Ice	22341.25	9229.18	-15781.63	-1158.39	-677.77	0.56
Dead+Wind 60 deg - No Ice	22341.25	15880.29	-9162.23	-672.86	-1165.32	0.53
Dead+Wind 90 deg - No Ice	22341.25	18325.72	-112.40	-9.01	-1344.66	0.32
Dead+Wind 120 deg - No Ice	22341.25	15953.85	9009.12	660.63	-1171.26	0.06
Dead+Wind 150 deg - No Ice	22341.25	9094.21	15779.61	1158.37	-666.88	-0.22
Dead+Wind 180 deg - No Ice	22341.25	0.00	18229.80	1338.28	-0.16	-0.25
Dead+Wind 210 deg - No Ice	22341.25	-9094.21	15779.61	1158.37	666.55	-0.21
Dead+Wind 240 deg - No Ice	22341.25	-15953.85	9009.12	660.63	1170.93	-0.31
Dead+Wind 270 deg - No Ice	22341.25	-18325.72	-112.40	-9.01	1344.34	-0.32
Dead+Wind 300 deg - No Ice	22341.25	-15880.29	-9162.23	-672.86	1164.99	-0.29
Dead+Wind 330 deg - No Ice	22341.25	-9229.18	-15781.63	-1158.38	677.44	-0.13
Dead+Ice+Temp	27321.72	0.00	0.00	-0.07	-0.45	0.00
Dead+Wind 0 deg+Ice+Temp	27321.72	-0.00	-16251.38	-1199.53	-0.47	0.29
Dead+Wind 30 deg+Ice+Temp	27321.72	8165.65	-13984.09	-1031.49	-602.76	0.51
Dead+Wind 60 deg+Ice+Temp	27321.72	14058.33	-8114.71	-598.91	-1036.73	0.45
Dead+Wind 90 deg+Ice+Temp	27321.72	16224.08	-90.87	-7.49	-1196.30	0.23
Dead+Wind 120 deg+Ice+Temp	27321.72	14117.80	7990.92	588.67	-1041.59	-0.02
Dead+Wind 150 deg+Ice+Temp	27321.72	8056.53	13982.46	1031.23	-593.86	-0.27
Dead+Wind 180 deg+Ice+Temp	27321.72	-0.00	16152.91	1191.37	-0.47	-0.29
Dead+Wind 210 deg+Ice+Temp	27321.72	-8056.53	13982.46	1031.23	592.92	-0.23
Dead+Wind 240 deg+Ice+Temp	27321.72	-14117.80	7990.92	588.67	1040.64	-0.27
Dead+Wind 270 deg+Ice+Temp	27321.72	-16224.08	-90.87	-7.49	1195.36	-0.23
Dead+Wind 300 deg+Ice+Temp	27321.72	-14058.33	-8114.71	-598.91	1035.79	-0.16
Dead+Wind 330 deg+Ice+Temp	27321.72	-8165.65	-13984.09	-1031.49	601.82	-0.02
Dead+Wind 0 deg - Service	22341.25	0.00	-6350.04	-466.94	-0.16	0.09
Dead+Wind 30 deg - Service	22341.25	3193.49	-5460.77	-401.26	-234.91	0.19
Dead+Wind 60 deg - Service	22341.25	5494.91	-3170.32	-233.06	-403.81	0.19
Dead+Wind 90 deg - Service	22341.25	6341.08	-38.89	-3.08	-465.94	0.11
Dead+Wind 120 deg - Service	22341.25	5520.36	3117.34	228.91	-405.87	0.02
Dead+Wind 150 deg - Service	22341.25	3146.79	5460.07	401.34	-231.13	-0.08
Dead+Wind 180 deg - Service	22341.25	0.00	6307.89	463.67	-0.16	-0.09
Dead+Wind 210 deg - Service	22341.25	-3146.79	5460.07	401.34	230.81	-0.07
Dead+Wind 240 deg - Service	22341.25	-5520.36	3117.34	228.91	405.54	-0.11
Dead+Wind 270 deg - Service	22341.25	-6341.08	-38.89	-3.08	465.61	-0.11
Dead+Wind 300 deg - Service	22341.25	-5494.91	-3170.32	-233.06	403.49	-0.10
Dead+Wind 330 deg - Service	22341.25	-3193.49	-5460.77	-401.26	234.58	-0.05

Solution Summary

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.00	-22341.25	0.00	0.00	22341.25	0.00	0.000%
2	0.00	-22341.25	-18351.60	-0.00	22341.25	18351.61	0.000%
3	9229.18	-22341.25	-15781.63	-9229.18	22341.25	15781.63	0.000%
4	15880.29	-22341.25	-9162.23	-15880.29	22341.25	9162.23	0.000%
5	18325.71	-22341.25	-112.40	-18325.72	22341.25	112.40	0.000%
6	15953.85	-22341.25	9009.12	-15953.85	22341.25	-9009.12	0.000%
7	9094.21	-22341.25	15779.61	-9094.21	22341.25	-15779.61	0.000%
8	0.00	-22341.25	18229.79	-0.00	22341.25	-18229.80	0.000%
9	-9094.21	-22341.25	15779.61	9094.21	22341.25	-15779.61	0.000%
10	-15953.85	-22341.25	9009.12	15953.85	22341.25	-9009.12	0.000%
11	-18325.71	-22341.25	-112.40	18325.72	22341.25	112.40	0.000%
12	-15880.29	-22341.25	-9162.23	15880.29	22341.25	9162.23	0.000%
13	-9229.18	-22341.25	-15781.63	9229.18	22341.25	15781.63	0.000%
14	0.00	-27321.72	0.00	0.00	27321.72	0.00	0.000%
15	0.00	-27321.72	-16251.35	0.00	27321.72	16251.38	0.000%
16	8165.65	-27321.72	-13984.08	-8165.65	27321.72	13984.09	0.000%
17	14058.33	-27321.72	-8114.70	-14058.33	27321.72	8114.71	0.000%
18	16224.05	-27321.72	-90.87	-16224.08	27321.72	90.87	0.000%
19	14117.80	-27321.72	7990.92	-14117.80	27321.72	-7990.92	0.000%
20	8056.53	-27321.72	13982.46	-8056.53	27321.72	-13982.46	0.000%
21	0.00	-27321.72	16152.87	0.00	27321.72	-16152.91	0.000%
22	-8056.53	-27321.72	13982.46	8056.53	27321.72	-13982.46	0.000%
23	-14117.80	-27321.72	7990.92	14117.80	27321.72	-7990.92	0.000%
24	-16224.05	-27321.72	-90.87	16224.08	27321.72	90.87	0.000%
25	-14058.33	-27321.72	-8114.70	14058.33	27321.72	8114.71	0.000%
26	-8165.65	-27321.72	-13984.08	8165.65	27321.72	13984.09	0.000%
27	0.00	-22341.25	-6350.03	-0.00	22341.25	6350.04	0.000%
28	3193.49	-22341.25	-5460.77	-3193.49	22341.25	5460.77	0.000%
29	5494.91	-22341.25	-3170.32	-5494.91	22341.25	3170.32	0.000%
30	6341.08	-22341.25	-38.89	-6341.08	22341.25	38.89	0.000%
31	5520.36	-22341.25	3117.34	-5520.36	22341.25	-3117.34	0.000%
32	3146.79	-22341.25	5460.07	-3146.79	22341.25	-5460.07	0.000%
33	0.00	-22341.25	6307.89	-0.00	22341.25	-6307.89	0.000%
34	-3146.79	-22341.25	5460.07	3146.79	22341.25	-5460.07	0.000%
35	-5520.36	-22341.25	3117.34	5520.36	22341.25	-3117.34	0.000%
36	-6341.08	-22341.25	-38.89	6341.08	22341.25	38.89	0.000%
37	-5494.91	-22341.25	-3170.32	5494.91	22341.25	3170.32	0.000%
38	-3193.49	-22341.25	-5460.77	3193.49	22341.25	5460.77	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	0.00062662
3	Yes	6	0.00000001	0.00011103
4	Yes	6	0.00000001	0.00010548
5	Yes	5	0.00000001	0.00004502
6	Yes	6	0.00000001	0.00010870
7	Yes	6	0.00000001	0.00010746
8	Yes	4	0.00000001	0.00062351
9	Yes	6	0.00000001	0.00010655
10	Yes	6	0.00000001	0.00010918
11	Yes	5	0.00000001	0.00004502
12	Yes	6	0.00000001	0.00010591
13	Yes	6	0.00000001	0.00011008

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14	Yes	4	0.00000001	0.00000001
15	Yes	5	0.00000001	0.00050419
16	Yes	6	0.00000001	0.00023969
17	Yes	6	0.00000001	0.00023026
18	Yes	5	0.00000001	0.00050732
19	Yes	6	0.00000001	0.00023483
20	Yes	6	0.00000001	0.00023304
21	Yes	5	0.00000001	0.00050290
22	Yes	6	0.00000001	0.00023071
23	Yes	6	0.00000001	0.00023572
24	Yes	5	0.00000001	0.00050700
25	Yes	6	0.00000001	0.00023100
26	Yes	6	0.00000001	0.00023726
27	Yes	4	0.00000001	0.00013656
28	Yes	5	0.00000001	0.00016931
29	Yes	5	0.00000001	0.00015282
30	Yes	4	0.00000001	0.00026375
31	Yes	5	0.00000001	0.00016409
32	Yes	5	0.00000001	0.00015900
33	Yes	4	0.00000001	0.00013558
34	Yes	5	0.00000001	0.00015603
35	Yes	5	0.00000001	0.00016560
36	Yes	4	0.00000001	0.00026356
37	Yes	5	0.00000001	0.00015389
38	Yes	5	0.00000001	0.00016601

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 96.5	24.988	27	1.8711	0.0033
L2	96.5 - 96	19.715	27	1.8497	0.0028
L3	96 - 46	19.521	27	1.8479	0.0028
L4	50 - 20	5.026	27	0.9872	0.0008
L5	20 - 0	0.732	27	0.3500	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
108.00	800-10504	27	24.204	1.8698	0.0032	44735
98.00	(2) 7770.xx w/ mt	27	20.297	1.8545	0.0029	12931
88.00	(2) 948F85T2E-M	27	16.499	1.7853	0.0025	4579
78.00	A-ANT-28G-2-C	27	12.961	1.6326	0.0021	3643

Maximum Tower Deflections - Design Wind

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 96.5	72.031	2	5.3980	0.0097
L2	96.5 - 96	56.838	2	5.3357	0.0083
L3	96 - 46	56.281	2	5.3305	0.0083
L4	50 - 20	14.503	2	2.8485	0.0023
L5	20 - 0	2.112	2	1.0102	0.0006

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
108.00	800-10504	2	69.771	5.3942	0.0095	15925
98.00	(2) 7770.xx w/ mt	2	58.515	5.3496	0.0085	4588
88.00	(2) 948F85T2E-M	2	47.574	5.1498	0.0075	1615
78.00	A-ANT-28G-2-C	2	37.378	4.7095	0.0061	1278

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$							
L1	110 - 108.962	TP16x16x0.375	13.50	0.00	0.0	21.600	18.4078	-85.79	397608.00	0.000							
	108.962 - 107.923							-1625.19	397608.00	0.004							
	107.923 - 106.885							-1594.18	397608.00	0.004							
	106.885 - 105.846							-1340.36	397608.00	0.003							
	105.846 - 104.808							-1411.33	397608.00	0.004							
	104.808 - 103.769							-1482.32	397608.00	0.004							
	103.769 - 102.731							-1553.36	397608.00	0.004							
	102.731 - 101.692							-1624.44	397608.00	0.004							
	101.692 - 100.654							-1695.57	397608.00	0.004							
	100.654 - 99.6154							-1766.75	397608.00	0.004							
	99.6154 - 98.5769							-1837.99	397608.00	0.005							
	98.5769 - 97.5385							-3749.73	397608.00	0.009							
	97.5385 - 96.5							-3821.67	397608.00	0.010							
	L2							96.5 - 96 (2)	TP17.49x16x0.375	0.50	0.00	0.0	21.600	18.4078	-3822.46	397608.00	0.010
	L3							96 - 93.5789	TP27.98x17.49x0.25	50.00	0.00	0.0	39.000	14.0830	-4043.27	549237.00	0.007
								93.5789 -							-4230.47	564955.00	0.007

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Section No.	Elevation ft	Size	L ft	L _n ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
	91.1579									
	91.1579 - 88.7368					39.000	14.8891	-4422.04	580674.00	0.008
	88.7368 - 86.3158					39.000	15.2921	-6336.02	596393.00	0.011
	86.3158 - 83.8947					39.000	15.6952	-6540.53	612112.00	0.011
	83.8947 - 81.4737					39.000	16.0982	-6750.49	627831.00	0.011
	81.4737 - 79.0526					39.000	16.5013	-6965.77	643550.00	0.011
	79.0526 - 76.6316					39.000	16.9043	-8733.95	659269.00	0.013
	76.6316 - 74.2105					39.000	17.3074	-8951.02	674987.00	0.013
	74.2105 - 71.7895					39.000	17.7104	-9190.68	690706.00	0.013
	71.7895 - 69.3684					39.000	18.1135	-9436.62	706425.00	0.013
	69.3684 - 66.9474					39.000	18.5165	-9688.62	722144.00	0.013
	66.9474 - 64.5263					39.000	18.9196	-9946.49	737863.00	0.013
	64.5263 - 62.1053					39.000	19.3226	-10210.10	753582.00	0.014
	62.1053 - 59.6842					39.000	19.7257	-10479.20	769301.00	0.014
	59.6842 - 57.2632					39.000	20.1287	-10753.70	785020.00	0.014
	57.2632 - 54.8421					39.000	20.5318	-11033.50	800738.00	0.014
	54.8421 - 52.4211					39.000	20.9348	-11318.50	816457.00	0.014
	52.4211 - 50					39.000	21.3379	-11608.60	832176.00	0.014
	50 - 46					39.000	22.0038	-5613.17	858146.00	0.007
L4	50 - 46	TP33.392x26.6408x0.3125	30.00	0.00	0.0	39.000	27.0072	-6808.85	1053280.00	0.006
	46 - 44.6316					39.000	27.3127	-12626.50	1065190.00	0.012
	44.6316 - 43.2632					39.000	27.6181	-12825.50	1077110.00	0.012
	43.2632 - 41.8947					39.000	27.9236	-13026.20	1089020.00	0.012
	41.8947 - 40.5263					39.000	28.2290	-13228.60	1100930.00	0.012
	40.5263 - 39.1579					39.000	28.5345	-13432.60	1112840.00	0.012
	39.1579 - 37.7895					39.000	28.8399	-13638.20	1124760.00	0.012
	37.7895 - 36.4211					39.000	29.1454	-13845.50	1136670.00	0.012
	36.4211 - 35.0526					39.000	29.4508	-14054.40	1148580.00	0.012
	35.0526 - 33.6842					39.000	29.7563	-14264.90	1160490.00	0.012
	33.6842 - 32.3158					39.000	30.0617	-14477.00	1172410.00	0.012
	32.3158 - 30.9474					39.000	30.3671	-14690.70	1184320.00	0.012
	30.9474 - 29.5789					39.000	30.6726	-14906.10	1196230.00	0.012
	29.5789 - 29.5789					39.000	30.9780	-15123.10	1208140.00	0.013

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	28.2105									
	28.2105 - 26.8421					39.000	31.2835	-15341.60	1220060.00	0.013
	26.8421 - 25.4737					39.000	31.5889	-15561.80	1231970.00	0.013
	25.4737 - 24.1053					39.000	31.8944	-15783.50	1243880.00	0.013
	24.1053 - 22.7368					39.000	32.1998	-16006.90	1255790.00	0.013
	22.7368 - 21.3684					39.000	32.5053	-16231.90	1267710.00	0.013
L5	21.3684 - 20	TP37x33.392x0.389	20.00	0.00	0.0	39.000	32.8107	-16458.40	1279620.00	0.013
	20 - 19					39.000	40.9711	-16748.20	1597870.00	0.010
	19 - 18					39.000	41.1938	-17033.90	1606560.00	0.011
	18 - 17					39.000	41.4166	-17320.50	1615250.00	0.011
	17 - 16					39.000	41.6393	-17608.00	1623930.00	0.011
	16 - 15					39.000	41.8620	-17896.40	1632620.00	0.011
	15 - 14					39.000	42.0848	-18185.70	1641310.00	0.011
	14 - 13					39.000	42.3075	-18476.00	1649990.00	0.011
	13 - 12					39.000	42.5302	-18767.20	1658680.00	0.011
	12 - 11					39.000	42.7530	-19059.30	1667370.00	0.011
	11 - 10					39.000	42.9757	-19352.30	1676050.00	0.012
	10 - 9					39.000	43.1985	-19646.30	1684740.00	0.012
	9 - 8					39.000	43.4212	-19941.10	1693430.00	0.012
	8 - 7					39.000	43.6439	-20236.90	1702110.00	0.012
	7 - 6					39.000	43.8667	-20533.60	1710800.00	0.012
	6 - 5					39.000	44.0894	-20831.30	1719490.00	0.012
	5 - 4					39.000	44.3121	-21129.80	1728170.00	0.012
	4 - 3					39.000	44.5349	-21429.30	1736860.00	0.012
	3 - 2					39.000	44.7576	-21729.70	1745550.00	0.012
	2 - 1					39.000	44.9804	-22031.00	1754230.00	0.013
	1 - 0					39.000	45.2031	-22333.20	1762920.00	0.013

