CROWN CASTLE

Crown Castle
3 Corporate Park Drive, Suite 101
Clifton Park, NY 12065

November 9, 2018

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RE: **Notice of Exempt Modification for T-Mobile Crown Site BU: 801367**
T-Mobile Site ID: CT11352C
1121 Summit Road, Cheshire, CT 06410
Latitude: 41° 32' 11.2" / Longitude: -72° 57' 26.3"

Dear Ms. Bachman:

T-Mobile currently maintains nine (9) existing antennas at the 138' level of the existing 167' monopole at 1121 Summit road in Cheshire, CT. The tower is owned by Crown Castle. The property is owned by Thomas & M. Joanne Didomizio. T-Mobile now intends to replace (6) of its existing antennas with (6) new antennas. These antennas would be installed at the same 138'level on the tower. T-Mobile also intends to add (3) RRUs and swap out (1) coax for (1) new hybrid fiber cable.

This facility was approved by the by the Connecticut Siting Council in Docket No. 199 on April 12, 2001. This approval included the conditions that:

1. The tower shall be constructed as a monopole, no taller than necessary to provide the proposed telecommunications services, sufficient to accommodate the antennas of AT&T, Voicestream, Sprint, the Town of Cheshire and other entities, both public and private, but such tower shall not exceed a height of 170 feet above ground level.

This modification complies with the aforementioned condition(s).

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b) (2). In accordance with R.S.C.A. § 16-50j-73, a copy of this letter is being sent to Mr. Robert Oris, Chairman – Town Council, William S. Voelker, Town Planner, as well as the property owner, and Crown Castle as the tower owner.

1. The proposed modifications will not result in an increase in the height of the existing tower.

2. The proposed modifications will not require the extension of the site boundary.

3. The proposed modification will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communication Commission safety standard.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, T-Mobile respectfully submits that the proposed modifications to the above-reference telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2). Please send approval/rejection letter to Attn: William Stone.

Sincerely,

William Stone
Real Estate Specialist
3 Corporate Park Drive, Suite 101
Clifton Park, NY 12065
518-373-3543
William.stone@crowncastle.com

Attachments:

Tab 1: Exhibit-1: Compound plan and elevation depicting the planned changes
Tab 2: Exhibit-2: Structural Modification Report
Tab 3: Exhibit-3: General Power Density Table Report (RF Emissions Analysis Report)

cc:

Mr. Robert Oris, Chairman – Town Council
Town of Cheshire
84 South Main Street, Cheshire, CT 06410

William S. Voelker- Town Planner
Town of Cheshire
84 South Main Street, Cheshire, CT 06410

Thomas & M. Joanne Didomizio
1119 Summit Road
Cheshire, CT 06410 East Hartford, CT 06118

ORIGIN ID:GFLA (518) 373-3523
ANNE MARIE ZSAMBA
CROWN CASTLE
3 CORPORATE PARK DRIVE
SUITE 101
CLIFTON PARK, NY 12065
UNITED STATES US

SHIP DATE: 26DEC18
ACTWGT: 4.50 LB
CAD: 104924194/INET4040

BILL SENDER

TO MELANIE BACHMAN
CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051
(860) 827-2951 REF: 1765.6880
INV:
PO: DEPT:

552J2/E4AF/DCA5

FedEx Express

J182118081501uv

TRK# 7740 6071 0084
0201

THU - 27 DEC 10:30A
PRIORITY OVERNIGHT

EB BDLA

DSR
06051
CT-US BDL

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ORIGIN ID:GFLA (518) 373-3523
ALLISON J. SQUIRES
CROWN CASTLE
3 CORPORATE PARK DRIVE
SUITE 101
CLIFTON PARK, NY 12065
UNITED STATES US

SHIP DATE: 12NOV18
ACTWGT: 1.50 LB
CAD: 104924194/INET4040

BILL SENDER

TO TOWN PLANNER
TOWN OF CHESHIRE
84 SOUTH MAIN ST

CHESHIRE CT 06410
(203) 271-6660 REF: 1734.7680
INV:
PO: DEPT:

552J3/C3B2/DCA5

FedEx Express

J182118081501uv

TUE - 13 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 7737 0520 6904

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06410

EB HVNA

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ORIGIN ID:GFLA (518) 373-3523
ALLISON J. SQUIRES
CROWN CASTLE
3 CORPORATE PARK DRIVE
SUITE 101
CLIFTON PARK, NY 12065
UNITED STATES US

SHIP DATE: 12NOV18
ACTWGT: 1.50 LB
CAD: 104924194/INET4040

BILL SENDER

TO **ROBERT ORIS**
TOWN OF CHESHIRE
84 SOUTH MAIN ST

CHESHIRE CT 06410
(203) 271-6660 REF: 1734.7680
INV:
PO: DEPT:

552J3/C3B2/DCA5

FedEx Express

J182118081501uv

TUE - 13 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **7737 0519 6542**

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06410

EB HVNA

CT-US **BDL**

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ORIGIN ID:GFLA (518) 373-3523
ALLISON J. SQUIRES
CROWN CASTLE
3 CORPORATE PARK DRIVE
SUITE 101
CLIFTON PARK, NY 12065
UNITED STATES US

SHIP DATE: 12NOV18
ACTWGT: 1.50 LB
CAD: 104924194/INET4040

BILL SENDER

TO THOMAS AND M. JOANNE DIDOMIZIO
1119 SUMMIT RD
EAST HARTFORD CT 06118
(518) 373-3543 REF: 1734.7680
INV:
PO: DEPT:

552J3/C3B2/DCA5

FedEx Express

J182118081501uv

TUE - 13 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 7737 0524 1527

DSR
06118

EB QCWA

CT-US BDL

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DOCKET NO. 199 - Crown Atlantic Company LLC and Cellco Partnership d/b/a Verizon Wireless application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance and operation of a cellular telecommunications facility at 1119 Summit Road, Cheshire, Connecticut.	} } }	Connecticut Siting Council April 12, 2001

Decision and Order

Pursuant to the foregoing Findings of Fact and Opinion, the Connecticut Siting Council (Council) finds that the effects associated with the construction, operation, and maintenance of a telecommunications facility at the proposed alternate site in Cheshire, Connecticut, including effects on the natural environment; ecological integrity and balance; public health and safety; scenic, historic, and recreational values; forests and parks; air and water purity; and fish and wildlife are not disproportionate either alone or cumulatively with other effects when compared to need, are not in conflict with the policies of the State concerning such effects, and are not sufficient reason to deny the application and therefore directs that a Certificate of Environmental Compatibility and Public Need, as provided by General Statutes § 16-50k, be issued to Crown Atlantic Company LLC and Cellco Partnership d/b/a Verizon Wireless for the construction, maintenance and operation of a cellular telecommunications facility at the proposed alternate site located at 1119 Summit Road, Cheshire, Connecticut. We deny certification of the proposed prime site located at 1119 Summit Road, Cheshire, Connecticut.

The facility shall be constructed, operated, and maintained substantially as specified in the Council's record in this matter, and subject to the following conditions:

1. The tower shall be constructed as a monopole, no taller than necessary to provide the proposed telecommunications services, sufficient to accommodate the antennas of AT&T, Voicestream, Sprint, the Town of Cheshire and other entities, both public and private, but such tower shall not exceed a height of 170 feet above ground level.

2. The Certificate Holder shall prepare a Development and Management (D&M) Plan for this site in compliance with Sections 16-50j-75 through 16-50j-77 of the Regulations of Connecticut State Agencies. The D&M Plan shall be submitted to and approved by the Council prior to the commencement of facility construction and shall include: a final site plan(s) for site development to include the location and specifications for the tower, tower foundation, antennas, a single equipment building capable to house all proposed users including the Town of Cheshire, security fence, access road, utility line, and landscaping plan. The D&M Plan shall also include construction plans to be submitted prior to construction for site clearing, water drainage, and erosion and sedimentation control consistent with the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended.

3. The Certificate Holder shall, prior to the commencement of operation, provide the Council worst-case modeling of electromagnetic radio frequency power density of all proposed entities' antennas at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin No. 65, August 1997. The Certificate Holder shall provide a recalculated report of electromagnetic radio frequency power density if and when circumstances in operation cause a change in power density above the levels calculated and provided pursuant to this Decision and Order.

4. Upon the establishment of any new State or federal radio frequency standards applicable to frequencies of this facility, the facility granted herein shall be brought into compliance with such standards.

5. The Certificate Holder shall permit public or private entities to share space on the proposed tower for fair consideration, or shall provide any requesting entity with specific legal, technical, environmental, or economic reasons precluding such tower sharing.

6. If the facility does not initially provide, or permanently ceases to provide cellular services following completion of construction, this Decision and Order shall be void, and the Certificate Holder shall dismantle the tower and remove all associated equipment or reapply for any continued or new use to the Council before any such use is made.