* DL controls

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	110 - 108.962	TP16x16x0.375	0.03	0.006	23.760	0.000	0.00	0.000	23.760	0.000
	108.962 - 107.923		0.12	0.020	23.760	0.001	0.00	0.000	23.760	0.000
	107.923 - 106.885		1.88	0.322	23.760	0.014	0.00	0.000	23.760	0.000
	106.885 - 105.846		3.72	0.635	23.760	0.027	0.00	0.000	23.760	0.000
	105.846 - 104.808		5.52	0.943	23.760	0.040	0.00	0.000	23.760	0.000
	104.808 - 103.769		7.38	1.261	23.760	0.053	0.00	0.000	23.760	0.000
	103.769 - 102.731		9.31	1.590	23.760	0.067	0.00	0.000	23.760	0.000
	102.731 - 101.692		11.30	1.930	23.760	0.081	0.00	0.000	23.760	0.000
	101.692 -		13.36	2.282	23.760	0.096	0.00	0.000	23.760	0.000

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Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
	100.654									
	100.654 - 99.6154		15.48	2.644	23.760	0.111	0.00	0.000	23.760	0.000
	99.6154 - 98.5769		17.67	3.017	23.760	0.127	0.00	0.000	23.760	0.000
	98.5769 - 97.5385		21.17	3.616	23.760	0.152	0.00	0.000	23.760	0.000
	97.5385 - 96.5		26.31	4.493	23.760	0.189	0.00	0.000	23.760	0.000
L2	96.5 - 96 (2)	TP17.49x16x0.375	26.31	4.493	23.760	0.189	0.00	0.000	23.760	0.000
L3	96 - 93.5789	TP27.98x17.49x0.25	41.18	8.061	39.000	0.207	0.00	0.000	39.000	0.000
	93.5789 - 91.1579		53.97	9.981	39.000	0.256	0.00	0.000	39.000	0.000
	91.1579 - 88.7368		67.18	11.758	39.000	0.301	0.00	0.000	39.000	0.000
	88.7368 - 86.3158		85.38	14.160	39.000	0.363	0.00	0.000	39.000	0.000
	86.3158 - 83.8947		106.00	16.683	39.000	0.428	0.00	0.000	39.000	0.000
	83.8947 - 81.4737		127.05	19.002	39.000	0.487	0.00	0.000	39.000	0.000
	81.4737 - 79.0526		148.55	21.138	39.000	0.542	0.00	0.000	39.000	0.000
	79.0526 - 76.6316		174.93	23.713	39.000	0.608	0.00	0.000	39.000	0.000
	76.6316 - 74.2105		205.28	26.539	39.000	0.680	0.00	0.000	39.000	0.000
	74.2105 - 71.7895		236.11	29.144	39.000	0.747	0.00	0.000	39.000	0.000
	71.7895 - 69.3684		267.37	31.543	39.000	0.809	0.00	0.000	39.000	0.000
	69.3684 - 66.9474		299.08	33.756	39.000	0.866	0.00	0.000	39.000	0.000
	66.9474 - 64.5263		331.22	35.800	39.000	0.918	0.00	0.000	39.000	0.000
	64.5263 - 62.1053		363.81	37.691	39.000	0.966	0.00	0.000	39.000	0.000
	62.1053 - 59.6842		396.84	39.442	39.000	1.011	0.00	0.000	39.000	0.000
	59.6842 - 57.2632		430.32	41.065	39.000	1.053	0.00	0.000	39.000	0.000
	57.2632 - 54.8421		464.25	42.572	39.000	1.092	0.00	0.000	39.000	0.000
	54.8421 - 52.4211		498.62	43.973	39.000	1.128	0.00	0.000	39.000	0.000
	52.4211 - 50		533.45	45.276	39.000	1.161	0.00	0.000	39.000	0.000
	50 - 46		271.85	21.691	39.000	0.556	0.00	0.000	39.000	0.000
L4	50 - 46	TP33.392x26.6408x0.3125	320.24	21.254	39.000	0.545	0.00	0.000	39.000	0.000
	46 - 44.6316		612.45	39.738	39.000	1.019	0.00	0.000	39.000	0.000
	44.6316 - 43.2632		632.93	40.159	39.000	1.030	0.00	0.000	39.000	0.000
	43.2632 - 41.8947		653.53	40.559	39.000	1.040	0.00	0.000	39.000	0.000
	41.8947 - 40.5263		674.24	40.938	39.000	1.050	0.00	0.000	39.000	0.000
	40.5263 - 39.1579		695.07	41.300	39.000	1.059	0.00	0.000	39.000	0.000
	39.1579 - 37.7895		716.01	41.643	39.000	1.068	0.00	0.000	39.000	0.000
	37.7895 - 36.4211		737.08	41.969	39.000	1.076	0.00	0.000	39.000	0.000

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	36.4211 - 35.0526		758.26	42.280	39.000	1.084	0.00	0.000	39.000	0.000
	35.0526 - 33.6842		779.56	42.575	39.000	1.092	0.00	0.000	39.000	0.000
	33.6842 - 32.3158		800.98	42.856	39.000	1.099	0.00	0.000	39.000	0.000
	32.3158 - 30.9474		822.52	43.124	39.000	1.106	0.00	0.000	39.000	0.000
	30.9474 - 29.5789		844.18	43.378	39.000	1.112	0.00	0.000	39.000	0.000
	29.5789 - 28.2105		865.98	43.620	39.000	1.118	0.00	0.000	39.000	0.000
	28.2105 - 26.8421		887.88	43.850	39.000	1.124	0.00	0.000	39.000	0.000
	26.8421 - 25.4737		909.92	44.069	39.000	1.130	0.00	0.000	39.000	0.000
	25.4737 - 24.1053		932.08	44.278	39.000	1.135	0.00	0.000	39.000	0.000
	24.1053 - 22.7368		954.36	44.476	39.000	1.140	0.00	0.000	39.000	0.000
	22.7368 - 21.3684		976.77	44.665	39.000	1.145	0.00	0.000	39.000	0.000
L5	21.3684 - 20	TP37x33.392x0.389	999.30	44.845	39.000	1.150	0.00	0.000	39.000	0.000
	20 - 19		1015.87	36.476	39.000	0.935	0.00	0.000	39.000	0.000
	19 - 18		1032.52	36.672	39.000	0.940	0.00	0.000	39.000	0.000
	18 - 17		1049.27	36.865	39.000	0.945	0.00	0.000	39.000	0.000
	17 - 16		1066.10	37.054	39.000	0.950	0.00	0.000	39.000	0.000
	16 - 15		1083.03	37.241	39.000	0.955	0.00	0.000	39.000	0.000
	15 - 14		1100.04	37.424	39.000	0.960	0.00	0.000	39.000	0.000
	14 - 13		1117.16	37.605	39.000	0.964	0.00	0.000	39.000	0.000
	13 - 12		1134.36	37.783	39.000	0.969	0.00	0.000	39.000	0.000
	12 - 11		1151.65	37.958	39.000	0.973	0.00	0.000	39.000	0.000
	11 - 10		1169.03	38.130	39.000	0.978	0.00	0.000	39.000	0.000
	10 - 9		1186.52	38.300	39.000	0.982	0.00	0.000	39.000	0.000
	9 - 8		1204.08	38.468	39.000	0.986	0.00	0.000	39.000	0.000
	8 - 7		1221.74	38.632	39.000	0.991	0.00	0.000	39.000	0.000
	7 - 6		1239.50	38.794	39.000	0.995	0.00	0.000	39.000	0.000
	6 - 5		1257.34	38.954	39.000	0.999	0.00	0.000	39.000	0.000
	5 - 4		1275.28	39.112	39.000	1.003	0.00	0.000	39.000	0.000
	4 - 3		1293.31	39.267	39.000	1.007	0.00	0.000	39.000	0.000
	3 - 2		1311.43	39.420	39.000	1.011	0.00	0.000	39.000	0.000
	2 - 1		1329.65	39.570	39.000	1.015	0.00	0.000	39.000	0.000
	1 - 0		1347.96	39.718	39.000	1.018	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V lb	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	110 - 108.962	TP16x16x0.375	58.67	0.003	14.400	0.000	0.00	0.000	14.400	0.000
	108.962 - 107.923		0.00	0.000	14.400	0.000	0.00	0.000	14.400	0.000
	107.923 - 106.885		1517.00	0.082	14.400	0.011	0.00	0.000	14.400	0.000
	106.885 - 105.846		1702.79	0.093	14.400	0.013	0.00	0.000	14.400	0.000

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Section No.	Elevation ft	Size	Actual V lb	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 $\frac{f_{vt}}{F_{vt}}$
	105.846 - 104.808		1764.81	0.096	14.400	0.013	0.00	0.000	14.400	0.000
	104.808 - 103.769		1826.80	0.099	14.400	0.014	0.00	0.000	14.400	0.000
	103.769 - 102.731		1888.76	0.103	14.400	0.014	0.00	0.000	14.400	0.000
	102.731 - 101.692		1950.68	0.106	14.400	0.015	0.00	0.000	14.400	0.000
	101.692 - 100.654		2012.55	0.109	14.400	0.015	0.00	0.000	14.400	0.000
	100.654 - 99.6154		2074.38	0.113	14.400	0.016	0.00	0.000	14.400	0.000
	99.6154 - 98.5769		2136.15	0.116	14.400	0.016	0.00	0.000	14.400	0.000
	98.5769 - 97.5385		4921.38	0.267	14.400	0.037	0.00	0.000	14.400	0.000
	97.5385 - 96.5		4982.67	0.271	14.400	0.038	0.00	0.000	14.400	0.000
L2	96.5 - 96 (2)	TP17.49x16x0.375	5020.64	0.273	14.400	0.035	0.00	0.000	14.400	0.000
L3	96 - 93.5789	TP27.98x17.49x0.25	5196.37	0.369	26.000	0.028	0.01	0.001	26.000	0.000
	93.5789 - 91.1579		5373.71	0.371	26.000	0.029	0.01	0.001	26.000	0.000
	91.1579 - 88.7368		5553.04	0.373	26.000	0.029	0.02	0.002	26.000	0.000
	88.7368 - 86.3158		8431.57	0.551	26.000	0.042	0.02	0.002	26.000	0.000
	86.3158 - 83.8947		8612.07	0.549	26.000	0.042	0.03	0.002	26.000	0.000
	83.8947 - 81.4737		8793.69	0.546	26.000	0.042	0.03	0.002	26.000	0.000
	81.4737 - 79.0526		8976.47	0.544	26.000	0.042	0.04	0.003	26.000	0.000
	79.0526 - 76.6316		12345.2	0.730	26.000	0.056	0.04	0.003	26.000	0.000
	76.6316 - 74.2105		0	0	0	0	0	0	0	0
	74.2105 - 71.7895		12652.4	0.731	26.000	0.056	0.05	0.003	26.000	0.000
	71.7895 - 69.3684		0	0	0	0	0	0	0	0
	69.3684 - 66.9474		12834.3	0.725	26.000	0.056	0.06	0.003	26.000	0.000
	66.9474 - 64.5263		0	0	0	0	0	0	0	0
	64.5263 - 62.1053		13016.6	0.719	26.000	0.055	0.06	0.004	26.000	0.000
	62.1053 - 59.6842		0	0	0	0	0	0	0	0
	59.6842 - 57.2632		13199.3	0.713	26.000	0.055	0.07	0.004	26.000	0.000
	57.2632 - 54.8421		0	0	0	0	0	0	0	0
	54.8421 - 52.4211		13382.6	0.707	26.000	0.054	0.07	0.004	26.000	0.000
	52.4211 - 50		0	0	0	0	0	0	0	0
	50 - 46		13566.4	0.702	26.000	0.054	0.08	0.004	26.000	0.000
	50 - 46		0	0	0	0	0	0	0	0
	46 - 44.6316		13750.9	0.697	26.000	0.054	0.08	0.004	26.000	0.000
	44.6316 -		0	0	0	0	0	0	0	0
			13936.2	0.692	26.000	0.053	0.09	0.004	26.000	0.000
			0	0	0	0	0	0	0	0
			14122.1	0.688	26.000	0.053	0.10	0.004	26.000	0.000
			0	0	0	0	0	0	0	0
			14308.8	0.683	26.000	0.053	0.10	0.004	26.000	0.000
			0	0	0	0	0	0	0	0
			14496.4	0.679	26.000	0.052	0.11	0.005	26.000	0.000
			0	0	0	0	0	0	0	0
L4	50 - 46		6917.29	0.314	26.000	0.025	0.06	0.002	26.000	0.000
	50 - 46	TP33.392x26.6408x0.3125	7939.26	0.294	26.000	0.023	0.06	0.002	26.000	0.000
	46 - 44.6316		14934.2	0.547	26.000	0.042	0.12	0.004	26.000	0.000
	44.6316 -		0	0	0	0	0	0	0	0
			15018.1	0.544	26.000	0.042	0.13	0.004	26.000	0.000

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	43.2632		0							
	43.2632 - 41.8947		15102.5	0.541	26.000	0.042	0.13	0.004	26.000	0.000
	41.8947 - 40.5263		0							
	40.5263 - 39.1579		15187.5	0.538	26.000	0.041	0.13	0.004	26.000	0.000
	39.1579 - 37.7895		0							
	37.7895 - 36.4211		15272.9	0.535	26.000	0.041	0.14	0.004	26.000	0.000
	36.4211 - 35.0526		0							
	35.0526 - 33.6842		15359.0	0.533	26.000	0.041	0.14	0.004	26.000	0.000
	33.6842 - 32.3158		0							
	32.3158 - 30.9474		15445.5	0.530	26.000	0.041	0.14	0.004	26.000	0.000
	30.9474 - 29.5789		0							
	29.5789 - 28.2105		15532.6	0.527	26.000	0.041	0.15	0.004	26.000	0.000
	28.2105 - 26.8421		0							
	26.8421 - 25.4737		15620.3	0.525	26.000	0.040	0.15	0.004	26.000	0.000
	25.4737 - 24.1053		0							
	24.1053 - 22.7368		15708.5	0.523	26.000	0.040	0.15	0.004	26.000	0.000
	22.7368 - 21.3684		0							
	21.3684 - 20		15797.3	0.520	26.000	0.040	0.16	0.004	26.000	0.000
			0							
			15886.6	0.518	26.000	0.040	0.16	0.004	26.000	0.000
			0							
			15976.5	0.516	26.000	0.040	0.16	0.004	26.000	0.000
			0							
			16066.9	0.514	26.000	0.039	0.17	0.004	26.000	0.000
			0							
			16157.9	0.512	26.000	0.039	0.17	0.004	26.000	0.000
			0							
			16249.4	0.509	26.000	0.039	0.17	0.004	26.000	0.000
			0							
			16341.6	0.508	26.000	0.039	0.18	0.004	26.000	0.000
			0							
			16434.2	0.506	26.000	0.039	0.18	0.004	26.000	0.000
			0							
			16527.5	0.504	26.000	0.039	0.18	0.004	26.000	0.000
			0							
L5	20 - 19	TP37x33.392x0.389	16613.9	0.406	26.000	0.031	0.19	0.003	26.000	0.000
			0							
	19 - 18		16705.3	0.406	26.000	0.031	0.19	0.003	26.000	0.000
			0							
	18 - 17		16796.8	0.406	26.000	0.031	0.19	0.003	26.000	0.000
			0							
	17 - 16		16888.4	0.406	26.000	0.031	0.20	0.003	26.000	0.000
			0							
	16 - 15		16980.0	0.406	26.000	0.031	0.20	0.003	26.000	0.000
			0							
	15 - 14		17071.7	0.406	26.000	0.031	0.20	0.003	26.000	0.000
			0							
	14 - 13		17163.5	0.406	26.000	0.031	0.21	0.003	26.000	0.000
			0							
	13 - 12		17255.3	0.406	26.000	0.031	0.21	0.003	26.000	0.000
			0							
	12 - 11		17347.1	0.406	26.000	0.031	0.21	0.003	26.000	0.000
			0							
	11 - 10		17439.1	0.406	26.000	0.031	0.21	0.003	26.000	0.000
			0							
	10 - 9		17531.1	0.406	26.000	0.031	0.22	0.003	26.000	0.000
			0							
	9 - 8		17623.1	0.406	26.000	0.031	0.22	0.003	26.000	0.000
			0							
	8 - 7		17715.2	0.406	26.000	0.031	0.22	0.003	26.000	0.000

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	7 - 6		0							
			17807.3	0.406	26.000	0.031	0.23	0.003	26.000	0.000
	6 - 5		0							
			17899.6	0.406	26.000	0.031	0.23	0.003	26.000	0.000
	5 - 4		0							
			17991.8	0.406	26.000	0.031	0.23	0.003	26.000	0.000
	4 - 3		0							
			18084.1	0.406	26.000	0.031	0.24	0.003	26.000	0.000
	3 - 2		0							
			18176.5	0.406	26.000	0.031	0.24	0.003	26.000	0.000
	2 - 1		0							
			18268.9	0.406	26.000	0.031	0.24	0.004	26.000	0.000
	1 - 0		0							
			18361.4	0.406	26.000	0.031	0.25	0.004	26.000	0.000
			0							

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P	Ratio f _{bx}	Ratio f _{by}	Ratio f _v	Ratio f _{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		P _u	F _{bx}	F _{by}	F _v	F _{vt}			
L1	110 - 108.962	0.000	0.000	0.000	0.000	0.000	0.000 ✓	1.333	H1-3+VT ✓
	108.962 - 107.923	0.004	0.001	0.000	0.000	0.000	0.005 ✓	1.000	H1-3+VT ✓
	107.923 - 106.885	0.004	0.014	0.000	0.011	0.000	0.018 ✓	1.333	H1-3+VT ✓
	106.885 - 105.846	0.003	0.027	0.000	0.013	0.000	0.030 ✓	1.333	H1-3+VT ✓
	105.846 - 104.808	0.004	0.040	0.000	0.013	0.000	0.043 ✓	1.333	H1-3+VT ✓
	104.808 - 103.769	0.004	0.053	0.000	0.014	0.000	0.057 ✓	1.333	H1-3+VT ✓
	103.769 - 102.731	0.004	0.067	0.000	0.014	0.000	0.071 ✓	1.333	H1-3+VT ✓
	102.731 - 101.692	0.004	0.081	0.000	0.015	0.000	0.085 ✓	1.333	H1-3+VT ✓
	101.692 - 100.654	0.004	0.096	0.000	0.015	0.000	0.100 ✓	1.333	H1-3+VT ✓
	100.654 - 99.6154	0.004	0.111	0.000	0.016	0.000	0.116 ✓	1.333	H1-3+VT ✓
	99.6154 - 98.5769	0.005	0.127	0.000	0.016	0.000	0.132 ✓	1.333	H1-3+VT ✓
	98.5769 - 97.5385	0.009	0.152	0.000	0.037	0.000	0.162 ✓	1.333	H1-3+VT ✓
	97.5385 - 96.5	0.010	0.189	0.000	0.038	0.000	0.199 ✓	1.333	H1-3+VT ✓
L2	96.5 - 96 (2)	0.010	0.189	0.000	0.035	0.000	0.199 ✓	1.333	H1-3+VT ✓
L3	96 - 93.5789	0.007	0.207	0.000	0.028	0.000	0.214 ✓	1.333	H1-3+VT ✓
	93.5789 - 91.1579	0.007	0.256	0.000	0.029	0.000	0.264 ✓	1.333	H1-3+VT ✓
	91.1579 - 88.7368	0.008	0.301	0.000	0.029	0.000	0.309 ✓	1.333	H1-3+VT ✓
	88.7368 - 86.3158	0.011	0.363	0.000	0.042	0.000	0.374 ✓	1.333	H1-3+VT ✓

RISATower Structural Components, LLC 1617 Pearl Street, Unit A Boulder, CO 80302 Phone: 866.386.7622 FAX: 720.489.3764	Job	100048	Page	19 of 21
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Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		P_a	f_{bx} F_{bx}	f_{by} F_{by}	f_v F_v	f_{vt} F_{vt}			
	86.3158 - 83.8947	0.011	0.428	0.000	0.042	0.000	0.439 ✓	1.333	H1-3+VT ✓
	83.8947 - 81.4737	0.011	0.487	0.000	0.042	0.000	0.498 ✓	1.333	H1-3+VT ✓
	81.4737 - 79.0526	0.011	0.542	0.000	0.042	0.000	0.553 ✓	1.333	H1-3+VT ✓
	79.0526 - 76.6316	0.013	0.608	0.000	0.056	0.000	0.622 ✓	1.333	H1-3+VT ✓
	76.6316 - 74.2105	0.013	0.680	0.000	0.056	0.000	0.695 ✓	1.333	H1-3+VT ✓
	74.2105 - 71.7895	0.013	0.747	0.000	0.056	0.000	0.761 ✓	1.333	H1-3+VT ✓
	71.7895 - 69.3684	0.013	0.809	0.000	0.055	0.000	0.823 ✓	1.333	H1-3+VT ✓
	69.3684 - 66.9474	0.013	0.866	0.000	0.055	0.000	0.880 ✓	1.333	H1-3+VT ✓
	66.9474 - 64.5263	0.013	0.918	0.000	0.054	0.000	0.932 ✓	1.333	H1-3+VT ✓
	64.5263 - 62.1053	0.014	0.966	0.000	0.054	0.000	0.981 ✓	1.333	H1-3+VT ✓
	62.1053 - 59.6842	0.014	1.011	0.000	0.054	0.000	1.026 ✓	1.333	H1-3+VT ✓
	59.6842 - 57.2632	0.014	1.053	0.000	0.053	0.000	1.067 ✓	1.333	H1-3+VT ✓
	57.2632 - 54.8421	0.014	1.092	0.000	0.053	0.000	1.106 ✓	1.333	H1-3+VT ✓
	54.8421 - 52.4211	0.014	1.128	0.000	0.053	0.000	1.142 ✓	1.333	H1-3+VT ✓
	52.4211 - 50	0.014	1.161	0.000	0.052	0.000	1.176 ✓	1.333	H1-3+VT ✓
	50 - 46	0.007	0.556	0.000	0.025	0.000	0.563 ✓	1.333	H1-3+VT ✓
L4	50 - 46	0.006	0.545	0.000	0.023	0.000	0.552 ✓	1.333	H1-3+VT ✓
	46 - 44.6316	0.012	1.019	0.000	0.042	0.000	1.031 ✓	1.333	H1-3+VT ✓
	44.6316 - 43.2632	0.012	1.030	0.000	0.042	0.000	1.042 ✓	1.333	H1-3+VT ✓
	43.2632 - 41.8947	0.012	1.040	0.000	0.042	0.000	1.052 ✓	1.333	H1-3+VT ✓
	41.8947 - 40.5263	0.012	1.050	0.000	0.041	0.000	1.062 ✓	1.333	H1-3+VT ✓
	40.5263 - 39.1579	0.012	1.059	0.000	0.041	0.000	1.071 ✓	1.333	H1-3+VT ✓
	39.1579 - 37.7895	0.012	1.068	0.000	0.041	0.000	1.080 ✓	1.333	H1-3+VT ✓
	37.7895 - 36.4211	0.012	1.076	0.000	0.041	0.000	1.089 ✓	1.333	H1-3+VT ✓
	36.4211 - 35.0526	0.012	1.084	0.000	0.041	0.000	1.097 ✓	1.333	H1-3+VT ✓
	35.0526 - 33.6842	0.012	1.092	0.000	0.040	0.000	1.104 ✓	1.333	H1-3+VT ✓
	33.6842 - 32.3158	0.012	1.099	0.000	0.040	0.000	1.112 ✓	1.333	H1-3+VT ✓
	32.3158 - 30.9474	0.012	1.106	0.000	0.040	0.000	1.119 ✓	1.333	H1-3+VT ✓
	30.9474 - 29.5789	0.012	1.112	0.000	0.040	0.000	1.125 ✓	1.333	H1-3+VT ✓
	29.5789 - 28.2105	0.013	1.118	0.000	0.040	0.000	1.131 ✓	1.333	H1-3+VT ✓
	28.2105 - 26.8421	0.013	1.124	0.000	0.039	0.000	1.137 ✓	1.333	H1-3+VT ✓

RISATower Structural Components, LLC 1617 Pearl Street, Unit A Boulder, CO 80302 Phone: 866.386.7622 FAX: 720.489.3764	Job	100048	Page	20 of 21
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	Client	URS	Designed by	LBM

Section No.	Elevation ft	Ratio P	Ratio f_{bx}	Ratio f_{by}	Ratio f_v	Ratio f_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L5	26.8421 - 25.4737	0.013	1.130	0.000	0.039	0.000	1.143 ✓	1.333	H1-3+VT ✓
	25.4737 - 24.1053	0.013	1.135	0.000	0.039	0.000	1.148 ✓	1.333	H1-3+VT ✓
	24.1053 - 22.7368	0.013	1.140	0.000	0.039	0.000	1.154 ✓	1.333	H1-3+VT ✓
	22.7368 - 21.3684	0.013	1.145	0.000	0.039	0.000	1.158 ✓	1.333	H1-3+VT ✓
	21.3684 - 20	0.013	1.150	0.000	0.039	0.000	1.163 ✓	1.333	H1-3+VT ✓
	20 - 19	0.010	0.935	0.000	0.031	0.000	0.946 ✓	1.333	H1-3+VT ✓
	19 - 18	0.011	0.940	0.000	0.031	0.000	0.951 ✓	1.333	H1-3+VT ✓
	18 - 17	0.011	0.945	0.000	0.031	0.000	0.956 ✓	1.333	H1-3+VT ✓
	17 - 16	0.011	0.950	0.000	0.031	0.000	0.961 ✓	1.333	H1-3+VT ✓
	16 - 15	0.011	0.955	0.000	0.031	0.000	0.966 ✓	1.333	H1-3+VT ✓
	15 - 14	0.011	0.960	0.000	0.031	0.000	0.971 ✓	1.333	H1-3+VT ✓
	14 - 13	0.011	0.964	0.000	0.031	0.000	0.976 ✓	1.333	H1-3+VT ✓
	13 - 12	0.011	0.969	0.000	0.031	0.000	0.980 ✓	1.333	H1-3+VT ✓
	12 - 11	0.011	0.973	0.000	0.031	0.000	0.985 ✓	1.333	H1-3+VT ✓
	11 - 10	0.012	0.978	0.000	0.031	0.000	0.989 ✓	1.333	H1-3+VT ✓
	10 - 9	0.012	0.982	0.000	0.031	0.000	0.994 ✓	1.333	H1-3+VT ✓
	9 - 8	0.012	0.986	0.000	0.031	0.000	0.998 ✓	1.333	H1-3+VT ✓
	8 - 7	0.012	0.991	0.000	0.031	0.000	1.003 ✓	1.333	H1-3+VT ✓
	7 - 6	0.012	0.995	0.000	0.031	0.000	1.007 ✓	1.333	H1-3+VT ✓
	6 - 5	0.012	0.999	0.000	0.031	0.000	1.011 ✓	1.333	H1-3+VT ✓
5 - 4	0.012	1.003	0.000	0.031	0.000	1.015 ✓	1.333	H1-3+VT ✓	
4 - 3	0.012	1.007	0.000	0.031	0.000	1.019 ✓	1.333	H1-3+VT ✓	
3 - 2	0.012	1.011	0.000	0.031	0.000	1.023 ✓	1.333	H1-3+VT ✓	
2 - 1	0.013	1.015	0.000	0.031	0.000	1.027 ✓	1.333	H1-3+VT ✓	
1 - 0	0.013	1.018	0.000	0.031	0.000	1.031 ✓	1.333	H1-3+VT ✓	

* DL controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail	
L1	110 - 96.5	Pole	TP16x16x0.375	1	-3821.67	530011.44	14.9	Pass	
L2	96.5 - 96	Pole	TP17.49x16x0.375	2	-3822.46	530011.44	14.9	Pass	
L3	96 - 46	Pole	TP27.98x17.49x0.25	3	-11608.60	1109290.56	88.2	Pass	
L4	46 - 20	Pole	TP33.392x26.6408x0.3125	4	-16458.40	1705733.39	87.3	Pass	
L5	20 - 0	Pole	TP37x33.392x0.389	5	-22333.20	2349972.26	77.4	Pass	
							Summary		
							Pole (L3)	88.2	Pass
							RATING =	88.2	Pass

<i>RISATower</i> <i>Structural Components, LLC</i> <i>1617 Pearl Street, Unit A</i> <i>Boulder, CO 80302</i> <i>Phone: 866.386.7622</i> <i>FAX: 720.489.3764</i>	Job 100048	Page 21 of 21
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	Client URS	Designed by LBM

Program Version 5.4.1.3 - 2/10/2010 File://10.0.1.130/ots2/URS Corporation/Danbury South - NY6314/100048 - RFQ QTE PO SA
INV/Analysis/Data/100048.DanburyF.Reinforced.eri

APPENDIX B
Data Provided for Analysis

3 DESIGN STANDARD

The tower analysis was performed in accordance with the following design criteria.

Standard:	TIA-222-G <i>Structural Standard for Antenna Supporting Structures and Antennas</i>
Building Code:	2006 International Building Code
Design Basic Wind Speed without Ice:	100 mph 3-second gust
Design Basic Wind Speed with Ice:	50 mph 3-second gust
Ice Thickness:	3/4" radial
Structure Class:	II
Exposure Category:	C
Topographic Category:	1

4 APPURTENANCES

The following antennas, mounts, transmission lines, and other appurtenances were considered for the structural analysis.

Elev. (ft) (1)	Appurtenance	Line ⁽²⁾	Notes
108.0	(3) Kathrein 800-10504 (3) Kathrein 742-351 (3) T-Arms	(12) 1-5/8"	MetroPCS Proposed
98.0	(6) 7770 Panel Antennas (6) TMA's (1) LP Platform w/ Hand Rails	(12) 1-5/8" ⁽³⁾	AT&T Existing
88.0	(6) 948F85T2E-M (6) 48" x 12" x 3" Panel Antennas (1) LP Platform w/ Hand Rails	(12) 1-5/8"	Verizon Existing
78.0 ⁽⁴⁾	(6) RR90-11-00DBL (3) KMW AM-XWM17-65-00T (3) KMW TMA's (1) 2ft Diameter Dish (1) LP Profile Platform	(12) 1-1/4" ⁽³⁾	Sprint/Nextel Existing

Notes:

- Elevations reference centerline of panel, yagi, and dish antennas, and base of whip antennas, in relation to the steel base of the tower.
- Proposed lines to be strapped to the tower in (2) sets of (6) lines.
- There are (12) existing 1-5/8" lines exposed up to 98.0ft for AT&T and (6) 1-1/4" lines exposed up to 78.0ft for Sprint. The lines are stacked with a maximum loading condition of (3) 1-5/8" lines fully exposed to the wind without shielding from either other lines or the pole up to 98.0ft.
- The loading for Sprint at 78.0ft represents the loading as listed on the information provided by EEI dated 07/09/2009 and exceeds the existing loading at 78.0ft as listed in the 09/09/2009 mapping report.

Sprint Nextel Loading

- (9) Decibel DB844H90-XY (existing)
- (3) Kathrein 840 10054 (proposed)
- (3) Samsung DAP Head (proposed)
- (2) Dragonwave A-ANT-28G-2-C Dish Antennas (proposed)
- (12) 1-1/4" Coax, (existing)
- (2) 1/2" Coax, (6) 5/16" Coax (proposed)
- (1) Low Profile Platform (existing)



ENGINEERED ENDEAVORS INCORPORATED
The Experienced Point of View

Customer: URS CORP
Description: 14' EXTENSION
EEI Job Number: 15947-E01

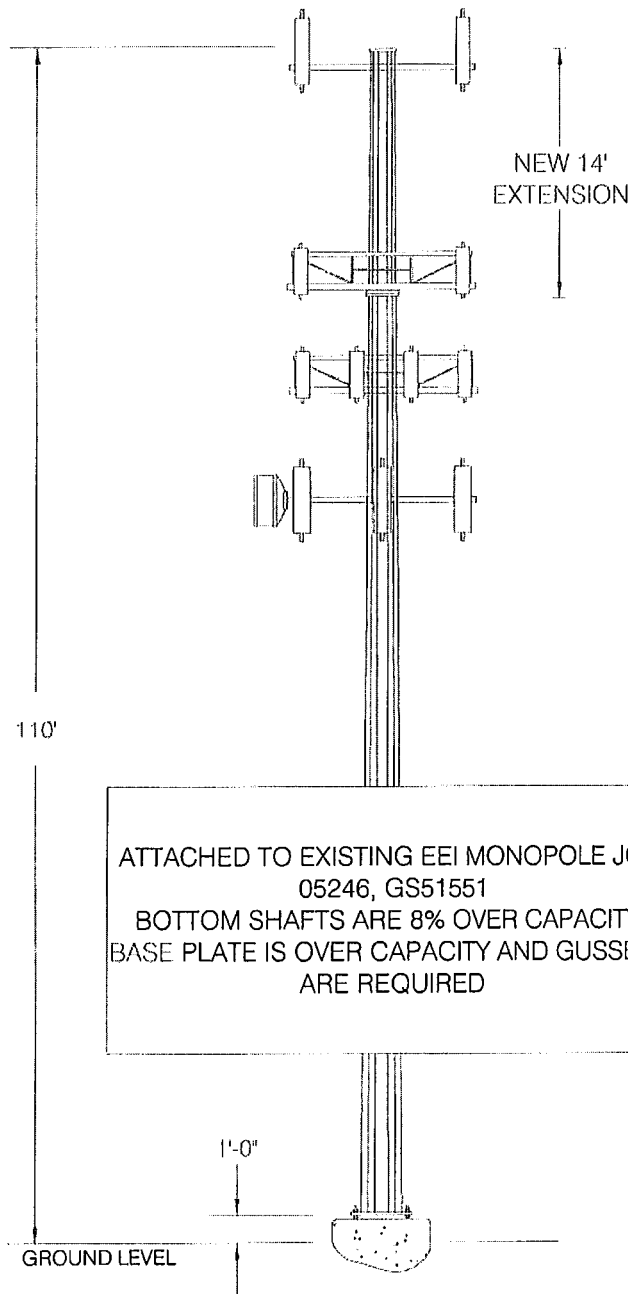


SITE INFORMATION

Location: DANBURY, CT
Site Name: DANBURY SOUTH

DESIGN INFORMATION

Designed By: MRM
Design Date: 7-2-2009
Status: RELEASE



ATTACHED TO EXISTING EEI MONOPOLE JOB 05246, GS51551
BOTTOM SHAFTS ARE 8% OVER CAPACITY
BASE PLATE IS OVER CAPACITY AND GUSSETS ARE REQUIRED

ANTENNA LOADING

- (3) 800 10504 PANEL ANTENNAS AND (3) 742 351 PANEL ANTENNAS MOUNTED ON A 10' T ARM @ 108' € (METRO PCS)
- (6) 7770 PANEL ANTENNAS AND (6) TMAs MOUNTED ON A STANDARD PLATFORM @ 98' € (AT&T)
- (6) ALLGON 7129.16 PANEL ANTENNAS AND (6) 48 x 12 x 3 PANEL ANTENNAS MOUNTED ON A STANDARD PLATFORM AT 88' € (VERIZON WIRELESS)
- (6) RR90-11-00DBL PANEL ANTENNAS, (3) KMW AM X WM17-65-00T, (3) KMW TMAs, AND (1) 2' Ø MW DISH MOUNTED ON A 12' LOW PROFILE PLATFORM @ 78' € (SPRINT & NEXTEL)
- (12) 1¼" Ø COAXIAL CABLES ON OUTSIDE OF MONOPOLE TO 110'

DESIGN CRITERIA

DESIGNED IN ACCORDANCE WITH TIA-222-G AND ASCE 7 FOR 100 MPH 3-SECOND GUST WIND SPEED

- STRUCTURE CLASSIFICATION - II
- EXPOSURE - C
- TOPOGRAPHIC CATEGORY - 1

ENGINEERED ENDEAVORS, INC.