7. Any antenna that becomes obsolete and ceases to function shall be removed within 60 days after such antennas become obsolete and ceases to function.

8. Unless otherwise approved by the Council, this Decision and Order shall be void if all construction authorized herein is not completed within three years of the effective date of this Decision and Order or within three years after all appeals to this Decision and Order have been resolved.

Pursuant to General Statutes § 16-50p, we hereby direct that a copy of the Findings of Fact, Opinion, and Decision and Order be served on each person listed below, and notice of issuance shall be published in The Hartford Courant, The Cheshire Herald, The Waterbury Republican-American and The Record Journal.

By this Decision and Order, the Council disposes of the legal rights, duties, and privileges of each party named or admitted to the proceeding in accordance with Section 16-50j-17 of the Regulations of Connecticut State Agencies.

The parties and intervenors to this proceeding are:

Crown Atlantic Company LLC And Cellco Partnership d/b/a Verizon Wireless	Robert Stanford, Project Manager Crown Atlantic Company LLC 703 Hebron Avenue Glastonbury, CT 06033 Kenneth C. Baldwin, Esq. Robinson & Cole LLP 280 Trumbull Street Hartford, CT 06103-3597
AT&T Wireless Services, Inc.	Anthony B. Gioffre III, Esq. Cuddy & Feder & Worby 90 Maple Avenue White Plains, NY 10601

Content Last Modified on 10/9/2002 1:52:54 PM

The Assessor’s office is responsible for the maintenance of records on the ownership of properties. Assessments are computed at 70% of the estimated market value of real property at the time of the last revaluation which was 2013.

Town of Cheshire

The bedding plant capital of Connecticut

Information on the Property Records for the Municipality of Cheshire was last updated on 10/27/2016.

Parcel Information

Location:	1119 SUMMIT RD	Property Use:	Residential	Primary Use:	Residential
Unique ID:	00087800	Map Block Lot:	24 2	Acres:	22.52
Zone:	R-80	Volume / Page:	0798/0074	Developers Map / Lot:	15809
Census:	3432				

Value Information

	Appraised Value	70% Assessed Value
Land	377,245	264,070
Buildings	311,951	218,370

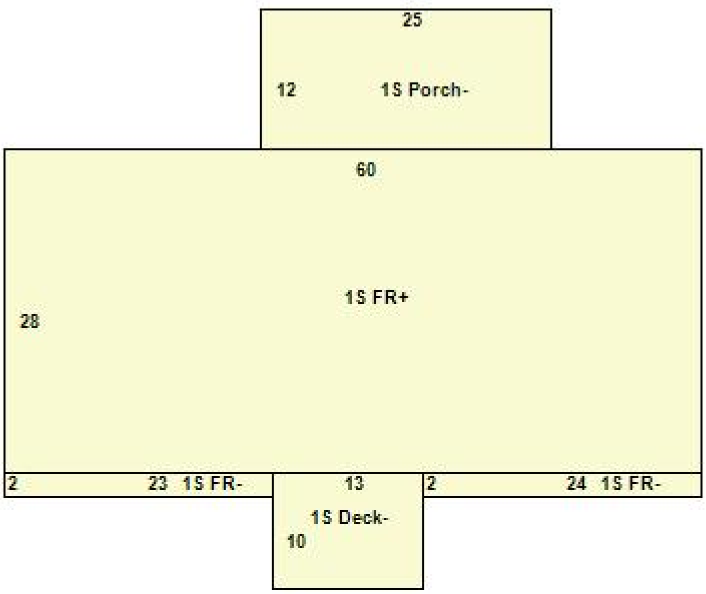
	Appraised Value	70% Assessed Value
Detached Outbuildings	6,370	4,460
Total	695,566	486,900

Owner's Information

Owner's Data
DIDOMIZIO JOANNE M 1115 SUMMIT RD CHESHIRE CT 06410

Building 1

0087800 03/08/2012



Building Use:	Single Family	Style:	Raised Ranch	Living Area:	1,774
Stories:	1.00	Construction:	Wood Frame	Year Built:	1990
Total Rooms:	7	Bedrooms:	2	Full Baths:	3
Heating:	FHA	Fireplaces:	0	Half Baths:	1
Fuel:	Oil	Cooling Percent:	0%	Basement Area:	1,680

Basement Finished Area:	840	Basement Garages:	2	Roof Material:	Asphalt
Siding:	Clapboards				

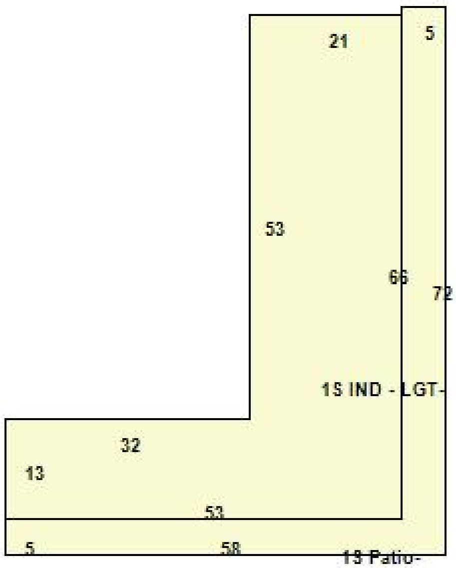
Special Features

Whirlpool	1

Attached Components

Type:	Year Built:	Area:
Wood Deck	1990	130
Open Porch	1990	300

Building 2



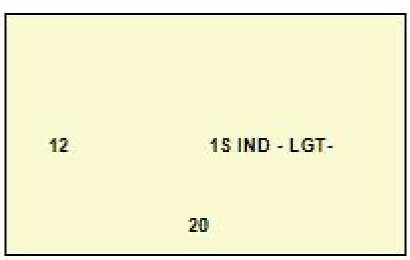
Category:	Industrial	Use:	Light Industrial	Stories:	1.00
Above Grade:	1,802	Below Grade:	0	Below Grade Finish:	0
Construction:	Good	Year Built:	2002	Heating:	
Fuel:		Cooling Percent:	0%	Siding:	Stone
Roof Material:		Beds/Units:	0		

Special Features

Attached Components

Type:	Year Built:	Area:
Concrete Patio	2002	625

Building 3



Category:	Industrial	Use:	Light Industrial	Stories:	1.00
Above Grade:	240	Below Grade:	0	Below Grade Finish:	0

Construction:	Good	Year Built:	2004	Heating:	
Fuel:		Cooling Percent:	0%	Siding:	Concrete Block
Roof Material:		Beds/Units:	0		