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COMMUNICATIONS STRUCTURE WIND LOADING DEVELOPMENT
Per the ANSI/TIA 222-G-2005



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The Experienced Point of View

7610 Jenther Drive
 Mentor, Ohio 44060
 Tel (440) 918-1101 * Fax (440) 918-1108



CUSTOMER: URS Corp
SITE LOCATION: Danbury, CT
SITE NAME: Danbury South
SITE NUMBER: NY6314

CURRENT DATE: 07/07/09
STRUCTURE: 110' Monopole
JOB NUMBER: 15947-E01
STATUS: Release

Load Combinations

6	1.0D + 1.0W _o	SERVICE DEAD LOAD FACTOR = 1.0 SERVICE WIND LOAD FACTOR = 1.0	MAXIMUM DEFLECTION (in) = 39.6 MAXIMUM ROTATION @ TOP (°) = 4.00
1	1.2D + 1.6W _o	WIND DEAD LOAD FACTOR = 1.2 WIND w/o ICE FACTOR = 1.6	
3	1.2D + 1.0D _i + 1.0W _i	WIND DEAD LOAD w/ICE FACTOR = 1.2 WIND w/ ICE FACTOR = 1.0 DEAD LOAD FACTOR FOR ICE = 1.0	WEIGHT OF ICE (pcf) = 56 TEMPERATURE FACTOR = N/A to non-guy structures

General Information

STRUCTURE HEIGHT (ft) = 110.00	STRUCTURE CLASSIFICATION	II	(Importance Factor)
NUMBER OF MONOPOLE SIDES = 18		DESIGN	SERVICE (Section 2.8.3)
DESIGN WIND SPEED (mph) = 100	Wind Load w/o Ice	1.00	1.00
WIND SPEED w/ ICE (mph) = 30	Wind Load w/ Ice	1.00	
RADIAL ICE (in) = 0.75	Ice Thickness	1.00	
OPERATIONAL WIND SPEED (mph) = 60	Earthquake	1.00	
DIRECTIONALITY DESIGN, K _d = 0.95	EXPOSURE CATEGORY -	C	
DIRECTIONALITY SERVICE, K _d = 0.85	Z _g =	900	
DESIGN GUST RESPONSE FACTOR, G _h = 1.10	a =	9.5	
SERVICE GUST RESPONSE FACTOR, G _h = 1.10	K _e =	1.0	
FORCE COEFFICIENT w/o ICE, C _f = 0.65	K _{zmin} =	0.85	
FORCE COEFFICIENT w/ ICE, C _f = 1.20	TOPOGRAPHIC CATEGORY-	1	
ACROSS POINTS FACTOR = 1.015	K _t =	N/A	
	f =	N/A	

COMMUNICATIONS STRUCTURE WIND LOADING DEVELOPMENT

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Tel (440) 918-1101 * Fax (440) 918-1108



CUSTOMER: URS Corp
SITE LOCATION: Danbury, CT
SITE NAME: Danbury South
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CURRENT DATE: 07/07/09
STRUCTURE: 110' Monopole
JOB NUMBER: 15947-E01
STATUS: Release

Antenna Loading

DESCRIPTION	QTY	HEIGHT (ft)	Kz	CASE 1		CASE 2		CASE 3	
				EPA (ft ²)	WEIGHT (lbs)	EPA (ft ²)	WEIGHT (lbs)	EPA ₁ (ft ²)	WEIGHT ₁ (lbs)
1 800 10504 Antennas	3	108	1.286	3.07	18.00	2.46	18.00	4.09	100.62
2 742 351 Antennas	3	108	1.286	4.00	30.00	3.20	30.00	5.18	159.68
3 T ARM MOUNTS	1	108	1.286	22.00	2500.00	22.00	2500.00	38.00	3500.00
4 7770 Antennas	6	98	1.260	4.67	35.00	3.73	35.00	5.56	171.66
5 TMAs	6	98	1.260	1.20	15.00	0.96	15.00	1.52	63.71
6 STD Platform	1	98	1.260	33.00	3000.00	33.00	3000.00	43.00	4200.00
7 Allgon 7129.16	6	88	1.232	6.05	18.00	4.84	18.00	6.51	194.51
8 4' Panel Antennas	6	88	1.232	3.78	25.00	3.02	25.00	4.86	146.21
9 STD Platform	1	88	1.232	33.00	3000.00	33.00	3000.00	43.00	4200.00
10 RR90-11-00DBL	6	78	1.201	3.78	18.00	3.02	18.00	4.84	137.50
11 KMW AM-X-WM17-65-00T	3	78	1.201	2.69	15.00	2.16	15.00	3.62	89.00
12 KMW RET Unit	3	78	1.201	0.16	5.00	0.13	5.00	0.44	13.08
13 KMW TMA	3	78	1.201	0.97	15.00	0.78	15.00	1.45	53.25
14 2' MW Dish	1	78	1.201	4.40	65.00	4.40	65.00	6.50	
15 LOW PROFILE PLATFORM	1	78	1.201	22.00	1500.00	22.00	1500.00	35.00	3300.00
16 Cables	1	100	1.266	6.67	240.00	6.67	240.00		
17 Cables	1	80	1.208	6.67	240.00	6.67	240.00		
18 Cables	1	60	1.137	6.67	240.00	6.67	240.00		
19 Cables	1	40	1.044	6.67	240.00	6.67	240.00		
20 Cables	1	20	0.902	6.67	240.00	6.67	240.00		
21 Cables	1	5	0.850	6.67	120.00	6.67	120.00		
22									
23									
24									
25									
26									
27									
28									
29									
30									

COMMUNICATIONS STRUCTURE WIND LOADING DEVELOPMENT

Per the ANSI/TIA 222-G-2005



7610 Jenther Drive
Mentor, Ohio 44060
Tel (440) 918-1101 * Fax (440) 918-1108



CUSTOMER: URS Corp
SITE LOCATION: Danbury, CT
SITE NAME: Danbury South
SITE NUMBER: NY6314

CURRENT DATE: 07/07/09
STRUCTURE: 110' Monopole
JOB NUMBER: 15947-E01
STATUS: Release

Loading Case 1 - Serviceability

The loading developed in Case 1 shall be used for the evaluation of serviceability for the twist and sway limits. The design of a monopole must also take into account the factored loading cases.

WIND VELOCITY (mph) = 60

Load Combination

1.0D + 1.0Wo

Antenna Loads						Monopole Pressures		
	HEIGHT (ft)	APPURTENANCE FORCES		APPURTENANCE FACTORED FORCES		HEIGHT (ft)	EXPOSURE PRESSURE	
		GRAVITY (kips)	WIND (kips)	GRAVITY (kips)	WIND (kips)		HEIGHT (ft)	Kz
1	108	0.054	0.102	0.054	0.102	1	3.93	4.83
2	108	0.090	0.133	0.090	0.133	2	11.79	4.83
3	108	2.500	0.244	2.500	0.244	3	19.64	5.11
4	98	0.210	0.304	0.210	0.304	4	27.50	5.49
5	98	0.090	0.078	0.090	0.078	5	35.36	5.78
6	98	3.000	0.358	3.000	0.358	6	43.21	6.03
7	88	0.108	0.385	0.108	0.385	7	51.07	6.25
8	88	0.150	0.241	0.150	0.241	8	58.93	6.44
9	88	3.000	0.350	3.000	0.350	9	66.79	6.61
10	78	0.108	0.235	0.108	0.235	10	74.64	6.77
11	78	0.045	0.084	0.045	0.084	11	82.50	6.91
12	78	0.015	0.005	0.015	0.005	12	90.36	7.05
13	78	0.045	0.030	0.045	0.030	13	98.21	7.17
14	78	0.065	0.046	0.065	0.046	14	106.07	7.29
15	78	1.500	0.228	1.500	0.228	15	110.00	7.34
16	100	0.240	0.073	0.240	0.073	0.073		
17	80	0.240	0.069	0.240	0.069	0.069		
18	60	0.240	0.065	0.240	0.065	0.065		
19	40	0.240	0.060	0.240	0.060	0.060		
20	20	0.240	0.052	0.240	0.052	0.052		
21	5	0.120	0.049	0.120	0.049	0.049		
22								
23								
24								
25								
26								
27								
28								
29								
30								

COMMUNICATIONS STRUCTURE WIND LOADING DEVELOPMENT

Per the ANSI/TIA 222-G-2005



**ENGINEERED
ENDEAVORS
INCORPORATED**
The Experienced Point of View

7610 Jenther Drive
Mentor, Ohio 44060
Tel (440) 918-1101 * Fax (440) 918-1108



CUSTOMER: URS Corp
SITE LOCATION: Danbury, CT
SITE NAME: Danbury South
SITE NUMBER: NY6314

CURRENT DATE: 07/07/09
STRUCTURE: 110' Monopole
JOB NUMBER: 15947-E01
STATUS: Release

Loading Case 2 - Design

WIND VELOCITY (mph) = 100.00

Load Combination
1.2D + 1.6Wo

Antenna Loads						Monopole Pressures			
	APPURTENANCE FORCES			APPURTENANCE FACTORED FORCES			EXPOSURE		WIND
	HEIGHT (ft)	GRAVITY (kips)	WIND (kips)	GRAVITY (kips)	WIND (kips)		HEIGHT (ft)	COEFFICIENT Kz	PRESSURE ON POLE (psf)
1	108	0.054	0.254	0.065	0.406	1	3.93	0.850	24.01
2	108	0.090	0.330	0.108	0.528	2	11.79	0.850	24.01
3	108	2.500	0.757	3.000	1.211	3	19.64	0.898	25.38
4	98	0.210	0.755	0.252	1.209	4	27.50	0.964	27.25
5	98	0.090	0.194	0.108	0.311	5	35.36	1.017	28.73
6	98	3.000	1.113	3.600	1.780	6	43.21	1.061	29.97
7	88	0.108	0.957	0.130	1.531	7	51.07	1.099	31.04
8	88	0.150	0.598	0.180	0.957	8	58.93	1.132	31.99
9	88	3.000	1.088	3.600	1.740	9	66.79	1.163	32.84
10	78	0.108	0.583	0.130	0.933	10	74.64	1.190	33.62
11	78	0.045	0.208	0.054	0.332	11	82.50	1.215	34.34
12	78	0.015	0.012	0.018	0.020	12	90.36	1.239	35.00
13	78	0.045	0.075	0.054	0.120	13	98.21	1.261	35.62
14	78	0.065	0.141	0.078	0.226	14	106.07	1.281	36.20
15	78	1.500	0.707	1.800	1.131	15	110.00	1.291	36.48
16	100	0.240	0.226	0.288	0.361				
17	80	0.240	0.215	0.288	0.345				
18	60	0.240	0.203	0.288	0.324				
19	40	0.240	0.186	0.288	0.298				
20	20	0.240	0.161	0.288	0.257				
21	5	0.120	0.152	0.144	0.243				
22									
23									
24									
25									
26									
27									
28									
29									
30									

Engineered Endeavors Inc.

7810 Jenther Drive
Mentor, Ohio 44060
Tel (440) 918-1101 Fax (440) 918-1108

Communications Structure Nonlinear Analysis and Design Program

7/7/2009 2:33:07 PM
Revision 2.3 01/16/09
Engineer MR MOREL

Customer URS Corp
Job Name 15947-E01
Structure 110' Monopole
Location Danbury, CT
Site Danbury South
Site Number NY6314
Data File LASTPOLE.TXT

OD BOT	OD TOP	NUM SIDES	THICK INCH	TAPER IN/FT	LENGTH FT	JOINT INCH	JOINT TYPE	YIELD KSI	WEIGHT LBS	JOINT HEIGHT
17.49	14.56	18	.1875	.210	14.00	.01	FLANGE	65.00	444.	96.00
27.98	17.49	18	.2500	.210	50.00	48.00	SLIP	65.00	2999.	48.00
37.00	26.51	18	.3125	.210	50.00	.00	BASEPL	65.00	5242.	.00
TOTAL TUBE WEIGHT						8684.	POUNDS			
POLE SHAFT LENGTH						110.00	FEET			

AISC constants are used for stress reductions.
Tube sections have 18 sides
Internal bend radius = 4. X T
Tube diameters are measured flat to flat.
AISC Tube Shape Coefficient of 1.000 is applied.
Slip joint length factor is 1.500 times the inner tube diameter.
An additional length of 6.00 inches is added to the joint.

RESISTANCE TABLE

ELEV Ft	DIAM In.	THICK In.	EFF FY Ksi	PhiPn Kips	PhiMn Ft-Kips	PhiVn Kips	PhiTn Ft-Kips	DEFLECT IN	TILT DEG
110.00	14.56	.1875	65.00	468.	146.	248.	293.		
108.00	14.98	.1875	65.00	481.	155.	255.	310.		
104.00	15.82	.1875	65.00	509.	173.	269.	347.		
100.00	16.65	.1875	65.00	536.	192.	284.	385.		
98.00	17.07	.1875	65.00	550.	202.	291.	405.		
96.00	17.49	.2500	65.00	748.	281.	396.	561.		
96.00	17.49	.1875	65.00	563.	213.	298.	425.		
92.00	18.33	.2500	65.00	785.	309.	415.	618.		
88.00	19.17	.2500	65.00	821.	338.	435.	677.		
84.00	20.01	.2500	65.00	857.	369.	454.	738.		
80.00	20.85	.2500	65.00	894.	401.	473.	803.		
78.00	21.27	.2500	65.00	912.	418.	483.	836.		
72.00	22.53	.2500	65.00	967.	470.	512.	940.		
66.00	23.78	.2500	65.00	1021.	525.	541.	1049.		
60.00	25.04	.2500	65.00	1076.	583.	570.	1165.		
54.00	26.30	.2500	65.00	1130.	643.	598.	1287.		
48.00	26.93	.3125	65.00	1444.	838.	764.	1676.		
48.00	27.56	.2500	65.00	1185.	707.	627.	1415.		
44.00	27.77	.3125	65.00	1489.	892.	789.	1784.		
40.00	28.61	.3125	65.00	1535.	948.	813.	1896.		
36.00	29.45	.3125	65.00	1580.	1005.	837.	2010.		
32.00	30.29	.3125	65.00	1626.	1064.	861.	2128.		
26.00	31.55	.3125	65.00	1694.	1156.	897.	2312.		
20.00	32.81	.3125	65.00	1762.	1251.	933.	2503.		
15.50	33.75	.3125	65.00	1814.	1325.	960.	2651.		
11.00	34.69	.3125	65.00	1865.	1402.	987.	2803.		
5.00	35.95	.3125	65.00	1933.	1507.	1023.	3013.		
.00	37.00	.3125	65.00	1990.	1597.	1054.	3194.		

LOAD CASE 1

Loading Case 1 - Serviceability

DEAD LOAD FACTOR 1.00 RADIAL ICE .00 IN.

WIND VELOCITY 60. MPH BOTTOM 4.8 PSF TOP 7.3 PSF
 MAX BASE ROTATION 0.0 DEG

LOAD CASE 1 Loading Case 1 - Serviceability

ELEV Ft	DIAM In.	THICK In.	EFF FY Ksi	RATIO	Pu Kips	Mu Ft-Kips	Vu Kips	Tu Ft-Kips	Displ Inches	Tilt Deg
108.00	14.98	.1875	65.00	.000	.03	.	.00	.0	22.85	1.77
108.00	14.98	.1875	65.00	.006	2.77	.	.60	.0	22.85	1.77
104.00	15.82	.1875	65.00	.019	2.77	2.	.60	.0	21.37	1.76
100.00	16.65	.1875	65.00	.031	2.89	5.	.64	.0	19.90	1.75
100.00	16.65	.1875	65.00	.032	3.23	5.	.76	.0	19.90	1.75
98.00	17.07	.1875	65.00	.038	3.23	7.	.76	.0	19.17	1.74
98.00	17.07	.1875	65.00	.044	6.60	7.	1.61	.0	19.17	1.74
96.00	17.49	.1875	65.00	.058	6.60	10.	1.61	.0	18.44	1.73
96.00	17.49	.2500	65.00	.044	6.73	10.	1.65	.0	18.44	1.73
92.00	18.33	.2500	65.00	.062	6.73	16.	1.65	.0	17.01	1.70
88.00	19.17	.2500	65.00	.077	6.93	23.	1.70	.0	15.60	1.67
88.00	19.17	.2500	65.00	.081	10.39	23.	2.81	.0	15.60	1.67
84.00	20.01	.2500	65.00	.105	10.39	34.	2.81	.0	14.22	1.62
80.00	20.85	.2500	65.00	.126	10.60	46.	2.86	.0	12.89	1.57
78.00	21.27	.2500	65.00	.136	11.01	52.	2.97	.0	12.24	1.53
78.00	21.27	.2500	65.00	.138	13.02	52.	3.68	.0	12.24	1.53
72.00	22.53	.2500	65.00	.171	13.02	74.	3.68	.0	10.37	1.43
66.00	23.78	.2500	65.00	.197	13.38	96.	3.74	.0	8.65	1.31
60.00	25.04	.2500	65.00	.217	13.76	119.	3.80	.0	7.08	1.18
60.00	25.04	.2500	65.00	.218	14.40	119.	3.93	.0	7.08	1.18
54.00	26.30	.2500	65.00	.234	14.40	143.	3.93	.0	5.68	1.05
48.00	27.56	.2500	65.00	.248	14.82	166.	3.98	.0	4.45	.91
48.00	26.93	.3125	65.00	.209	15.58	166.	4.04	.0	4.45	.91
44.00	27.77	.3125	65.00	.215	15.58	183.	4.04	.0	3.72	.83
40.00	28.61	.3125	65.00	.220	15.95	199.	4.08	.0	3.06	.75
36.00	29.45	.3125	65.00	.225	16.57	216.	4.18	.0	2.47	.67
32.00	30.29	.3125	65.00	.229	16.96	233.	4.22	.0	1.94	.59
26.00	31.55	.3125	65.00	.234	17.47	258.	4.27	.0	1.27	.47
20.00	32.81	.3125	65.00	.237	18.10	284.	4.33	.0	.75	.36
15.50	33.75	.3125	65.00	.240	18.91	304.	4.43	.0	.45	.28
11.00	34.69	.3125	65.00	.242	19.42	324.	4.47	.0	.22	.19
5.00	35.95	.3125	65.00	.243	20.03	351.	4.51	.0	.05	.09
.00	37.00	.3125	65.00	.245	21.11	374.	4.64	.0	.00	.00

Max Deflection Percentage 1.7% Max Tilt 1.77 Degrees

REACTION COMPONENTS (KIPS AND FT-KIPS)

TRANSVERSE SHEAR	VERTICAL FORCE	WIND SHEAR	MOMENT ABOUT TRANSVERSE	MOMENT ABOUT VERTICAL	MOMENT ABOUT WIND AXIS
.000	-21.108	4.628	374.212	.000	.000

LOAD CASE 2

Loading Case 2 - Design

DEAD LOAD FACTOR 1.00 RADIAL ICE .00 IN.

WIND VELOCITY 100. MPH BOTTOM 24. PSF TOP 36.5 PSF

MAX BASE ROTATION 0.0 DEG

LOAD CASE 2 Loading Case 2 - Design

ELEV Ft	DIAM In.	THICK In.	EFF FY Ksi	RATIO	Pu Kips	Mu Ft-Kips	Vu Kips	Tu Ft-Kips	Displ Inches	Tilt Deg
108.00	14.98	.1875	65.00	.001	.02	.	.05	.0	102.46	8.01
108.00	14.98	.1875	65.00	.007	2.94	.	2.76	.0	102.46	8.01
104.00	15.82	.1875	65.00	.070	2.94	11.	2.76	.0	95.89	7.98
100.00	16.65	.1875	65.00	.124	3.05	23.	2.96	.0	89.35	7.92
100.00	16.65	.1875	65.00	.125	3.35	23.	3.55	.0	89.35	7.92
98.00	17.07	.1875	65.00	.153	3.35	30.	3.55	.0	86.11	7.88
98.00	17.07	.1875	65.00	.160	6.89	30.	7.43	.0	86.11	7.88
96.00	17.49	.1875	65.00	.222	6.89	44.	7.43	.0	82.88	7.82
96.00	17.49	.2500	65.00	.168	7.00	44.	7.60	.0	82.88	7.82
92.00	18.33	.2500	65.00	.251	7.00	75.	7.60	.0	76.49	7.70
88.00	19.17	.2500	65.00	.321	7.19	106.	7.82	.0	70.21	7.54
88.00	19.17	.2500	65.00	.326	10.73	106.	12.74	.0	70.21	7.54
84.00	20.01	.2500	65.00	.436	10.73	156.	12.74	.0	64.07	7.34
80.00	20.85	.2500	65.00	.530	10.95	208.	12.96	.0	58.12	7.09
80.00	20.85	.2500	65.00	.531	11.37	207.	13.55	.0	58.12	7.09
78.00	21.27	.2500	65.00	.574	11.37	234.	13.55	.0	55.22	6.95
78.00	21.27	.2500	65.00	.577	13.45	234.	16.70	.0	55.22	6.95
72.00	22.53	.2500	65.00	.726	13.45	334.	16.70	.0	46.88	6.48
72.00	22.53	.2500	65.00	.726	13.91	334.	17.00	.0	46.88	6.48
66.00	23.78	.2500	65.00	.844	13.91	435.	17.00	.0	39.15	5.94
66.00	23.78	.2500	65.00	.845	14.42	435.	17.30	.0	39.15	5.94
60.00	25.04	.2500	65.00	.939	14.42	539.	17.30	.0	32.10	5.36
60.00	25.04	.2500	65.00	.940	15.22	539.	17.94	.0	32.10	5.36
54.00	26.30	.2500	65.00	1.018	15.22	646.	17.94	.0	25.78	4.75
54.00	26.30	.2500	65.00	1.018	15.80	646.	18.22	.0	25.78	4.75
48.00	27.56	.2500	65.00	1.081	15.80	755.	18.22	.0	20.23	4.13
48.00	26.93	.3125	65.00	.912	16.68	755.	18.48	.0	20.23	4.13
44.00	27.77	.3125	65.00	.940	16.68	828.	18.48	.0	16.93	3.77
40.00	28.61	.3125	65.00	.964	17.15	903.	18.69	.0	13.94	3.41
40.00	28.61	.3125	65.00	.965	17.90	903.	19.19	.0	13.94	3.41
36.00	29.45	.3125	65.00	.987	17.90	980.	19.19	.0	11.24	3.05
32.00	30.29	.3125	65.00	1.005	18.40	1057.	19.39	.0	8.84	2.69
26.00	31.55	.3125	65.00	1.028	19.04	1175.	19.64	.0	5.79	2.16
20.00	32.81	.3125	65.00	1.046	19.84	1294.	19.92	.0	3.40	1.64
20.00	32.81	.3125	65.00	1.047	21.35	1294.	20.43	.0	3.40	1.64
15.50	33.75	.3125	65.00	1.058	21.35	1386.	20.43	.0	2.03	1.26
11.00	34.69	.3125	65.00	1.067	21.86	1479.	20.62	.0	1.02	.89
5.00	35.95	.3125	65.00	1.077	22.47	1604.	20.84	.0	.21	.40
.00	37.00	.3125	65.00	1.083	23.57	1711.	21.48	.0	.00	.00

Max Deflection Percentage 7.8%

Max Tilt 8.01 Degrees

REACTION COMPONENTS (KIPS AND FT-KIPS)					
TRANSVERSE SHEAR	VERTICAL FORCE	WIND SHEAR	MOMENT ABOUT TRANSVERSE	MOMENT ABOUT VERTICAL	MOMENT ABOUT WIND AXIS
.000	-23.569	21.403	1710.566	.000	.000

Design Summary Table

Elevation	Stress Ratio	Axial	Bending	Loading	
110.	.	.03	.	1	Loading Case 1 - Serviceabilit
108.	.	.02	.1	2	Loading Case 2 - Design
104.	.07	2.94	11.	2	Loading Case 2 - Design
100.	.12	3.05	22.8	2	Loading Case 2 - Design
98.	.15	3.35	29.8	2	Loading Case 2 - Design
96.	.22	6.89	44.5	2	Loading Case 2 - Design
92.	.25	7.	74.6	2	Loading Case 2 - Design
88.	.32	7.19	105.6	2	Loading Case 2 - Design
84.	.44	10.73	156.1	2	Loading Case 2 - Design
80.	.53	10.95	207.6	2	Loading Case 2 - Design
78.	.57	11.37	234.4	2	Loading Case 2 - Design
72.	.73	13.45	333.8	2	Loading Case 2 - Design
66.	.84	13.91	435.3	2	Loading Case 2 - Design
60.	.94	14.42	538.5	2	Loading Case 2 - Design
54.	1.02	15.22	645.7	2	Loading Case 2 - Design
48.	1.08	15.8	754.7	2	Loading Case 2 - Design
44.	.94	16.68	828.5	2	Loading Case 2 - Design
40.	.96	17.15	903.1	2	Loading Case 2 - Design
36.	.99	17.9	979.7	2	Loading Case 2 - Design
32.	1.01	18.4	1057.2	2	Loading Case 2 - Design
26.	1.03	19.04	1174.9	2	Loading Case 2 - Design
20.	1.05	19.84	1294.4	2	Loading Case 2 - Design
15.5	1.06	21.35	1386.3	2	Loading Case 2 - Design
11.	1.07	21.86	1479.1	2	Loading Case 2 - Design
5.	1.08	22.47	1604.1	2	Loading Case 2 - Design
0.	1.08	23.57	1710.6	2	Loading Case 2 - Design

BASE PLATE AT ELEVATION	.00	FEET
TUBE DIAMETER	37.00	INCHES
DESIGN MOMENT	1710.57	KIP FT
DESIGN MOMENT IS .00 DEGREES FROM THE WIND DIRECTION		
APPLIED AXIAL FORCE	23.6	KIPS
APPLIED SHEAR	21.48	KIPS

BOLT DATA

BOLT TYPE	A615 - G75	
BOLTS ARE EVENLY SPACED		
DIAMETER	2.250	INCHES
EFFECTIVE AREA	3.250	SQ IN
DESIGN STRESS	100.000	KSI
TOTAL LENGTH	7.0	FEET
BOTTOM TEMPLATE MUST BE BOLTED ON		
MINIMUM EMBEDMENT	11.9	FEET
NUMBER OF BOLTS	8	
BOLT CIRCLE DIAMETER	45.00	INCHES
APPLIED AXIAL STRESS	71.084	KSI
MAX BOLT FORCE	231.022	KIPS
MAX BOLT SHEAR	1.238	KIPS
BOLT PHI	.800	
TENSION RESISTANCE	45.450	KIPS
SHEAR RESISTANCE	23.550	KIPS
RATIO	.382	

PLATE DATA

DIAMETER OF PLATE	51.00	INCHES
BEND WIDTH REDUCTION	.750	
EDGE CLEARANCE MAY BE BELOW SUGGESTED MINIMUM		
MATERIAL	A572MOD60	
PLATE YIELD	60.0	KSI
PROVIDED THICKNESS	2.000	INCHES
REQUIRED THICKNESS	1.975	INCHES
BOLT HOLE DIAMETER	2.625	INCHES
CENTER HOLE SIZE	27.00	INCHES
NET WEIGHT	807.7	POUNDS
RAW STOCK WEIGHT	1530.5	POUNDS
SURFACE AREA	19.82	SQ FT
MAX APPLIED STRESS	52.65	KSI
APPLIED MOMENT	2.57	KIP-FT
RESIST MOMENT	5.27	KIP-FT
RATIO	.49	
PLATE PHI	.90	

CONCRETE STRENGTH	3000.	PSI
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Base Plate - use 51.00 inch ROUND x 2.000 inch A572MOD60
 with (8) 2.250 diameter x 7. foot caged A615 - G75 bolts
 on a 45. inch bolt circle.

EXISTING BASE ϕ FAILS

FLANGE AT ELEVATION	96.00	FEET
TUBE DIAMETER	17.49	INCHES
DESIGN MOMENT	44.48	KIP FT
DESIGN MOMENT IS .00 DEGREES FROM THE WIND DIRECTION		
APPLIED AXIAL FORCE	6.9	KIPS
APPLIED SHEAR	7.43	KIPS

BOLT DATA

BOLT TYPE	A325 - G92	
BOLTS ARE EVENLY SPACED		
DIAMETER	1.000	INCHES
EFFECTIVE AREA	.606	SQ IN
DESIGN STRESS	100.000	KSI
TOTAL LENGTH	4.0	INCHES
NUMBER OF BOLTS	6	
BOLT CIRCLE DIAMETER	25.75	INCHES
APPLIED AXIAL STRESS	24.701	KSI
MAX BOLT FORCE	14.969	KIPS
MAX BOLT SHEAR	1.238	KIPS
BOLT PHI	.750	
TENSION RESISTANCE	45.450	KIPS
SHEAR RESISTANCE	23.550	KIPS
RATIO	.382	

PLATE DATA

DIAMETER OF PLATE	28.50	INCHES
BEND WIDTH REDUCTION	.750	
EDGE CLEARANCE MAY BE BELOW SUGGESTED MINIMUM		
MATERIAL	A572MOD50	
PLATE YIELD	60.0	KSI
PROVIDED THICKNESS	1.000	INCHES
REQUIRED THICKNESS	.699	INCHES
BOLT HOLE DIAMETER	1.250	INCHES
CENTER HOLE SIZE	15.50	INCHES
NET WEIGHT	125.1	POUNDS
RAW STOCK WEIGHT	246.3	POUNDS
SURFACE AREA	6.14	SQ FT
MAX APPLIED STRESS	21.97	KSI
APPLIED MOMENT	2.57	KIP-FT
RESIST MOMENT	5.27	KIP-FT
RATIO	.49	
PLATE PHI	.90	

Flange - use 28.50 inch ROUND x 1.000 inch A572MOD50
with (6) 1.000 diameter x 4. inch A325 - G92 bolts
on a 25.75 inch bolt circle.

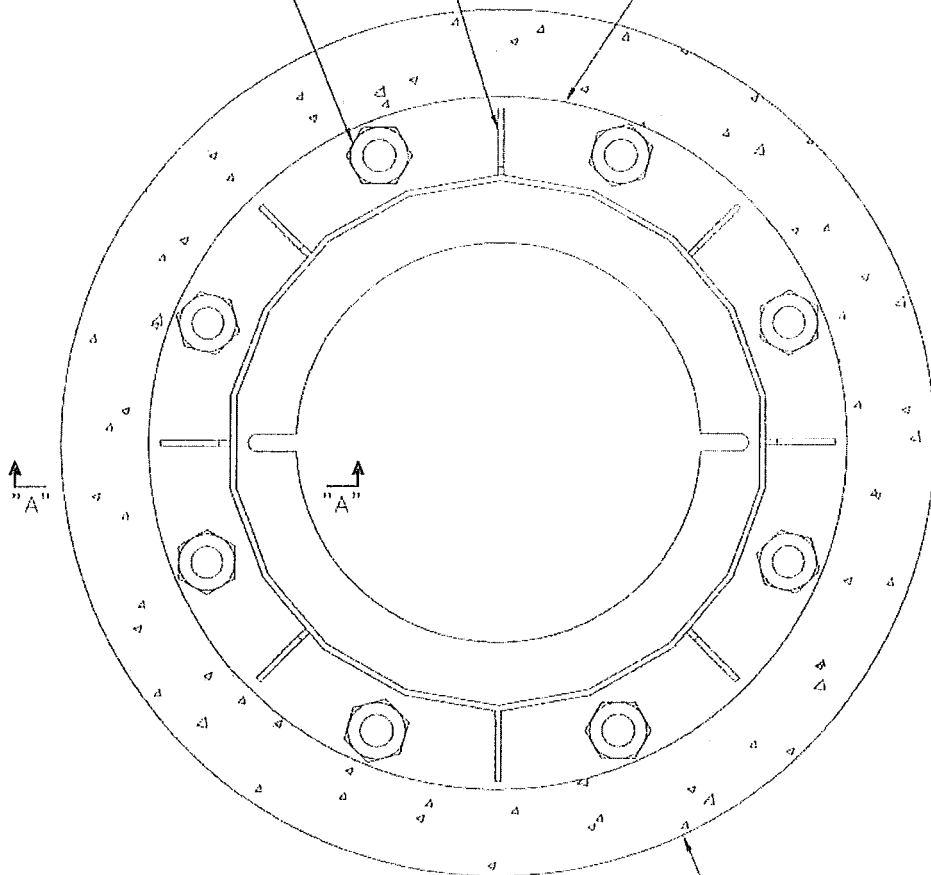
REFER TO EEI'S NOTES AND SPECIFICATIONS FOR FIELD GUSSET DETAILS.

ADD (8) PL 1/2 x 6 1/2 x 18" STIFFENERS (A572 GR.50) CENTERED BETWEEN EXISTING ANCHOR BOLTS

EXISTING ANCHOR BOLTS

REF. EXISTING BASE PLATE

EXISTING SHAFT



PL 1/2 (A572 GR.50)

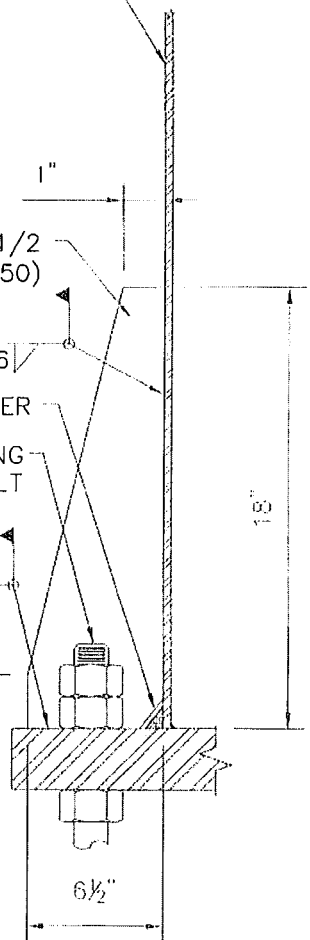
5/16"

3/4" CHAMFER

EXISTING ANCHOR BOLT

1/2"

3"



SECTION "A-A"
N.T.S.

PLAN VIEW
BASE PLATE
N.T.S.