Special Features

Attached Components

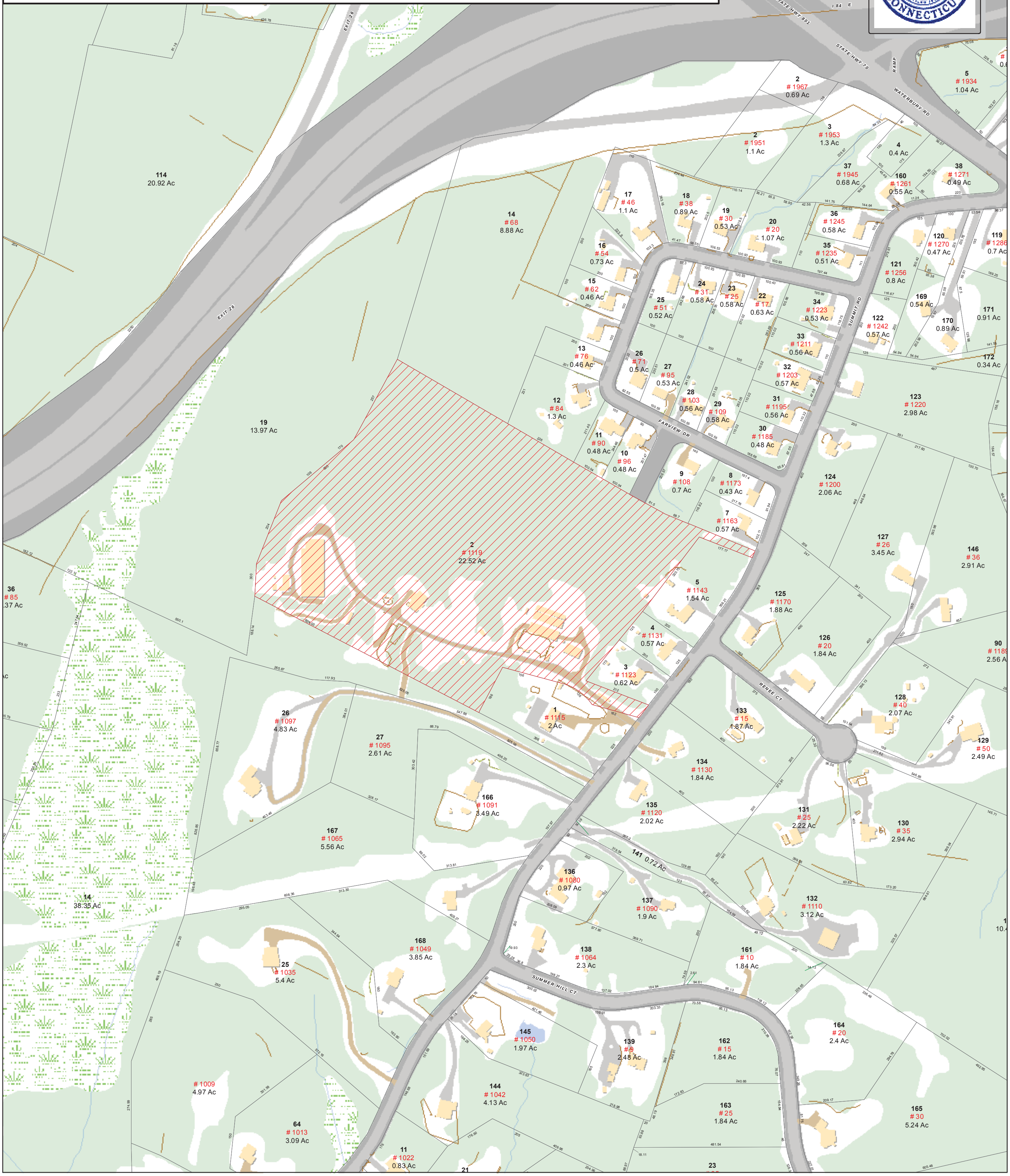
Detached Outbuildings

Type:	Year Built:	Length:	Width:	Area:
Fencing	2002			1,600

Information Published With Permission From The Assessor

Town of Cheshire, Connecticut - Assessment Parcel Map

Unique ID: 00087800 **Address:** 1119 SUMMIT RD



Approximate Scale:

1 inch = 400 feet

Disclaimer:
This map is for informational purposes only.
All information is subject to verification by any user.
The Town of Cheshire and its mapping contractors
assume no legal responsibility for the information contained herein.

Map Produced January 2016

Date: **October 26, 2018**

Charles McGuirt
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277

Tower Engineering Professionals
326 Tryon Road
Raleigh, NC 27603
(919) 661-6351

Subject: **Structural Analysis Report**

Carrier Designation:	***T-Mobile* Co-Locate**	
	Carrier Site Number:	CT11352C
	Carrier Site Name:	Crown Cheshire
Crown Castle Designation:	**Crown Castle BU Number:**	801367
	Crown Castle Site Name:	CT NHV-2075 CAC 801367
	Crown Castle JDE Job Number:	512587
	Crown Castle Work Order Number:	1652298
	Crown Castle Order Number:	446057 Rev. 0
Engineering Firm Designation:	**TEP Project Number:**	25630.193451
Site Data:	**1121 Summit Road, Cheshire, New Haven County, CT 06410** **Latitude *41° 32' 11.2"*, Longitude *-72° 57' 26.3"*** **167 Foot - Monopole Tower**	

Dear Charles McGuirt,

Tower Engineering Professionals is pleased to submit this "**Structural Analysis Report**" to determine the structural integrity of the above-mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC5: Proposed Equipment Configuration	**Sufficient Capacity**

This analysis utilizes an ultimate 3-second gust wind speed of 125 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Christopher D. Crook, E.I. / MGY

Respectfully submitted by:

Aaron T. Rucker, P.E.

STATE OF CONNECTICUT
AARON THOMAS RUCKER
32608
LICENSED
PROFESSIONAL ENGINEER
Electronic Copy
10/26/2018

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 167-ft monopole tower designed by Paul J. Ford and Company. The tower has been modified multiple times in the past to accommodate additional loading, however the modifications were determined to be ineffective and not considered structurally in this analysis. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	125 mph
Exposure Category:	B
Topographic Factor:	1.0
Ice Thickness:	1.5 in
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
140.0	140.0	1	Tower Mounts	Platform Mount [LP 1201-1]	1 1 17	1-3/8 1-1/2 1-5/8
		1	Site Pro 1	PRK1245L Kicker		
		1	Commscope	HRK14-U Handrail Kit		
	138.0	3	Ericsson	AIR -32 B2A/B66AA w/ Mount Pipe		
		3	RFS Celwave	APXVAARR24_43-U-NA20 w/ Mount Pipe		
		3	RFS Celwave	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe		
		3	Ericsson	Radio 4449 B12/B71		
		3	Ericsson	KRY 112 89/5		
		3	Ericsson	KRY 112 134/1		

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
167.0	171.0	1	RFS Celwave	201-7	18 1 1 1	1-5/8 1-1/4 7/8 1/2
	169.0	1	GPS	GPS_A		
	168.0	6	Antel	LPA-80063-6CF-EDIN w/ Mount Pipe		
		3	Amphenol	BXA-171063-8CF-EDIN-X w/ Mount Pipe		
		3	Antel	BXA-171063-8CF-EDIN-X w/ Mount Pipe		
		3	Amphenol	BXA-70063-6CF-EDIN-X w/ Mount Pipe		
		3	Alcatel Lucent	RRH2X40-AWS		
		1	Raycap	RRFDC-3315-PF-48		
	167.0	1	Tower Mounts	Platform Mount [LP 1201-1]		
160.0	162.0	3	Powerwave Technologies	7770.00 w/ Mount Pipe	4 2 12	3/4 3/8 1-5/8
		6	Powerwave Technologies	LGP21401		
		1	Tower Mounts	Handrail Kit [NA 510-1]		
	161.0	3	CCI Antennas	TPA-65R-LCUUUU-H8 w/ Mount Pipe		
		1	Raycap	DC6-48-60-18-8F		
		3	Kathrein	78211056		
		3	Ericsson	RRUS 32 B30		
		6	Kaelus	DBC0061F1V51-2		
	160.0	3	Andrew	SBNH-1D6565C w/ Mount Pipe		
		3	Ericsson	RRUS 11 B12		
		3	Ericsson	RRUS 32 B2		
		1	Raycap	DC6-48-60-18-8F		
		1	Tower Mounts	Platform Mount [LP 1201-1]		
	158.0	1	Tower Mounts	Kicker Kit [NA 509-3]		
150.0	150.0	3	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz	-	-
		3	Alcatel Lucent	800MHz 2X50W RRH w/Filter		
		2	Tower Mounts	Pipe Mount [PM 601-3]		
148.0	148.0	3	RFS Celwave	APXVTM14-ALU-I20 w/ Mount Pipe	4	1-1/4
		3	RFS Celwave	APXVSPP18-C-A20 w/ Mount Pipe		
		3	Alcatel Lucent	TD-RRH8x20-25		
		1	Tower Mounts	Platform Mount [LP 1201-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Geotechnical Report	Clough, Harbour & Associates, LLP	445076	CCISites
Tower Foundation Drawings	Paul J. Ford and Company	842573	CCISites
Foundation Mapping	FDH Velocitel	842573	CCISites
Tower Manufacturer Drawings	Paul J. Ford and Company	799210	CCISites

3.1) Analysis Method

tnxTower (version 8.0.4.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) The tower and foundation were built and maintained in accordance with the manufacturer's specification.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2, and the referenced drawings.
3) All tower components are in sufficient condition to carry their full design capacity.
4) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance.
5) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.
6) The modifications designed by Paul J. Ford in June of 2012 and in January of 2013 were determined to be ineffective and not considered structurally in this analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)[1]

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	ϕP_{allow} (lb)	% Capacity	Pass / Fail
L1	167 - 118.25	Pole	TP35.36x24x0.25	1	-22141	1890682	61.7	Pass
L2	118.25 - 77.75	Pole	TP44.297x33.8114x0.3125	2	-32445	2959603	73.6	Pass
L3	77.75 - 38.25	Pole	TP52.877x42.3904x0.375	3	-46571	4245622	69.9	Pass
L4	38.25 - 0	Pole	TP61.04x50.554x0.4375	4	-66620	5849434	64.0	Pass
							Summary	
						Pole (L2)	73.6	Pass
						RATING =	**73.6**	**Pass**

Table 5 - Tower Component Stresses vs. Capacity - LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1,2	Anchor Rods	-	64.5	Pass
1,2	Base Plate	-	49.7	Pass
1,2	Base Foundation Soil Interaction	-	80.7	Pass
1,2	Base Foundation Structural	-	42.7	Pass

Structure Rating (max from all components) =	**80.7%**

Notes:
1) Rating per TIA-222-H Section 15.5
2) See additional documentation in “Appendix C - Additional Calculations” for calculations supporting the % capacity listed.