EXISTING
CONCRETE
FOUNDATION



**ENGINEERED
ENDEAVORS
INCORPORATED**
The Experienced Point of View

7610 Jenther Drive * Mentor, OH 44060-4872
Ph: (440) 918-1101 * Ph: (888) 270-3855
Fx: (440) 918-1108 * www.engend.com

**BASE PLATE
MODIFICATION**

CHECKED BY	DATE	15947-E01
DRAWN BY R.V.H.	DATE 9/2/09	

REV	DESCRIPTION	DATE	DWG	APPROV

Stiffened or Unstiffened UngROUTED Circular Base Plate - Rev. G



ENGINEERED
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CUSTOMER: URS Corp
STRUCTURE: 96' Monopole w/ 14' Ext
LOCATION: Danbury, CT

DATE: 01-Jul-09
JOB NUMBER: 15947
SITE: Danbury South

Reactions		
Moment:	1711	ft-kips
Axial:	23.6	kips
Shear:	21.4	kips

Anchor Rod Data		
Qty:	8	
Diam:	2.25	in
Grade(Fu):	100	ksi
Circle:	45	in

Anchor Rod Results

Maximum Rod Tension: 225.2 Kips
Allowable Tension: 243.8 Kips
Anchor Rod Stress Ratio: 93.5% **Pass**

Plate Data		
Diam:	51	in
Thick:	1.5	in
Grade:	60	ksi
Sect. Mod:	8.17	in ³
Eff. Width:	14.53	in

Base Plate Results

Plate Maximum Moment: 157.5 ksi
Plate Design Moment: 441.3 ksi
Base Plate Stress Ratio: 15.5% **Pass**

Stiffener Data		
Config:	1	*
H. Weld:	0.5	in
V. Weld:	0.3125	in
Width:	6.5	in
Height:	18	in
Thick:	0.5	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

Stiffener Results

Horizontal Weld : 92.4% **Pass**
Vertical Weld: 71.4% **Pass**
Plate Bending: 55.5% **Pass**
Plate Tension: 91.4% **Pass**

Pole Data		
Diam:	37	in
Thick:	0.3125	in
Grade:	65	ksi

Pole Results

Punching Shear: 88.5% **Pass**

* 0 = none, 1 = every bolt, 2 = every 2 bolts



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ANALYSIS
OF A
DRILLED PIER FOUNDATION

URS Corp
110' Monopole

Danbury South Site
Danbury, CT

EEI Project Number 15947, Revision 0

July 7, 2009

7610 Jenther Drive • Mentor, Ohio 44060-4872
Phone: (440) 918-1101 • Phone: (888) 270-3855
Fax: (440) 918-1108 • www.engend.com

FOUNDATION DESIGN CALCULATIONS FOR A DRILLED PIER FOUNDATION



**ENGINEERED
ENDEAVORS
INCORPORATED**
The Experienced Point of View



CUSTOMER: URS Corp

DATE: 07/07/09

LOCATION: Danbury, CT

STRUCTURE: 110' Monopole

SITE NAME: Danbury South

JOB NUMBER: 15947

SITE NUMBER:

STATUS: Revision 0

FACTORED FOUNDATION DESIGN LOADS

SERVICEABILITY LOADS	OVERTURNING MOMENT	SHEAR FORCE	AXIAL FORCE
STRENGTH LOADS	1710.6 ft-kips	21.5 kips	23.6 kips
$\phi_s = 0.75$	2280.8 ft-kips	28.7 kips	31.5 kips

PIER PROPERTIES

ANCHOR BOLT CIRCLE	45.0 in	ACTUAL DIAMETER	66.0 in
ANCHOR BOLT DESCRIPTION	(8) 2.25 in BOLTS AT 6 ft - 0 in LONG	PIER AREA	3421.2 in ²
MINIMUM DIAMETER	65.0 in	MOMENT OF INERTIA	931420.2 in ⁴

SOIL INFORMATION

SOIL DESCRIPTION	DEPTH ft	DEPTH in	K _H VALUE pci	ϕ degrees	γ pcf/pci	COHESION psf/psi	E ₅₀ in/in
SAND	3.0	36	122	38	135		
	14.0	168			0.078		
SAND	14.0	168	100	38	75		
	30.0	360			0.043		

GROUNDWATER WAS ENCOUNTERED AT 14 ft
DISREGARD UPPER 36in OF SOIL

ACTUAL EMBEDMENT	La = 20.0 ft
TOTAL LENGTH	L = 21.0 ft
CONCRETE VOLUME	V = 18.5 yds ³

CONCRETE REINFORCEMENT

	BAR SIZE	BAR WEIGHT	QUANTITY	LENGTH	WEIGHT
VERTICAL BARS	# 8	2.670 lbs/ft	24	20.5 ft	1313.6 lbs
HORIZONTAL TIES	# 5	1.043 lbs/ft	23	16.92 ft	405.8 lbs
TOTAL					1719.5 lbs

PIER STRUCTURAL DESIGN

FACTORED MOMENT
FACTORED SHEAR

2942000 in-lbs
298100 lbs

BENDING MOMENT
SHEAR FORCE

1838.8 ft-kips
223.6 kips

PIER DIAMETER 66 in
 CONCRETE 3 ksi
 REINFORCEMENT 60 ksi
 REBAR # 8 QUANTITY 24
 DESIGN REBAR QUANTITY 12
 MINIMUM REINFORCEMENT RATIO: 0.0050
 ACTUAL REINFORCEMENT RATIO: 0.0055
 CONCRETE COVER 4 in
 REBAR LAYOUT RADIUS 27.5000 in
 CHECK DEFLECTION IN PIER

ACTUAL BAR AREA 0.79 in²
 THEORETICAL BAR AREA 1.58 in²
 REBAR SPACING 7.20 in
 HORIZONTAL TIES 23

VERTICAL REBAR LAYOUT

REBAR NUMBER	ANGLE degrees	COORDINATE in	EDGE DIST in	REBAR NUMBER	ANGLE degrees	COORDINATE in	EDGE DIST in
1	0	27.50	5.50	7	180	-27.50	60.50
2	30	23.82	9.18	8	210	-23.82	56.82
3	60	13.75	19.25	9	240	-13.75	46.75
4	90	0.00	33.00	10	270	0.00	33.00
5	120	-13.75	46.75	11	300	13.75	19.25
6	150	-23.82	56.82	12	330	23.82	9.18

LOCATION OF NEUTRAL AXIS
COMPRESSION ZONE

c = 10.968 in
a = 9.323 in

COMPRESSION ZONE

REBAR NUMBER	ε in/in	FORCE kips
1	0.0015	64.50
2	0.0005	18.33
12	0.0005	18.33

CONCRETE	752.06
----------	--------

COMPRESSION FORCE: 853.21 kips

TENSION ZONE

REBAR NUMBER	ε in/in	FORCE kips
2		
3	0.0023	94.80
4	0.0060	94.80
5	0.0098	94.80
6	0.0125	94.80
7	0.0135	94.80
8	0.0125	94.80
9	0.0098	94.80
10	0.0060	94.80
11	0.0023	94.80
12		

TENSION FORCE: 853.20 kips

MAXIMUM MOMENT CAPACITY

MOMENT DUE TO COMPRESSION

REBAR NUMBER	FORCE kips	ARM in	MOMENT ft-kips
1	64.50	27.50	147.81
2	18.33	23.82	36.37
12	18.33	23.82	36.37

CONCRETE	752.06	26.78	1678.64
----------	--------	-------	---------

COMPRESSION MOMENT: 1899.20 ft-kips

MOMENT DUE TO TENSION

REBAR NUMBER	FORCE kips	ARM in	MOMENT ft-kips
2			
3	94.80	13.75	-108.63
4	94.80	0.00	0.00
5	94.80	-13.75	108.63
6	94.80	-23.82	188.14
7	94.80	-27.50	217.25
8	94.80	-23.82	188.14
9	94.80	-13.75	108.63
10	94.80	0.00	0.00
11	94.80	13.75	-108.63
12			

TENSION MOMENT: 593.54 ft-kips

DESIGN MOMENT ($\phi \times M_n$):

2243.46 ft-kips

Licensed to: MRM

EEI

PROGRAM LPILE plus Version 3.0
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Danbury South Site

UNITS--ENGLISH UNITS

INPUT INFORMATION

THE LOADING IS STATIC

PILE GEOMETRY AND PROPERTIES

PILE LENGTH	=	252.00 IN		
2 POINTS				
X		DIAMETER	MOMENT OF INERTIA	AREA
			IN**4	IN**2
IN		IN		
.00		66.000	.931E+06	.342E+04
252.00		66.000	.931E+06	.342E+04
				MODULUS OF ELASTICITY
				LBS/IN**2
				.300E+07
				.300E+07

SOILS INFORMATION

X AT THE GROUND SURFACE = 48.00 IN

SLOPE ANGLE AT THE GROUND SURFACE = .00 DEG.

2 LAYER(S) OF SOIL

LAYER 1
THE SOIL IS A SAND - P-Y CRITERIA BY REESE ET AL, 1974

X AT THE TOP OF THE LAYER = 48.00 IN

X AT THE BOTTOM OF THE LAYER = 180.00 IN

MODULUS OF SUBGRADE REACTION = .122E+03 LBS/IN**3

LAYER 2
THE SOIL IS A SAND - P-Y CRITERIA BY REESE ET AL, 1974

00 DataExport 00.1po
 X AT THE TOP OF THE LAYER = 180.00 IN
 X AT THE BOTTOM OF THE LAYER = 372.00 IN
 MODULUS OF SUBGRADE REACTION = .100E+03 LBS/IN**3

DISTRIBUTION OF EFFECTIVE UNIT WEIGHT WITH DEPTH
 4 POINTS

X, IN	WEIGHT, LBS/IN**3
48.00	.78E-01
180.00	.78E-01
180.00	.43E-01
372.00	.43E-01

DISTRIBUTION OF STRENGTH PARAMETERS WITH DEPTH
 4 POINTS

X, IN	C, LBS/IN**2	PHI, DEGREES	E50
48.00	.000E+00	.380E+02	-----
180.00	.000E+00	.380E+02	-----
180.00	.000E+00	.380E+02	-----
372.00	.000E+00	.380E+02	-----

BOUNDARY AND LOADING CONDITIONS

LOADING NUMBER 1

BOUNDARY-CONDITION CODE = 1
 LATERAL LOAD AT THE PILE HEAD = .000E+00 LBS
 MOMENT AT THE PILE HEAD = .000E+00 IN-LBS
 AXIAL LOAD AT THE PILE HEAD = .000E+00 LBS

LOADING NUMBER 2

BOUNDARY-CONDITION CODE = 1
 LATERAL LOAD AT THE PILE HEAD = .287E+05 LBS
 MOMENT AT THE PILE HEAD = .274E+08 IN-LBS
 AXIAL LOAD AT THE PILE HEAD = .315E+05 LBS

FINITE-DIFFERENCE PARAMETERS

NUMBER OF PILE INCREMENTS = 100
 DEFLECTION TOLERANCE ON DETERMINATION OF CLOSURE = .100E-04 IN
 MAXIMUM NUMBER OF ITERATIONS ALLOWED FOR PILE ANALYSIS = 100
 MAXIMUM ALLOWABLE DEFLECTION = .10E+03 IN

OUTPUT CODES

KOUTPT = 1
 KPYOP = 0
 INC = 5

 O U T P U T I N F O R M A T I O N

00 DataExport 00.1po
 * COMPUTE LOAD-DISTRIBUTION AND LOAD-DEFLECTION *
 * CURVES FOR LATERAL LOADING *

LOADING NUMBER 1

BOUNDARY CONDITION CODE = 1
 LATERAL LOAD AT THE PILE HEAD = .000E+00 LBS
 MOMENT AT THE PILE HEAD = .000E+00 IN-LBS
 AXIAL LOAD AT THE PILE HEAD = .000E+00 LBS

X	DEFLECTION	MOMENT	SHEAR	SLOPE	TOTAL STRESS	FLEXURAL RIGIDITY	SOIL REACTION
IN	IN	LBS-IN	LBS	RAD.	LBS/IN**2	LBS-IN**2	LBS/IN
*****	*****	*****	*****	*****	*****	*****	*****
.0	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
12.6	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
25.2	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
37.8	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
50.4	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
63.0	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
75.6	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
88.2	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
100.8	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
113.4	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
126.0	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
138.6	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
151.2	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
163.8	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
176.4	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
189.0	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
201.6	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
214.2	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
226.8	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
239.4	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00
252.0	.000E+00	.000E+00	.000E+00	.000E+00	.000E+00	.279E+13	.000E+00

OUTPUT VERIFICATION

THE MAXIMUM MOMENT IMBALANCE FOR ANY ELEMENT = .000E+00 IN-LBS
 THE MAX. LATERAL FORCE IMBALANCE FOR ANY ELEMENT = .000E+00 LBS

OUTPUT SUMMARY

PILE-HEAD DEFLECTION = .000E+00 IN
 COMPUTED SLOPE AT PILE HEAD = .000E+00
 MAXIMUM BENDING MOMENT = .000E+00 LBS-IN
 MAXIMUM SHEAR FORCE = .000E+00 LBS
 NO. OF ITERATIONS = 1
 NO. OF ZERO DEFLECTION POINTS = 0

LOADING NUMBER 2

00 DataExport 00.1po

BOUNDARY CONDITION CODE = 1
 LATERAL LOAD AT THE PILE HEAD = .287E+05 LBS
 MOMENT AT THE PILE HEAD = .274E+08 IN-LBS
 AXIAL LOAD AT THE PILE HEAD = .315E+05 LBS

X	DEFLECTION	MOMENT	SHEAR	SLOPE	TOTAL STRESS	FLEXURAL RIGIDITY	SOIL REACTION
IN	IN	LBS-IN	LBS	RAD.	LBS/IN**2	LBS-IN**2	LBS/IN
0.0	.172E+01	.274E+08	.287E+05	-.102E-01	.979E+03	.279E+13	.000E+00
12.6	.159E+01	.277E+08	.287E+05	-.101E-01	.992E+03	.279E+13	.000E+00
25.2	.146E+01	.281E+08	.287E+05	-.100E-01	.100E+04	.279E+13	.000E+00
37.8	.134E+01	.285E+08	.287E+05	-.987E-02	.102E+04	.279E+13	.000E+00
50.4	.122E+01	.288E+08	.285E+05	-.974E-02	.103E+04	.279E+13	.110E+03
63.0	.109E+01	.292E+08	.232E+05	-.961E-02	.104E+04	.279E+13	-.747E+03
75.6	.973E+00	.294E+08	.946E+04	-.948E-02	.105E+04	.279E+13	-.144E+04
88.2	.854E+00	.294E+08	-.132E+05	-.934E-02	.105E+04	.279E+13	-.215E+04
100.8	.737E+00	.290E+08	-.446E+05	-.921E-02	.104E+04	.279E+13	-.283E+04
113.4	.622E+00	.282E+08	-.841E+05	-.908E-02	.101E+04	.279E+13	-.343E+04
126.0	.509E+00	.269E+08	-.131E+06	-.896E-02	.962E+03	.279E+13	-.392E+04
138.6	.396E+00	.249E+08	-.182E+06	-.884E-02	.892E+03	.279E+13	-.424E+04
151.2	.286E+00	.223E+08	-.233E+06	-.874E-02	.799E+03	.279E+13	-.360E+04
163.8	.176E+00	.191E+08	-.271E+06	-.864E-02	.686E+03	.279E+13	-.249E+04
176.4	.678E-01	.155E+08	-.294E+06	-.856E-02	.560E+03	.279E+13	-.106E+04
189.0	-.397E-01	.118E+08	-.297E+06	-.850E-02	.427E+03	.279E+13	.559E+03
201.6	-.146E+00	.814E+07	-.279E+06	-.846E-02	.298E+03	.279E+13	.225E+04
214.2	-.253E+00	.485E+07	-.239E+06	-.843E-02	.181E+03	.279E+13	.420E+04
226.8	-.359E+00	.223E+07	-.173E+06	-.841E-02	.883E+02	.279E+13	.623E+04
239.4	-.465E+00	.573E+06	-.901E+05	-.841E-02	.295E+02	.279E+13	.686E+04
252.0	-.571E+00	.000E+00	.000E+00	-.841E-02	.920E+01	.279E+13	.748E+04

OUTPUT VERIFICATION

THE MAXIMUM MOMENT IMBALANCE FOR ANY ELEMENT = -.296E-02 IN-LBS
 THE MAX. LATERAL FORCE IMBALANCE FOR ANY ELEMENT = -.579E-03 LBS

OUTPUT SUMMARY

PILE-HEAD DEFLECTION = .172E+01 IN
 COMPUTED SLOPE AT PILE HEAD = -.102E-01
 MAXIMUM BENDING MOMENT = .294E+08 LBS-IN
 MAXIMUM SHEAR FORCE = -.298E+06 LBS
 NO. OF ITERATIONS = 20
 NO. OF ZERO DEFLECTION POINTS = 1

SUMMARY TABLE

BOUNDARY CONDITION BC1	BOUNDARY CONDITION BC2	AXIAL LOAD LBS	PILE HEAD DEFLECTION IN	MAX. MOMENT IN-LBS	MAX. SHEAR LBS
------------------------	------------------------	----------------	-------------------------	--------------------	----------------

00 DataExport 00.1po
.0000E+00 .0000E+00 .0000E+00 .0000E+00 .0000E+00 .0000E+00
.2867E+05 .2737E+08 .3147E+05 .1719E+01 .2942E+08 -.2981E+06

Pier Overturning Stability Check

EEl Project No. 15947

Base Moment, kip-ft	2281	Pier Diameter, ft	5.5
Shear Force, kips	28.7	Groundwater, ft	14
Vertical Force, kips	31.5	Pier Embedment, ft	20
		Disregard, ft	3

Date 7/2/2009

Soil Properties Information

Soil Layer	Depth, ft	γ	ϕ	C, psf	Kp
Sand	14	135	38		4.20
Sand	30	75	38		4.20

Zero Line, ft 14.4 Force 1.635%

Resisting Moment, k-ft 4,353.50 Overturning Moment, k-ft 2,722.98

Safety Factor 1.60

MODIFICATION DRAWINGS FOR DANBURY SOUTH, CT

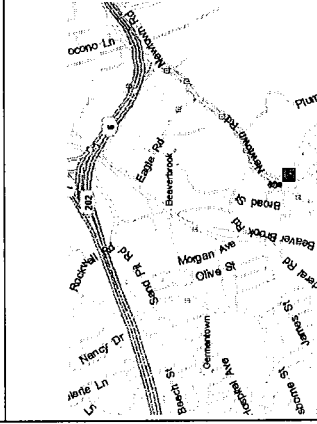
metroPOS

Unlimit Yourself.