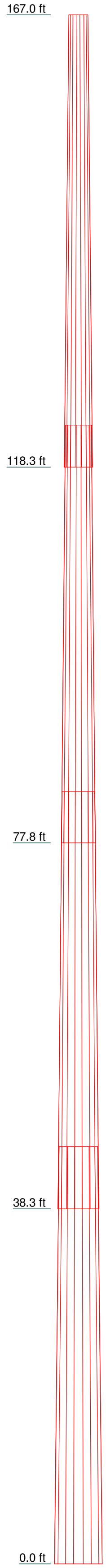
4.1) Recommendations

1) If the load differs from that described in Tables 1 and 2 of this report, the referenced drawings, or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
2) The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (lb)
1	48.75	18	0.2500	4.50	24.0000	35.3600	A607-65	3873.9
2	45.00	18	0.3125	5.50	33.8114	44.2970	A607-65	5884.1
3	45.00	18	0.3750	6.75	42.3904	52.8770	A607-65	8613.3
4	45.00	18	0.4375		50.5540	61.0400	A607-65	11771.3
								30142.6



DESIGNED APPURTENANCE LOADING

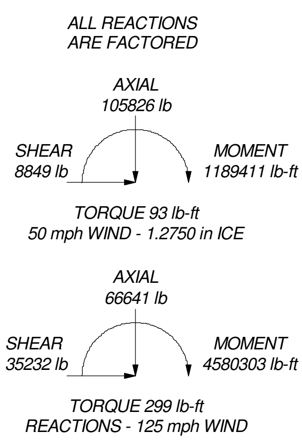
TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8" x 6'	167	(2) LGP21401	160
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	167	2.4" Dia x 6-ft Pipe	160
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	167	2.4" Dia x 6-ft Pipe	160
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	167	2.4" Dia x 6-ft Pipe	160
BXA-70063-6CF-EDIN-X w/ Mount Pipe	167	SBNH-1D6565C w/ Mount Pipe	160
BXA-70063-6CF-EDIN-X w/ Mount Pipe	167	Platform Mount [LP 1201-1]	160
BXA-70063-6CF-EDIN-X w/ Mount Pipe	167	Miscellaneous [NA 509-3]	158
BXA-171063-8CF-EDIN-X w/ Mount Pipe	167	PCS 1900MHz 4x45W-65MHz	150
BXA-171063-8CF-EDIN-X w/ Mount Pipe	167	(2) PCS 1900MHz 4x45W-65MHz	150
BXA-171063-8CF-EDIN-X w/ Mount Pipe	167	(2) 800MHz 2X50W RRH W/FILTER	150
BXA-171063-8CF-EDIN-X w/ Mount Pipe	167	800MHz 2X50W RRH W/FILTER	150
BXA-171063-8CF-EDIN-X w/ Mount Pipe	167	(2) Pipe Mount [PM 601-3]	150
BXA-171063-8CF-EDIN-X w/ Mount Pipe	167	APXVTM14-ALU-I20 w/ Mount Pipe	148
GPS_A	167	APXVTM14-ALU-I20 w/ Mount Pipe	148
201-7	167	APXVTM14-ALU-I20 w/ Mount Pipe	148
RRH2X40-AWS	167	APXVSPP18-C-A20 w/ Mount Pipe	148
RRH2X40-AWS	167	APXVSPP18-C-A20 w/ Mount Pipe	148
RRH2X40-AWS	167	APXVSPP18-C-A20 w/ Mount Pipe	148
RRFDC-3315-PF-48	167	TD-RRH8x20-25	148
2.4" Dia x 4-ft Mount Pipe	167	TD-RRH8x20-25	148
Platform Mount [LP 1201-1]	167	TD-RRH8x20-25	148
Miscellaneous [NA 510-1]	162	2.4" Dia x 6-ft Pipe	148
SBNH-1D6565C w/ Mount Pipe	160	2.4" Dia x 6-ft Pipe	148
SBNH-1D6565C w/ Mount Pipe	160	2.4" Dia x 6-ft Pipe	148
TPA-65R-LCUUUU-H8 w/ Mount Pipe	160	Platform Mount [LP 1201-1]	148
TPA-65R-LCUUUU-H8 w/ Mount Pipe	160	AIR -32 B2A/B66AA w/ Mount Pipe	140
TPA-65R-LCUUUU-H8 w/ Mount Pipe	160	AIR -32 B2A/B66AA w/ Mount Pipe	140
7770.00 w/ Mount Pipe	160	AIR -32 B2A/B66AA w/ Mount Pipe	140
7770.00 w/ Mount Pipe	160	APXVAARR24_43-U-NA20 w/ Mount Pipe	140
7770.00 w/ Mount Pipe	160	APXVAARR24_43-U-NA20 w/ Mount Pipe	140
RRUS 11 B12	160	APXVAARR24_43-U-NA20 w/ Mount Pipe	140
RRUS 11 B12	160	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	140
RRUS 11 B12	160	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	140
RRUS 32 B2	160	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	140
RRUS 32 B2	160	KRY 112 89/5	140
RRUS 32 B2	160	KRY 112 89/5	140
DC6-48-60-18-8F	160	KRY 112 89/5	140
DC6-48-60-18-8F	160	KRY 112 134/1	140
78211056	160	KRY 112 134/1	140
78211056	160	KRY 112 134/1	140
78211056	160	RADIO 4449 B12/B71	140
RRUS 32 B30	160	RADIO 4449 B12/B71	140
RRUS 32 B30	160	RADIO 4449 B12/B71	140
RRUS 32 B30	160	SitePro1 PRK1245L Kicker	140
(2) DBC0061F1V51-2	160	Commscope HRK14-U Handrail Kit	140
(2) DBC0061F1V51-2	160	Platform Mount [LP 1201-1]	140
(2) DBC0061F1V51-2	160		
(2) LGP21401	160		
(2) LGP21401	160		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 125 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.27 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TIA-222-H Annex S
9. TOWER RATING: 73.6%



Tower Engineering Professionals	Job: **CT NHV-2075 CAC 801367 (BU 801367)**	
326 Tryon Road	Project: **TEP No. 25630.193451**	
Raleigh, NC 27603	Client: Crown Castle / Drawn by: cdcrook	App'd:
Phone: (919) 661-6351	Code: TIA-222-H / Date: 10/26/18	Scale: NTS
FAX: (919) 661-6350	Path: C:\Users\cdcrook\Desktop\TNX Tower Run\25630\801367_LC5.eri	Dwg No. E-1

Tower Engineering Professionals

Tower Input Data

The tower is a monopole.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

- Tower is located in New Haven County, Connecticut.
- Tower base elevation above sea level: 616.00 ft.
- Basic wind speed of 125 mph.
- Risk Category II.
- Exposure Category B.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height 0.00 ft.
- Nominal ice thickness of 1.2750 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- TIA-222-H Annex S.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.05.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
Use Code Stress Ratios
Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
SR Members Have Cut Ends
SR Members Are Concentric

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
Use Clear Spans For KL/r
Retension Guys To Initial Tension
√ Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
Autocalc Torque Arm Areas
Add IBC .6D+W Combination
√ Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing
Treat Feed Line Bundles As Cylinder
Ignore KL/ry For 60 Deg. Angle Legs

Use ASCE 10 X-Brace Ly Rules
Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
SR Leg Bolts Resist Compression
All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feed Line Torque
Include Angle Block Shear Check
Use TIA-222-H Bracing Resist. Exemption
Use TIA-222-H Tension Splice Exemption

Poles

√ Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets
Pole Without Linear Attachments
Pole With Shroud Or No Appurtenances
Outside and Inside Corner Radii Are Known

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	167.00-118.25	48.75	4.50	18	24.0000	35.3600	0.2500	1.0000	A607-65 (65 ksi)
L2	118.25-77.75	45.00	5.50	18	33.8114	44.2970	0.3125	1.2500	A607-65 (65 ksi)
L3	77.75-38.25	45.00	6.75	18	42.3904	52.8770	0.3750	1.5000	A607-65 (65 ksi)
L4	38.25-0.00	45.00		18	50.5540	61.0400	0.4375	1.7500	A607-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	24.3317	18.8456	1342.9976	8.4313	12.1920	110.1540	2687.7623	9.4246	3.7840	15.136
	35.8669	27.8598	4338.8723	12.4641	17.9629	241.5466	8683.4538	13.9325	5.7834	23.133
L2	35.3495	33.2267	4710.7000	11.8921	17.1762	274.2577	9427.5985	16.6165	5.4008	17.283
	44.9321	43.6271	10663.3428	15.6145	22.5029	473.8658	21340.7168	21.8177	7.2463	23.188
L3	44.2880	50.0089	11153.2625	14.9155	21.5343	517.9293	22321.2007	25.0092	6.8007	18.135
	53.6349	62.4905	21762.2193	18.6382	26.8615	810.1635	43553.0740	31.2512	8.6464	23.057
L4	52.8636	69.5930	22083.3520	17.7914	25.6814	859.8954	44195.7618	34.8031	8.1275	18.577
	61.9141	84.1541	39047.5735	21.5139	31.0083	1259.2612	78146.5267	42.0851	9.9730	22.796

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 167.00-118.25				1	1	1			
L2 118.25-77.75				1	1	1			
L3 77.75-38.25				1	1	1			
L4 38.25-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
561(1-5/8")	C	No	Surface Ar (CaAa)	167.00 - 0.00	6	6	0.000 0.000	1.6250		1.35
MLE Hybrid 3Power/6Fiber RL 2 10AWG(1-1/4")	C	No	Surface Ar (CaAa)	167.00 - 0.00	1	1	0.000 0.000	1.2500		0.46
FLC 158-50J(1-5/8")	A	No	Surface Ar (CaAa)	140.00 - 0.00	4	4	-0.250 -0.250	2.0150		0.92
***										
Step Pegs (5/8" SR) 7-in. w/30" step	A	No	Surface Ar (CaAa)	167.00 - 0.00	1	1	0.500 0.500	0.3500		0.49
*										
Aero MP3-04	A	No	Surface Ar	53.00 -	1	1	-0.250	1.6100		14.10

Description	*Sector*	*Exclude From Torque Calculation*	*Component Type*	*Placement* *ft*	*Total Number*	*Number Per Row*	*Start/End Position*	*Width or Diameter* *in*	*Perimeter* *in*	*Weight* *plf*
			(CaAa)	43.00			-0.250			
Aero MP3-04	A	No	Surface Ar (CaAa)	53.00 - 43.00	1	1	0.500 0.500	1.6100		14.10
Aero MP3-04	A	No	Surface Ar (CaAa)	65.50 - 53.00	1	1	-0.250 -0.250	1.6100		14.10
Aero MP3-04	A	No	Surface Ar (CaAa)	65.50 - 53.00	1	1	0.500 0.500	1.6100		14.10
*										
Aero MP3-03	A	No	Surface Ar (CaAa)	91.50 - 81.50	1	1	-0.250 -0.250	1.5700		9.90
Aero MP3-03	A	No	Surface Ar (CaAa)	91.50 - 81.50	1	1	0.500 0.500	1.5700		9.90
*										

Feed Line/Linear Appurtenances - Entered As Area

Description	*Face or Leg*	*Allow Shield*	*Exclude From Torque Calculation*	*Component Type*	*Placement* *ft*	*Total Number*		*C_AA_A* *ft^2/ft*	*Weight* *plf*
LDF4-50A(1/2")	C	No	No	Inside Pole	167.00 - 0.00	1	No Ice	0.00	0.15
							1/2" Ice	0.00	0.15
							1" Ice	0.00	0.15
							2" Ice	0.00	0.15
LDF5-50A(7/8)	C	No	No	Inside Pole	167.00 - 0.00	1	No Ice	0.00	0.33
							1/2" Ice	0.00	0.33
							1" Ice	0.00	0.33
							2" Ice	0.00	0.33
561(1-5/8")	C	No	No	Inside Pole	167.00 - 0.00	12	No Ice	0.00	1.35
							1/2" Ice	0.00	1.35
							1" Ice	0.00	1.35
							2" Ice	0.00	1.35
***									
LDF7-50A(1-5/8")	A	No	No	Inside Pole	160.00 - 0.00	12	No Ice	0.00	0.82
							1/2" Ice	0.00	0.82
							1" Ice	0.00	0.82
							2" Ice	0.00	0.82
FB-L98B-002-75000 (3/8")	A	No	No	Inside Pole	160.00 - 0.00	1	No Ice	0.00	0.06
							1/2" Ice	0.00	0.06
							1" Ice	0.00	0.06
							2" Ice	0.00	0.06
FB-L98B-034-XXX(3/8")	A	No	No	Inside Pole	160.00 - 0.00	1	No Ice	0.00	0.06
							1/2" Ice	0.00	0.06
							1" Ice	0.00	0.06
							2" Ice	0.00	0.06
WR-VG86ST-BRD(3/4")	A	No	No	Inside Pole	160.00 - 0.00	4	No Ice	0.00	0.58
							1/2" Ice	0.00	0.58
							1" Ice	0.00	0.58
							2" Ice	0.00	0.58
2" Flexible Conduit	A	No	No	Inside Pole	160.00 - 0.00	3	No Ice	0.00	0.34
							1/2" Ice	0.00	0.34
							1" Ice	0.00	0.34
							2" Ice	0.00	0.34
***									
MLE Hybrid 3Power/6Fiber RL 2 10AWG(1-1/4")	B	No	No	Inside Pole	148.00 - 0.00	4	No Ice	0.00	0.46
							1/2" Ice	0.00	0.46
							1" Ice	0.00	0.46

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
							2" Ice	0.00	0.46
***									
FLC 158-50J(1-5/8")	B	No	No	Inside Pole	140.00 - 0.00	13	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
							2" Ice	0.00	0.92
MLC HYBRID 6x12 6AWGx6(1-1/2)	C	No	No	CaAa (Out Of Face)	140.00 - 0.00	1	No Ice	0.00	0.59
							1/2" Ice	0.00	1.83
							1" Ice	0.00	3.68
							2" Ice	0.00	9.21
HCS 6X12 6AWG(1-3/8)	C	No	No	CaAa (Out Of Face)	140.00 - 0.00	1	No Ice	0.00	1.70
							1/2" Ice	0.00	2.85
							1" Ice	0.00	4.61
							2" Ice	0.00	9.96
Aero MP3-04	C	No	No	CaAa (Out Of Face)	53.00 - 43.00	1	No Ice	0.00	14.10
							1/2" Ice	0.00	15.30
							1" Ice	0.00	16.85
							2" Ice	0.00	20.99
*									
Aero MP3-04	A	No	No	CaAa (Out Of Face)	53.00 - 50.50	1	No Ice	0.00	14.10
							1/2" Ice	0.00	15.30
							1" Ice	0.00	16.85
							2" Ice	0.00	20.99
Aero MP3-04	A	No	No	CaAa (Out Of Face)	53.00 - 50.50	1	No Ice	0.00	14.10
							1/2" Ice	0.00	15.30
							1" Ice	0.00	16.85
							2" Ice	0.00	20.99
Aero MP3-04	C	No	No	CaAa (Out Of Face)	65.50 - 50.50	1	No Ice	0.00	14.10
							1/2" Ice	0.00	15.30
							1" Ice	0.00	16.85
							2" Ice	0.00	20.99
Aero MP3-03	C	No	No	CaAa (Out Of Face)	91.50 - 81.50	1	No Ice	0.00	9.90
							1/2" Ice	0.00	11.06
							1" Ice	0.00	12.57
							2" Ice	0.00	16.63
*									

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	167.00-118.25	A	0.000	0.000	19.237	0.000	660
		B	0.000	0.000	0.000	0.000	315
		C	0.000	0.000	53.625	0.000	1280
L2	118.25-77.75	A	0.000	0.000	37.200	0.000	906
		B	0.000	0.000	0.000	0.000	559
		C	0.000	0.000	44.550	0.000	1214
L3	77.75-38.25	A	0.000	0.000	40.465	0.000	1395
		B	0.000	0.000	0.000	0.000	545
		C	0.000	0.000	43.450	0.000	1440
L4	38.25-0.00	A	0.000	0.000	32.168	0.000	669
		B	0.000	0.000	0.000	0.000	528
		C	0.000	0.000	42.075	0.000	1053

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	*Tower Elevation ft*	*Face or Leg*	*Ice Thickness in*	A_R *ft²*	A_F *ft²*	C_AA_A *In Face ft²*	C_AA_A *Out Face ft²*	*Weight lb*
L1	167.00-118.25	A	1.475	0.000	0.000	46.016	0.000	1129
		B		0.000	0.000	0.000	0.000	315
		C		0.000	0.000	97.858	0.000	2543
L2	118.25-77.75	A	1.421	0.000	0.000	78.136	0.000	1725
		B		0.000	0.000	0.000	0.000	559
		C		0.000	0.000	81.298	0.000	2559
L3	77.75-38.25	A	1.349	0.000	0.000	86.468	0.000	2316
		B		0.000	0.000	0.000	0.000	545
		C		0.000	0.000	78.334	0.000	2760
L4	38.25-0.00	A	1.204	0.000	0.000	63.089	0.000	1269
		B		0.000	0.000	0.000	0.000	528
		C		0.000	0.000	74.612	0.000	2147

Feed Line Center of Pressure

Section	*Elevation ft*	CP_X *in*	CP_Z *in*	CP_X *Ice in*	CP_Z *Ice in*
L1	167.00-118.25	-1.8837	5.0122	-1.5054	3.7140
L2	118.25-77.75	-3.9484	4.7283	-3.2915	3.4164
L3	77.75-38.25	-4.4277	4.7508	-3.8697	3.3473
L4	38.25-0.00	-4.3473	5.7058	-3.6690	4.4723