SITE NAME:
DANBURY SOUTH

SITE ADDRESS:
48 NEWTOWN RD.
DANBURY, CT 06810

VICINITY MAP



DRIVING DIRECTIONS

FROM DANBURY MUNICIPAL AIRPORT HEAD NORTHWEST ON KENOSIA AVE. TAKE THE 1ST RIGHT ONTO BACKUS AVE. SLIGHT RIGHT ONTO US7 N TOWARD I84. MERGE ONTO I84 E. EXIT 8 & BRING RIGHT ON TO DANBURY RD. TURN LEFT ON DANBURY RD. THE PROJECT SITE TOWER WILL BE ON THE RIGHT. TOTAL DISTANCE 7.3 MILES.

APPROVALS

DISCIPLINE	SIGNATURE	DATE
PRE CONSTRUCTION INSPECTION		
ZONING/ PERMITTING		
CONSTRUCTION (AS-BUILT)		
LESEE		

CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF ALL APPLICABLE BUILDING CODES. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE CURRENT EDITIONS OF ALL APPLICABLE ZONING CODES. PLANS IS TO BE CONSTRUCTED TO PERMIT WORK NOT CONFORMING TO THESE CODES.

PROJECT SUMMARY

APPLICANT/LESEE:
METRO PCS

CONTRACTORS:
CONSTRUCTION:
TBD.

CONSULTANTS:
ENGINEERING:
STRUCTURAL COMPONENTS, LLC
1-866-386-7622
CONTACT: BRAD COOK, P.ENG.

CLIENT:
ARETE DEVELOPMENT
20 INDUSTRIAL ROAD
FAIRFIELD, NJ 07004
(973) 244-0037
CONTACT: ROB BROOKA

SITE INFORMATION

LATITUDE: 41.40319 °N
LONGITUDE: -73.42387 °W

SHEET INDEX

ARCHITECTURAL:
T-1 TITLE SHEET
GN-1 GENERAL CONSTRUCTION NOTES

STRUCTURAL:
PK-1 PARTS LIST
S-1 SPECIFICATIONS

DETAILS:
D-1 REINFORCEMENT DETAILS
D-2 REINFORCEMENT DETAILS
D-M2S SWITCH-BLADE INSTALLATION DETAIL

FOUNDATION:
F-1 FOUNDATION DETAILS
F-M08 12 ANCHOR FOUNDATION DETAILS

JURISDICTION

FAIRFIELD COUNTY, CT



Structural Components
1617 PEARL ST. UNIT A
BOULDER, CO 80302
(970) 441-1122
JOB #: 100014

STAMP:

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REVISIONS:

NO.	DATE	DESCRIPTION
0	2/4/10	MODIFICATION DRAWINGS

BY	CHK	APPD
MY <td>ES</td> <td>BC</td>	ES	BC

48 NEWTOWN RD.
DANBURY, CT 06810

MONOPOLE
EXTENSION AND
REINFORCEMENT

TITLE SHEET

T-1 0



1617 PEARL ST. UNIT A
BOULDER, CO 80302
(866) 386-6222
JOB #: 100014

STAMP

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REVISIONS:

NO.	DATE	DESCRIPTION	BY	CHK	APD
0	2/18/10	MODIFICATION DRAWINGS	MY	ES	BC
1					
2					
3					
4					
5					

FILE INFORMATION:

48 NEWTOWN RD.
DANBURY, CT 06810

SECRETARY:

MONOPOLE
EXTENSION AND
REINFORCEMENT

SHEET TITLE:

PARTS LIST

SHEET NO.:

PL-1 0



RSB-0122-15
15' SWITCHBLADE
TERM - TERM
QTY: 1
WEIGHT: 304 LBS.



RSB-0112-10
10' SWITCHBLADE BASE
TERM - TERM
QTY: 1
WEIGHT: 377 LBS.



RSB-0112-20
20' SWITCHBLADE BASE
TERM - TERM
QTY: 2
WEIGHT: 573 LBS.



CA-00029-01
16" Ø x 14' MONOPOLE EXTENSION
WITH CUSTOM ATTACHMENT PLATE
QTY: 1
WEIGHT: 1150 LBS.



Structural Components
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NO.	DATE	DESCRIPTION
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AS NOTED UNLESS OTHERWISE SPECIFIED
MONOPOLE EXTENSION AND REINFORCEMENT
SPECIFICATIONS
S-1

POLE SPECIFICATIONS	
MANUFACTURER	UNKNOWN
BASE PLATE STEEL	96" MONOPOLE 18 SIDED W/ 1/4" EXTENSION SMOOTH 1.5625" THICK X 51" OD X 27" ID Fy = 60 KSI
ANCHOR BOLTS	(8) 2-1/4" DIA RODS ON 45" BOLT CIRCLE Fy = 75 KSI

CURRENT STRUCTURAL ANALYSIS	
COMPANY	STRUCTURAL COMPONENTS
AUTHOR / FILE # / DATE	MIKE DEBOER / 100014 / 2-8-2010

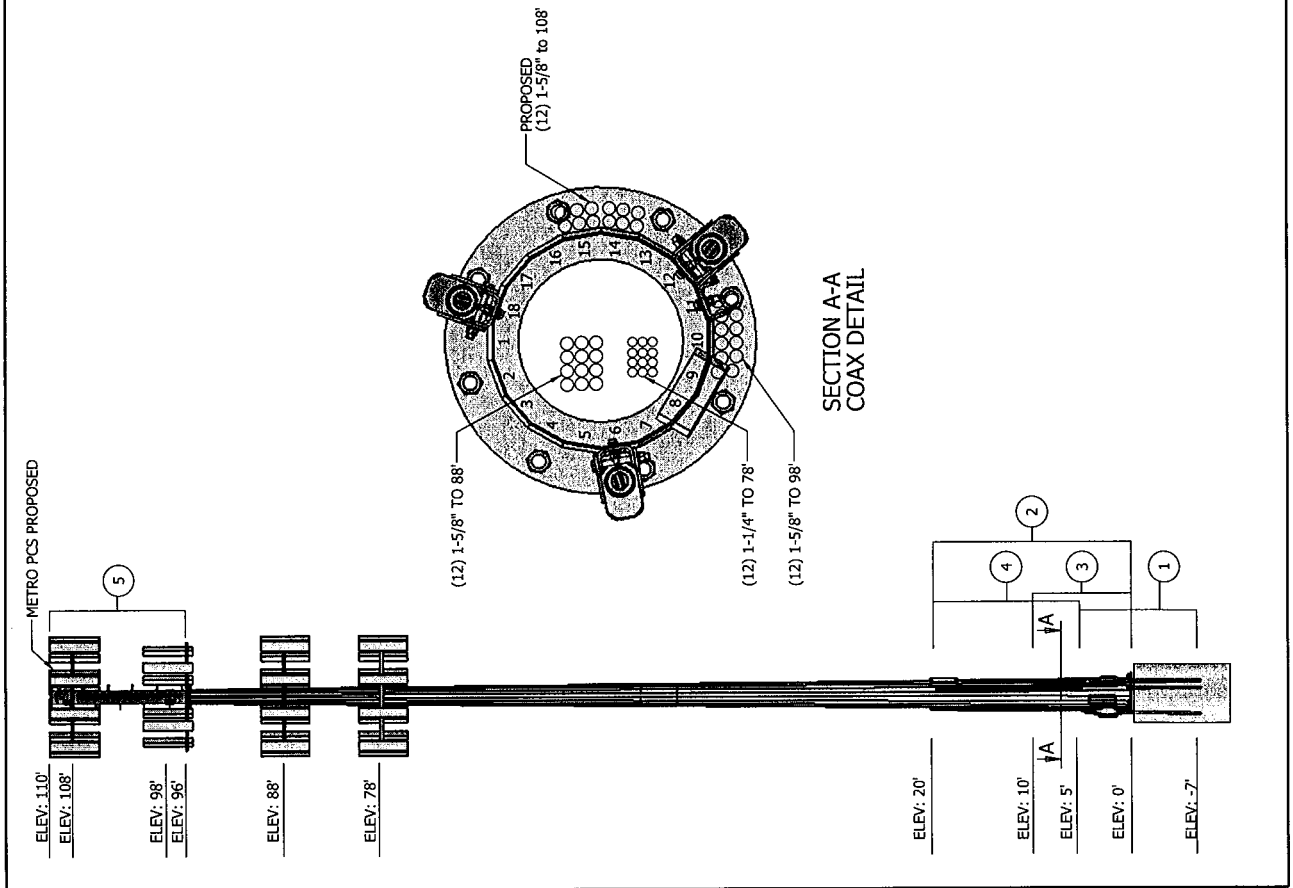
SHAFT SPECIFICATIONS						
SECTION	LENGTH (IN)	# SIDES	THICKNESS (IN)	GRADE (KSI)	OVERLAP (IN)	DIAMETER (F/F)
1	50.00'	18	.3125"	65	48.00"	26.51"
2	50.00'	18	.2500"	65	N/A	27.98"
3	14.00'	SMOOTH	.3750"	46	N/A	16.00"

DESIGN SPECIFICATIONS	
CODE	TIA/EIA-222-G (IBC 2006) FAIRFIELD, CT
WIND SPEED (BARE)	100 MPH 3-SECOND GUST
WIND SPEED (ICED)	50 MPH 3-SECOND GUST W/ 3/4" RADIAL ICE
EXPOSURE CATEGORY	EXPOSURE C
TOPOGRAPHIC CATEGORY	CATEGORY 1
CLASSIFICATION	CLASS II

EXISTING ANTENNA LIST			
ELEV. (FT.)	QTY.	ANTENNAS & MOUNTS	STATUS
78.0	6	RR90-11-00DBL PANEL ANTENNAS	SPRINT AND NEXTEL
	3	KMW AM XW/M17-65-00T	
	1	KMW TMA'S	
88.0	6	948F85T2E-M 48" x 12" x 3" PANEL ANTENNAS	VERIZON WIRELESS
	1	STANDARD PLATFORM	
98.0	6	7770 PANEL ANTENNAS	AT&T
	6	TMA'S	
	1	LOW PROFILE PLATFORM W/ HANDRAILS	

PROPOSED ANTENNA LIST			
ELEV. (FT.)	QTY.	ANTENNAS & MOUNTS	OWNER
108.0	3	KATHREIN 800-10504	METRO PCS
	3	KATHREIN 742-351 T-ARMS	
	3	T-ARMS	

TOWER MODIFICATION SCHEDULE				
ITEM	DESCRIPTION	ELEVATION (FT)		DWG. NO.
		BOTTOM	TOP	
1	INSTALL ANCHOR RODS (FACES 6,12,18)	-7.00	5.00	F-M08, F-1
2	INSTALL 20' SWITCHBLADE BASE-TERM (FACES 6,18)	0.50	20.00	F-M08, D-1
3	INSTALL 10' SWITCHBLADE BASE-TERM (FACE 12)	0.50	10.00	F-M08, D-1
4	INSTALL 15' SWITCHBLADE TERM-TERM (FACE 11)	5.00	20.00	D-M25, D-1
5	INSTALL MONOPOLE EXTENSION	96.00	110.00	D-2
6	INSTALL SAFETY CLIMB	0.00	110.00	---





1617 PEARL ST UNIT A
 BOSTON, MA 02112
 (617) 386-7622
 (617) 386-7623
 JOB #: 100014

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REVISIONS:

NO.	DATE	DESCRIPTION	BY	CHK	APP
0	2/18/10	MODIFICATION DRAWINGS	MY	ES	BC
1					
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4					
5					

SITE INFORMATION:

48 NEWTOWN RD.
 DANBURY, CT 06810

DESCRIPTION:

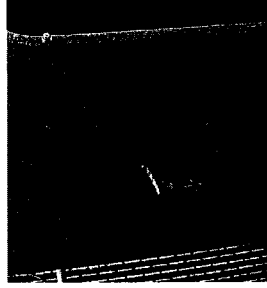
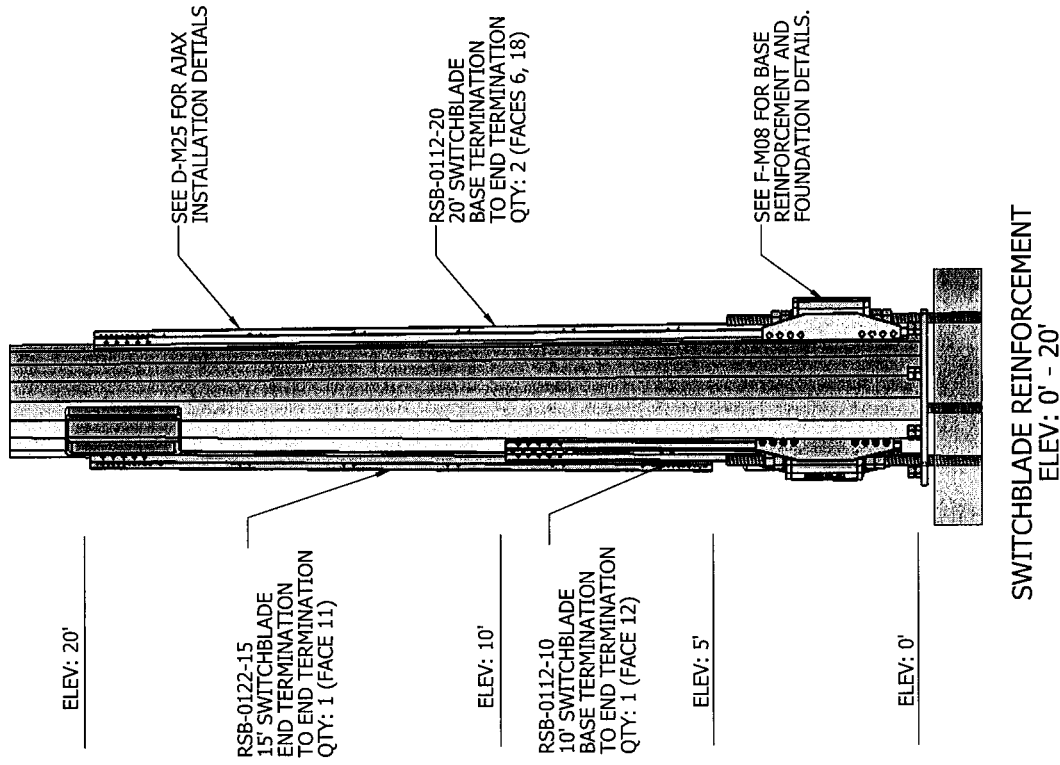
MONOPILE
 EXTENSION AND
 REINFORCEMENT

SHEET TITLE:

REINFORCEMENT
 DETAILS

REVISION:

D-1 **0**



4" x 3-1/2" x 1/2" PLATE ON FACE 6 WILL
 HAVE TO BE CUT TO ALLOW FOR PROPER
 CONNECTION TO FACE 18. REMOVE
 THE BASE OF THE POLE. THE BASE PLATE IS
 TO BE REMOVED AND THE BASE PLATE IS
 TO BE REINFORCED WITH (2) COATS OF
 95% ZINC RICH PAINT.