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

Shielding Factor Ka

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	K_a *No Ice*	K_a *Ice*
L1	4	561(1-5/8")	118.25 - 167.00	1.0000	1.0000
L1	5	MLE Hybrid 3Power/6Fiber RL 2 10AWG(1-1/4")	118.25 - 167.00	1.0000	1.0000
L1	16	FLC 158-50J(1-5/8")	118.25 - 140.00	1.0000	1.0000
L1	20	Step Pegs (5/8" SR) 7-in. w/30" step	118.25 - 167.00	1.0000	1.0000
L1	33	Aero MP3-03	118.25 - 91.50	1.0000	1.0000
L1	34	Aero MP3-03	118.25 - 91.50	1.0000	1.0000
L2	4	561(1-5/8")	77.75 - 118.25	1.0000	1.0000
L2	5	MLE Hybrid 3Power/6Fiber RL 2 10AWG(1-1/4")	77.75 - 118.25	1.0000	1.0000
L2	16	FLC 158-50J(1-5/8")	77.75 - 118.25	1.0000	1.0000
L2	20	Step Pegs (5/8" SR) 7-in.	77.75 - 118.25	1.0000	1.0000

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	*K_a No Ice*	*K_a Ice*
		w/30" step			
L2	23	Aero MP3-04	77.75 - 53.00	1.0000	1.0000
L2	24	Aero MP3-04	77.75 - 53.00	1.0000	1.0000
L2	28	Aero MP3-04	77.75 - 65.50	1.0000	1.0000
L2	30	Aero MP3-04	77.75 - 65.50	1.0000	1.0000
L3	4	561(1-5/8")	38.25 - 77.75	1.0000	1.0000
L3	5	MLE Hybrid 3Power/6Fiber RL 2 10AWG(1-1/4")	38.25 - 77.75	1.0000	1.0000
L3	16	FLC 158-50J(1-5/8")	38.25 - 77.75	1.0000	1.0000
L3	20	Step Pegs (5/8" SR) 7-in. w/30" step	38.25 - 77.75	1.0000	1.0000

Discrete Tower Loads

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		*C_AA_A Front* ft²	*C_AA_A Side* ft²	*Weight* lb
Lightning Rod 5/8" x 6'	C	From Leg	0.00 0.00 3.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.38 0.99 1.62 2.46	0.38 0.99 1.62 2.46	7 11 19 48
167									
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	A	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	9.97 10.54 11.08 12.17	10.25 11.42 12.31 14.13	52 145 247 480
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	B	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	9.97 10.54 11.08 12.17	10.25 11.42 12.31 14.13	52 145 247 480
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	9.97 10.54 11.08 12.17	10.25 11.42 12.31 14.13	52 145 247 480
BXA-70063-6CF-EDIN-X w/ Mount Pipe	A	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.81 8.36 8.87 9.93	5.80 6.95 7.82 9.60	42 103 171 335
BXA-70063-6CF-EDIN-X w/ Mount Pipe	B	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.81 8.36 8.87 9.93	5.80 6.95 7.82 9.60	42 103 171 335
BXA-70063-6CF-EDIN-X w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.81 8.36 8.87 9.93	5.80 6.95 7.82 9.60	42 103 171 335
BXA-171063-8CF-EDIN-X w/ Mount Pipe	A	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.16 3.53 3.90 4.66	3.33 3.94 4.56 5.86	28 60 97 191
BXA-171063-8CF-EDIN-X	B	From	4.00	0.0000	167.00	No Ice	3.16	3.33	28

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
w/ Mount Pipe		Centroid-Face	0.00 1.00			1/2" Ice 1" Ice 2" Ice	3.53 3.90 4.66	3.94 4.56 5.86	60 97 191
BXA-171063-8CF-EDIN-X w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.16 3.53 3.90 4.66	3.33 3.94 4.56 5.86	28 60 97 191
BXA-171063-8CF-EDIN-X w/ Mount Pipe	A	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.16 3.53 3.90 4.66	3.33 3.94 4.56 5.86	28 60 97 191
BXA-171063-8CF-EDIN-X w/ Mount Pipe	B	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.16 3.53 3.90 4.66	3.33 3.94 4.56 5.86	28 60 97 191
BXA-171063-8CF-EDIN-X w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.16 3.53 3.90 4.66	3.33 3.94 4.56 5.86	28 60 97 191
GPS_A	B	From Centroid-Face	4.00 0.00 2.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.26 0.32 0.39 0.56	0.26 0.32 0.39 0.56	1 5 10 25
201-7	C	From Centroid-Face	4.00 0.00 4.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.09 1.94 2.80 4.12	1.09 1.94 2.80 4.12	4 13 28 74
RRH2X40-AWS	A	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.16 2.36 2.57 3.00	1.42 1.59 1.77 2.14	44 61 82 132
RRH2X40-AWS	B	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.16 2.36 2.57 3.00	1.42 1.59 1.77 2.14	44 61 82 132
RRH2X40-AWS	C	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.16 2.36 2.57 3.00	1.42 1.59 1.77 2.14	44 61 82 132
RRFDC-3315-PF-48	A	From Centroid-Face	4.00 0.00 1.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.36 3.60 3.84 4.34	2.19 2.39 2.61 3.05	21 50 82 158
2.4" Dia x 4-ft Mount Pipe	C	From Centroid-Face	4.00 0.00 0.00	0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.87 1.12 1.37 1.91	0.87 1.12 1.37 1.91	15 22 32 62
Platform Mount [LP 1201-1]	C	None		0.0000	167.00	No Ice 1/2" Ice 1" Ice 2" Ice	23.10 26.80 30.50 37.90	23.10 26.80 30.50 37.90	2100 2500 2900 3700
160									
SBNH-1D6565C w/ Mount Pipe	A	From Centroid-Face	4.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	11.68 12.40 13.14 14.51	9.84 11.37 12.91 15.27	99 189 288 522
SBNH-1D6565C w/ Mount	B	From	4.00	0.0000	160.00	No Ice	11.68	9.84	99

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		C_AA_A *Front* *ft²*	C_AA_A *Side* *ft²*	*Weight* *lb*
Pipe		Centroid-Fa	0.00			1/2" Ice	12.40	11.37	189
		ce	0.00			1" Ice	13.14	12.91	288
						2" Ice	14.51	15.27	522
SBNH-1D6565C w/ Mount	C	From	4.00	0.0000	160.00	No Ice	11.68	9.84	99
Pipe		Centroid-Fa	0.00			1/2" Ice	12.40	11.37	189
		ce	0.00			1" Ice	13.14	12.91	288
						2" Ice	14.51	15.27	522
TPA-65R-LCUUUU-H8 w/	A	From	4.00	0.0000	160.00	No Ice	13.54	10.96	114
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	14.24	12.49	218
		ce	1.00			1" Ice	14.95	14.04	331
						2" Ice	16.31	16.39	593
TPA-65R-LCUUUU-H8 w/	B	From	4.00	0.0000	160.00	No Ice	13.54	10.96	114
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	14.24	12.49	218
		ce	1.00			1" Ice	14.95	14.04	331
						2" Ice	16.31	16.39	593
TPA-65R-LCUUUU-H8 w/	C	From	4.00	0.0000	160.00	No Ice	13.54	10.96	114
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	14.24	12.49	218
		ce	1.00			1" Ice	14.95	14.04	331
						2" Ice	16.31	16.39	593
7770.00 w/ Mount Pipe	A	From	4.00	0.0000	160.00	No Ice	5.75	4.25	55
		Centroid-Fa	0.00			1/2" Ice	6.18	5.01	103
		ce	2.00			1" Ice	6.61	5.71	157
						2" Ice	7.49	7.16	287
7770.00 w/ Mount Pipe	B	From	4.00	0.0000	160.00	No Ice	5.75	4.25	55
		Centroid-Fa	0.00			1/2" Ice	6.18	5.01	103
		ce	2.00			1" Ice	6.61	5.71	157
						2" Ice	7.49	7.16	287
7770.00 w/ Mount Pipe	C	From	4.00	0.0000	160.00	No Ice	5.75	4.25	55
		Centroid-Fa	0.00			1/2" Ice	6.18	5.01	103
		ce	2.00			1" Ice	6.61	5.71	157
						2" Ice	7.49	7.16	287
RRUS 11 B12	A	From	4.00	0.0000	160.00	No Ice	2.79	1.19	51
		Centroid-Fa	0.00			1/2" Ice	3.00	1.34	72
		ce	0.00			1" Ice	3.21	1.50	95
						2" Ice	3.67	1.84	153
RRUS 11 B12	B	From	4.00	0.0000	160.00	No Ice	2.79	1.19	51
		Centroid-Fa	0.00			1/2" Ice	3.00	1.34	72
		ce	0.00			1" Ice	3.21	1.50	95
						2" Ice	3.67	1.84	153
RRUS 11 B12	C	From	4.00	0.0000	160.00	No Ice	2.79	1.19	51
		Centroid-Fa	0.00			1/2" Ice	3.00	1.34	72
		ce	0.00			1" Ice	3.21	1.50	95
						2" Ice	3.67	1.84	153
RRUS 32 B2	A	From	4.00	0.0000	160.00	No Ice	2.73	1.67	53
		Centroid-Fa	0.00			1/2" Ice	2.95	1.86	74
		ce	0.00			1" Ice	3.18	2.05	98
						2" Ice	3.66	2.46	157
RRUS 32 B2	B	From	4.00	0.0000	160.00	No Ice	2.73	1.67	53
		Centroid-Fa	0.00			1/2" Ice	2.95	1.86	74
		ce	0.00			1" Ice	3.18	2.05	98
						2" Ice	3.66	2.46	157
RRUS 32 B2	C	From	4.00	0.0000	160.00	No Ice	2.73	1.67	53
		Centroid-Fa	0.00			1/2" Ice	2.95	1.86	74
		ce	0.00			1" Ice	3.18	2.05	98
						2" Ice	3.66	2.46	157
DC6-48-60-18-8F	A	From	4.00	0.0000	160.00	No Ice	1.21	1.21	33
		Centroid-Fa	0.00			1/2" Ice	1.89	1.89	55