Structural Components
 1617 PEARL ST. UNIT A
 BOULDER, CO 80302
 (866) 386-7622
 JOB #: 100014

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0	2/16/10	MODIFICATION DRAWINGS	MY	ES	BC
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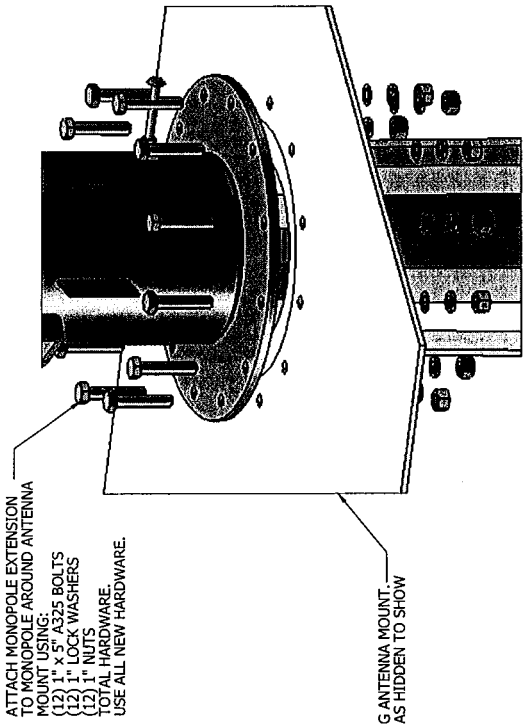
DATE OF REVISION:

PROJECT LOCATION:
 41 NEWFANGS RD
 DANBURY, CT 06810

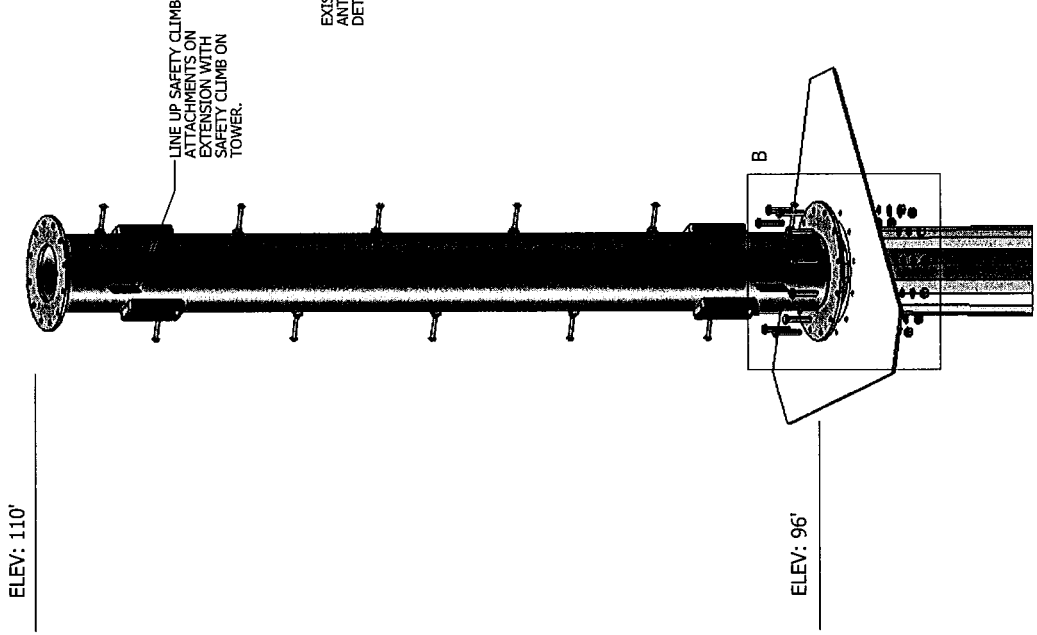
DESIGN TYPE:
**MONOPOLE
 EXTENSION AND
 REINFORCEMENT**

REINFORCEMENT
 DETAILS

SHEET TYPE: **D-2**
 REVISION: **0**



DETAIL B
 MONOPOLE EXTENSION ATTACHMENT DETAIL



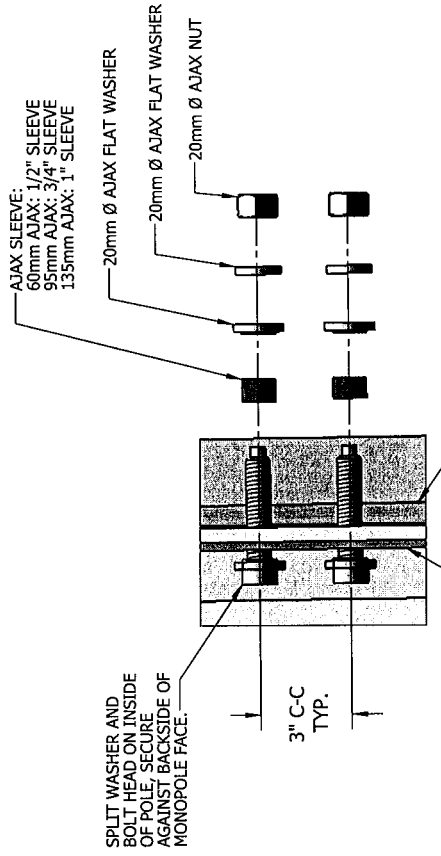
MONOPOLE EXTENSION
 ELEV: 96' - 110'

ELEV: 110'

ELEV: 96'

USE 1-3/16" ANNU-LAR CUTTER TO DRILL HOLES IN EXISTING MONOPOLE FOR AJAX BOLTS. HOLES MAY BE DRILLED THROUGH SWITCHBLADE USING REINFORCEMENT AS A TEMPLATE. WIPE HOLES CLEAN AND GILD GALVANIZE HOLES WITH MIN. (2) COATS OF 95% ZRC PAINT.

AJAX BOLT INSTALLATION INSTRUCTIONS:
 PLACE ASSEMBLED BOLT IN SHOWN ORDER ON AJAX TOOL WITH SPLIT WASHER FOLDED AROUND THE THIN NECK ON THE TOOL. GUIDE THE BOLT THROUGH THE HOLE AND TWIST TO ENGAGE THE SPLIT WASHER AGAINST THE BACK FACE OF THE POLE. SLIDE SLEEVE INTO HOLE AND THE REST OF THE HARDWARE ONTO THE BOLT. HAND TIGHTEN NUT WHILE HOLDING BOLT WITH AJAX TOOL.

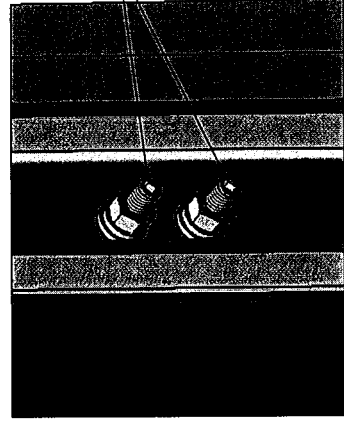


TOTAL LENGTH OF SWITCHBLADE WILL VARY FROM 5' TO 20'. SEE S-1 SHEET AND OR PARTS LIST FOR SPECIFIC LENGTHS REQUIRED.

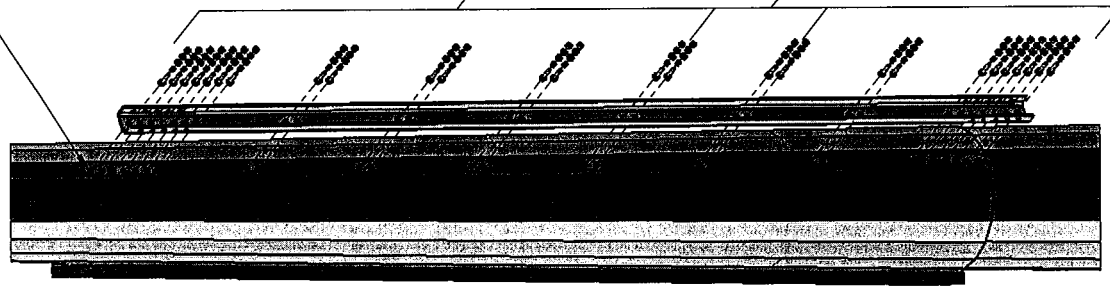
TYPICAL SPACING BETWEEN AJAX PAIRS IS 30"

AJAX CONNECTION DETAIL EXPLODED VIEW

REMOVE AJAX TOOL AND PRE-TENSION INDIVIDUAL PARTS OF AJAX BOLTS. SEE SHEET GN-1 FOR TIGHTENING PROCEDURE OF AJAX BOLTS.



AJAX CONNECTION DETAIL



SWITCHBLADE (TERMINATION - TERMINATION) INSTALLATION DETAIL



Structural Components
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 BOULDER, CO 80302
 (888) 386-1822

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REVISIONS:

NO	DATE	DESCRIPTION	BY	CHK	APP
0	2/12/10	SWITCHBLADE DETAIL DRAWING	RM	ES	BC
1					
2					
3					
4					
5					

FILE NAME:

D-M25 Switchblade Install Details
 (Rev. 1 Term. 11_20)

CUSTOMER:

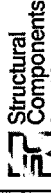
MONOPOLE REINFORCEMENT

SHEET TITLE:

SWITCHBLADE INSTALLATION DETAIL

REVISIONS:

D-M25 0



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(988) 386-7622
JOB #: 100014

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NO.	DATE	DESCRIPTION	BY	CHK	APP
0	2/16/10	MODIFYING DRAWINGS	MY	ES	BC
1					
2					
3					
4					
5					

PROJECT LOCATION:

48 NEWTOWN RD.
DANBURY, CT 06810

CLIENT TYPE:

MONOPOLE
EXTENSION AND
REINFORCEMENT

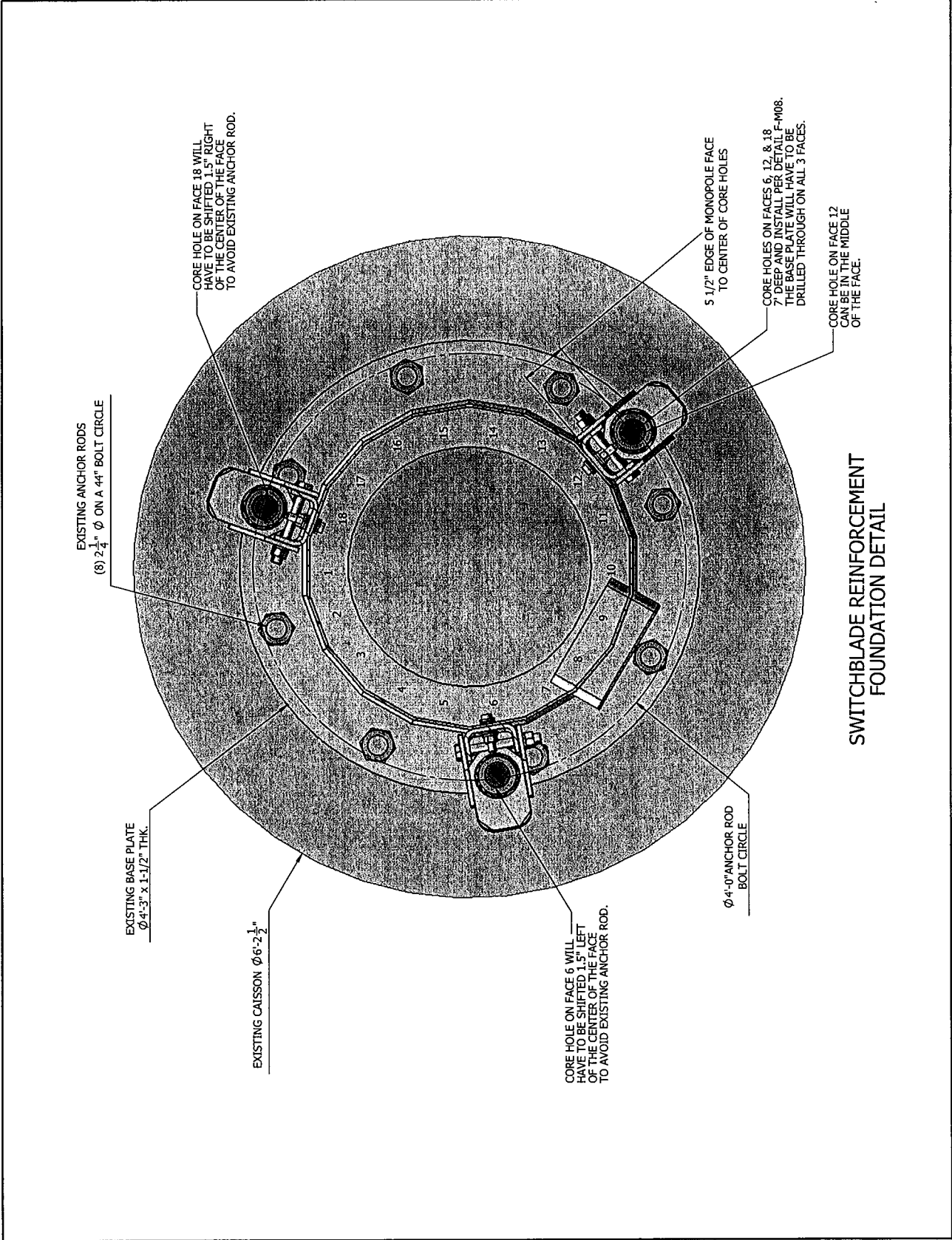
BASE TITLE:

FOUNDATION
DETAILS

DRAWING TITLE:

REVISION:

F-1 0



SWITCHBLADE REINFORCEMENT
FOUNDATION DETAIL



Structural Components
Energy & Air Systems
1617 PEARL ST. UNIT A
BOULDER, CO 80302
(866) 386-7622

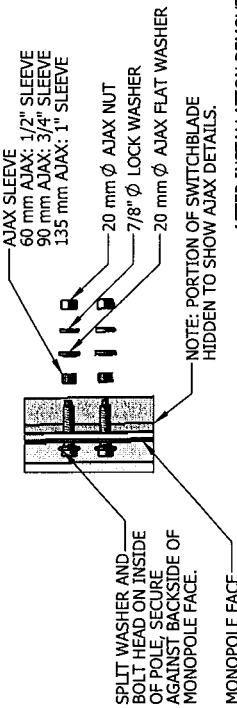
STAMP:

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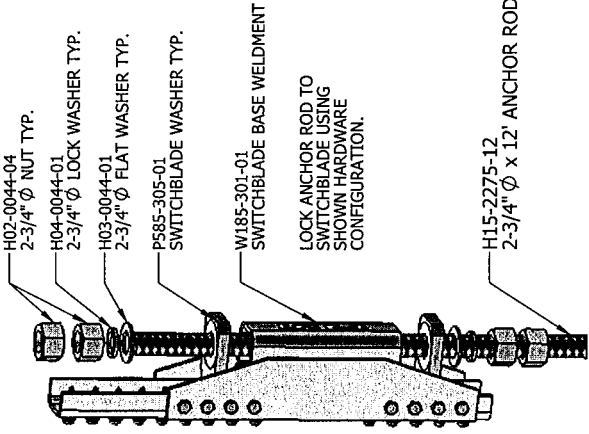
REVISIONS:	
NO.	DESCRIPTION
0	2/17/10 STANDARD DETAIL
1	
2	
3	
4	
5	

ANCHOR DETAIL F-M08
MONOPOLE REINFORCEMENT
12" ANCHOR FOUNDATION DETAILS
F-M08

AJAX BOLT INSTALLATION INSTRUCTIONS:
PLACE ASSEMBLED BOLT IN SHOWN ORDER ON AJAX TOOL WITH SPLIT WASHER FOLDED AROUND THE THIN NECK ON THE TOOL. GUIDE THE BOLT THROUGH THE HOLE AND TWIST TO ENGAGE THE SPLIT WASHER AGAINST THE BACK FACE OF THE POLE. SLIDE SLEEVE INTO HOLE AND THE REST OF THE HARDWARE ONTO THE BOLT. HAND TIGHTEN NUT WHILE HOLDING BOLT WITH AJAX TOOL.



AJAX CONNECTION DETAIL EXPLODED VIEW
AFTER INSTALLATION REMOVE AJAX TOOL AND PRE-TENSION INDIVIDUAL PARTS OF AJAX BOLTS. SEE SHEET GN-1 FOR TIGHTENING PROCEDURE OF AJAX BOLTS.



HARDWARE INSTALL DETAIL EXPLODED VIEW
LOCK ANCHOR ROD TO SWITCHBLADE USING SHOWN HARDWARE CONFIGURATION.

USE 1-3/16" ANNUULAR CUTTER TO DRILL HOLES IN EXISTING MONOPOLE FOR AJAX BOLTS. HOLES MAY BE DRILLED THROUGH SWITCHBLADE USING REINFORCEMENTS AS A TEMPLATE. WIPE HOLES CLEAN AND COLD-GALVANIZED HOLES WITH MIN. (2) COATS OF 95% ZRC PAINT.

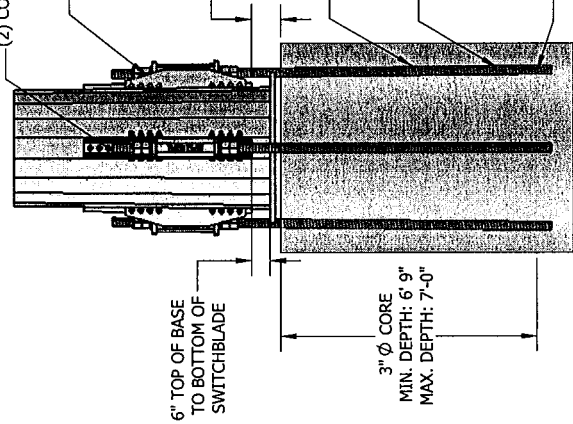
NOTE: BASE TERMINATION CONFIGURATION AND QUANTITY MAY VARY. SEE SHEET S-1 FOR EXACT CONFIGURATION AND SHEET F-1 FOR EXACT LOCATION.

TOP OF FOUNDATION TO BOTTOM EDGE OF SWITCHBLADE 8" - 12" (DEPENDS ON THICKNESS OF GROUT AND BASE PLATE)

2-3/4" ANCHOR ROD
Fu = 115 KSI

USE SIKADUR 32 LPL OR EQUIVALENT (1800 PSI BOND STRENGTH) TO BOND ANCHOR ROD TO FOUNDATION. FOLLOW MANUFACTURERS INSTALLATION INSTRUCTIONS.

NOTE: IF CORE DEPTH EXCEEDS 7'-0" HOLD TOP OF ANCHOR ROD AT 5' ABOVE FOUNDATION. ENSURE BOTTOM OF CORE IS FILLED WITH EPOXY BY INSTALLING EPOXY BEFORE SETTING ROD.



SWITCHBLADE FOUNDATION DETAIL

- ANCHOR ROD INSTALLATION NOTES:**
- HILES SHALL BE FREE OF DEBRIS AND MOISTURE. REFER TO MANUFACTURERS INSTRUCTIONS FOR ALLOWABLE INSTALLATION TEMPERATURE RANGE FOR SIKADUR.
 - AFTER CORING IS COMPLETE COMPLETE TAPE DROPS WITH PHOTOS FOR EACH HOLE. INSTALL ROD INTO HOLE TO ENSURE NO OBSTRUCTIONS, REMOVE, INSTALL EPOXY AND REINSTALL ROD. APPROXIMATE EPOXY AMOUNTS BASED ON 3" Ø CORE AND 2-3/4" Ø ROD: 7' CORE = 0.85 GAL/AR. REFER TO GN-1 FOR ADDITIONAL NOTES.
 -
 -
 -

SWITCHBLADE INSTALL DETAIL EXPLODED VIEW