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *lb*
		ce	1.00			1" Ice	2.11	2.11	80
						2" Ice	2.57	2.57	138
DC6-48-60-18-8F	B	From	4.00	0.0000	160.00	No Ice	1.21	1.21	33
		Centroid-Fa	0.00			1/2" Ice	1.89	1.89	55
		ce	0.00			1" Ice	2.11	2.11	80
						2" Ice	2.57	2.57	138
78211056	A	From	4.00	0.0000	160.00	No Ice	0.15	0.05	2
		Centroid-Fa	0.00			1/2" Ice	0.20	0.08	3
		ce	1.00			1" Ice	0.26	0.12	6
						2" Ice	0.40	0.22	14
78211056	B	From	4.00	0.0000	160.00	No Ice	0.15	0.05	2
		Centroid-Fa	0.00			1/2" Ice	0.20	0.08	3
		ce	1.00			1" Ice	0.26	0.12	6
						2" Ice	0.40	0.22	14
78211056	C	From	4.00	0.0000	160.00	No Ice	0.15	0.05	2
		Centroid-Fa	0.00			1/2" Ice	0.20	0.08	3
		ce	1.00			1" Ice	0.26	0.12	6
						2" Ice	0.40	0.22	14
RRUS 32 B30	A	From	4.00	0.0000	160.00	No Ice	2.74	1.67	53
		Centroid-Fa	0.00			1/2" Ice	2.96	1.86	74
		ce	1.00			1" Ice	3.19	2.05	98
						2" Ice	3.68	2.46	157
RRUS 32 B30	B	From	4.00	0.0000	160.00	No Ice	2.74	1.67	53
		Centroid-Fa	0.00			1/2" Ice	2.96	1.86	74
		ce	1.00			1" Ice	3.19	2.05	98
						2" Ice	3.68	2.46	157
RRUS 32 B30	C	From	4.00	0.0000	160.00	No Ice	2.74	1.67	53
		Centroid-Fa	0.00			1/2" Ice	2.96	1.86	74
		ce	1.00			1" Ice	3.19	2.05	98
						2" Ice	3.68	2.46	157
(2) DBC0061F1V51-2	A	From	4.00	0.0000	160.00	No Ice	0.43	0.41	26
		Centroid-Fa	0.00			1/2" Ice	0.51	0.50	31
		ce	1.00			1" Ice	0.61	0.59	38
						2" Ice	0.81	0.79	57
(2) DBC0061F1V51-2	B	From	4.00	0.0000	160.00	No Ice	0.43	0.41	26
		Centroid-Fa	0.00			1/2" Ice	0.51	0.50	31
		ce	1.00			1" Ice	0.61	0.59	38
						2" Ice	0.81	0.79	57
(2) DBC0061F1V51-2	C	From	4.00	0.0000	160.00	No Ice	0.43	0.41	26
		Centroid-Fa	0.00			1/2" Ice	0.51	0.50	31
		ce	1.00			1" Ice	0.61	0.59	38
						2" Ice	0.81	0.79	57
(2) LGP21401	A	From	4.00	0.0000	160.00	No Ice	1.10	0.21	14
		Centroid-Fa	0.00			1/2" Ice	1.24	0.27	21
		ce	2.00			1" Ice	1.38	0.35	30
						2" Ice	1.69	0.52	55
(2) LGP21401	B	From	4.00	0.0000	160.00	No Ice	1.10	0.21	14
		Centroid-Fa	0.00			1/2" Ice	1.24	0.27	21
		ce	2.00			1" Ice	1.38	0.35	30
						2" Ice	1.69	0.52	55
(2) LGP21401	C	From	4.00	0.0000	160.00	No Ice	1.10	0.21	14
		Centroid-Fa	0.00			1/2" Ice	1.24	0.27	21
		ce	2.00			1" Ice	1.38	0.35	30
						2" Ice	1.69	0.52	55
2.4" Dia x 6-ft Pipe	A	From	4.00	0.0000	160.00	No Ice	1.43	1.43	22
		Centroid-Fa	0.00			1/2" Ice	1.93	1.93	33
		ce	0.00			1" Ice	2.30	2.30	48

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*Placement*		*C_AA_A Front*	*C_AA_A Side*	*Weight*
			ft *ft* *ft*	*°*	*ft*		*ft²*	*ft²*	*lb*
						2" Ice	3.06	3.06	90
2.4" Dia x 6-ft Pipe	B	From	4.00	0.0000	160.00	No Ice	1.43	1.43	22
		Centroid-Fa	0.00			1/2" Ice	1.93	1.93	33
		ce	0.00			1" Ice	2.30	2.30	48
						2" Ice	3.06	3.06	90
2.4" Dia x 6-ft Pipe	C	From	4.00	0.0000	160.00	No Ice	1.43	1.43	22
		Centroid-Fa	0.00			1/2" Ice	1.93	1.93	33
		ce	0.00			1" Ice	2.30	2.30	48
						2" Ice	3.06	3.06	90
Miscellaneous [NA 509-3]	C	None		0.0000	158.00	No Ice	11.84	11.84	275
						1/2" Ice	16.96	16.96	296
						1" Ice	22.08	22.08	317
						2" Ice	32.32	32.32	360
Miscellaneous [NA 510-1]	C	None		0.0000	162.00	No Ice	6.00	6.00	256
						1/2" Ice	8.50	8.50	340
						1" Ice	11.00	11.00	409
						2" Ice	16.00	16.00	563
Platform Mount [LP 1201-1]	C	None		0.0000	160.00	No Ice	23.10	23.10	2100
						1/2" Ice	26.80	26.80	2500
						1" Ice	30.50	30.50	2900
						2" Ice	37.90	37.90	3700
150									
PCS 1900MHz	B	From Face	1.00	0.0000	150.00	No Ice	2.32	2.24	60
4x45W-65MHz			0.00			1/2" Ice	2.53	2.44	83
			0.00			1" Ice	2.74	2.65	110
						2" Ice	3.19	3.09	173
(2) PCS 1900MHz	C	From Face	1.00	0.0000	150.00	No Ice	2.32	2.24	60
4x45W-65MHz			0.00			1/2" Ice	2.53	2.44	83
			0.00			1" Ice	2.74	2.65	110
						2" Ice	3.19	3.09	173
(2) 800MHz 2X50W RRH	A	From Face	1.00	0.0000	150.00	No Ice	2.06	1.93	64
W/FILTER			0.00			1/2" Ice	2.24	2.11	86
			0.00			1" Ice	2.43	2.29	111
						2" Ice	2.83	2.68	172
800MHz 2X50W RRH	B	From Face	1.00	0.0000	150.00	No Ice	2.06	1.93	64
W/FILTER			0.00			1/2" Ice	2.24	2.11	86
			0.00			1" Ice	2.43	2.29	111
						2" Ice	2.83	2.68	172
(2) Pipe Mount [PM 601-3]	C	None		0.0000	150.00	No Ice	4.39	4.39	195
						1/2" Ice	5.48	5.48	237
						1" Ice	6.57	6.57	280
						2" Ice	8.75	8.75	365
148									
APXVTM14-ALU-I20 w/	A	From	4.00	0.0000	148.00	No Ice	6.58	4.96	77
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.03	5.75	132
		ce	0.00			1" Ice	7.47	6.47	193
						2" Ice	8.38	7.94	339
APXVTM14-ALU-I20 w/	B	From	4.00	0.0000	148.00	No Ice	6.58	4.96	77
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.03	5.75	132
		ce	0.00			1" Ice	7.47	6.47	193
						2" Ice	8.38	7.94	339
APXVTM14-ALU-I20 w/	C	From	4.00	0.0000	148.00	No Ice	6.58	4.96	77
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.03	5.75	132
		ce	0.00			1" Ice	7.47	6.47	193
						2" Ice	8.38	7.94	339
APXVSPP18-C-A20 w/	A	From	4.00	0.0000	148.00	No Ice	8.26	6.95	83
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	8.82	8.13	151

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		C_AA_A *Front* *ft²*	C_AA_A *Side* *ft²*	*Weight* *lb*
		ce	0.00			1" Ice	9.35	9.02	227
						2" Ice	10.42	10.84	406
APXVSPP18-C-A20 w/	B	From	4.00	0.0000	148.00	No Ice	8.26	6.95	83
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	8.82	8.13	151
		ce	0.00			1" Ice	9.35	9.02	227
						2" Ice	10.42	10.84	406
APXVSPP18-C-A20 w/	C	From	4.00	0.0000	148.00	No Ice	8.26	6.95	83
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	8.82	8.13	151
		ce	0.00			1" Ice	9.35	9.02	227
						2" Ice	10.42	10.84	406
TD-RRH8x20-25	A	From	4.00	0.0000	148.00	No Ice	3.70	1.29	66
		Centroid-Fa	0.00			1/2" Ice	3.95	1.46	90
		ce	0.00			1" Ice	4.20	1.64	117
						2" Ice	4.72	2.02	183
TD-RRH8x20-25	B	From	4.00	0.0000	148.00	No Ice	3.70	1.29	66
		Centroid-Fa	0.00			1/2" Ice	3.95	1.46	90
		ce	0.00			1" Ice	4.20	1.64	117
						2" Ice	4.72	2.02	183
TD-RRH8x20-25	C	From	4.00	0.0000	148.00	No Ice	3.70	1.29	66
		Centroid-Fa	0.00			1/2" Ice	3.95	1.46	90
		ce	0.00			1" Ice	4.20	1.64	117
						2" Ice	4.72	2.02	183
2.4" Dia x 6-ft Pipe	A	From	4.00	0.0000	148.00	No Ice	1.43	1.43	22
		Centroid-Fa	0.00			1/2" Ice	1.93	1.93	33
		ce	0.00			1" Ice	2.30	2.30	48
						2" Ice	3.06	3.06	90
2.4" Dia x 6-ft Pipe	B	From	4.00	0.0000	148.00	No Ice	1.43	1.43	22
		Centroid-Fa	0.00			1/2" Ice	1.93	1.93	33
		ce	0.00			1" Ice	2.30	2.30	48
						2" Ice	3.06	3.06	90
2.4" Dia x 6-ft Pipe	C	From	4.00	0.0000	148.00	No Ice	1.43	1.43	22
		Centroid-Fa	0.00			1/2" Ice	1.93	1.93	33
		ce	0.00			1" Ice	2.30	2.30	48
						2" Ice	3.06	3.06	90
Platform Mount [LP 1201-1]	C	None		0.0000	148.00	No Ice	23.10	23.10	2100
						1/2" Ice	26.80	26.80	2500
						1" Ice	30.50	30.50	2900
						2" Ice	37.90	37.90	3700
140									
AIR -32 B2A/B66AA w/	A	From	4.00	0.0000	140.00	No Ice	6.75	6.07	153
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.20	6.87	214
		ce	-2.00			1" Ice	7.65	7.58	282
						2" Ice	8.57	9.06	441
AIR -32 B2A/B66AA w/	B	From	4.00	0.0000	140.00	No Ice	6.75	6.07	153
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.20	6.87	214
		ce	-2.00			1" Ice	7.65	7.58	282
						2" Ice	8.57	9.06	441
AIR -32 B2A/B66AA w/	C	From	4.00	0.0000	140.00	No Ice	6.75	6.07	153
Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.20	6.87	214
		ce	-2.00			1" Ice	7.65	7.58	282
						2" Ice	8.57	9.06	441
APXVAARR24_43-U-NA20	A	From	4.00	0.0000	140.00	No Ice	20.48	11.02	161
w/ Mount Pipe		Centroid-Fa	0.00			1/2" Ice	21.23	12.55	297
		ce	-2.00			1" Ice	21.99	14.10	444
						2" Ice	23.44	16.45	775
APXVAARR24_43-U-NA20	B	From	4.00	0.0000	140.00	No Ice	20.48	11.02	161
w/ Mount Pipe		Centroid-Fa	0.00			1/2" Ice	21.23	12.55	297

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		*C_AA_A Front* ft^2	*C_AA_A Side* ft^2	*Weight* lb
		ce	-2.00			1" Ice	21.99	14.10	444
						2" Ice	23.44	16.45	775
APXVAARR24_43-U-NA20	C	From	4.00	0.0000	140.00	No Ice	20.48	11.02	161
w/ Mount Pipe		Centroid-Fa	0.00			1/2" Ice	21.23	12.55	297
		ce	-2.00			1" Ice	21.99	14.10	444
						2" Ice	23.44	16.45	775
APX16DWV-16DWV-S-E-A	A	From	4.00	0.0000	140.00	No Ice	6.82	3.49	61
20 w/ Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.28	4.26	110
		ce	-2.00			1" Ice	7.72	4.96	165
						2" Ice	8.63	6.40	298
APX16DWV-16DWV-S-E-A	B	From	4.00	0.0000	140.00	No Ice	6.82	3.49	61
20 w/ Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.28	4.26	110
		ce	-2.00			1" Ice	7.72	4.96	165
						2" Ice	8.63	6.40	298
APX16DWV-16DWV-S-E-A	C	From	4.00	0.0000	140.00	No Ice	6.82	3.49	61
20 w/ Mount Pipe		Centroid-Fa	0.00			1/2" Ice	7.28	4.26	110
		ce	-2.00			1" Ice	7.72	4.96	165
						2" Ice	8.63	6.40	298
KRY 112 89/5	A	From	4.00	0.0000	140.00	No Ice	0.20	0.37	15
		Centroid-Fa	0.00			1/2" Ice	0.26	0.45	20
		ce	-2.00			1" Ice	0.33	0.55	27
						2" Ice	0.48	0.76	46
KRY 112 89/5	B	From	4.00	0.0000	140.00	No Ice	0.20	0.37	15
		Centroid-Fa	0.00			1/2" Ice	0.26	0.45	20
		ce	-2.00			1" Ice	0.33	0.55	27
						2" Ice	0.48	0.76	46
KRY 112 89/5	C	From	4.00	0.0000	140.00	No Ice	0.20	0.37	15
		Centroid-Fa	0.00			1/2" Ice	0.26	0.45	20
		ce	-2.00			1" Ice	0.33	0.55	27
						2" Ice	0.48	0.76	46
KRY 112 134/1	A	From	4.00	0.0000	140.00	No Ice	0.86	0.43	10
		Centroid-Fa	0.00			1/2" Ice	0.98	0.53	17
		ce	-2.00			1" Ice	1.11	0.63	26
						2" Ice	1.39	0.85	49
KRY 112 134/1	B	From	4.00	0.0000	140.00	No Ice	0.86	0.43	10
		Centroid-Fa	0.00			1/2" Ice	0.98	0.53	17
		ce	-2.00			1" Ice	1.11	0.63	26
						2" Ice	1.39	0.85	49
KRY 112 134/1	C	From	4.00	0.0000	140.00	No Ice	0.86	0.43	10
		Centroid-Fa	0.00			1/2" Ice	0.98	0.53	17
		ce	-2.00			1" Ice	1.11	0.63	26
						2" Ice	1.39	0.85	49
RADIO 4449 B12/B71	A	From	4.00	0.0000	140.00	No Ice	1.65	1.16	74
		Centroid-Fa	0.00			1/2" Ice	1.81	1.30	90
		ce	-2.00			1" Ice	1.98	1.45	109
						2" Ice	2.34	1.76	155
RADIO 4449 B12/B71	B	From	4.00	0.0000	140.00	No Ice	1.65	1.16	74
		Centroid-Fa	0.00			1/2" Ice	1.81	1.30	90
		ce	-2.00			1" Ice	1.98	1.45	109
						2" Ice	2.34	1.76	155
RADIO 4449 B12/B71	C	From	4.00	0.0000	140.00	No Ice	1.65	1.16	74
		Centroid-Fa	0.00			1/2" Ice	1.81	1.30	90
		ce	-2.00			1" Ice	1.98	1.45	109
						2" Ice	2.34	1.76	155
SitePro1 PRK1245L Kicker	C	None		0.0000	140.00	No Ice	11.84	11.84	275
						1/2" Ice	16.96	16.96	296
						1" Ice	22.08	22.08	317

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		C_AA_A *Front* *ft²*	C_AA_A *Side* *ft²*	*Weight* *lb*
						2" Ice	32.32	32.32	360
Commscope HRK14-U Handrail Kit	C	None		0.0000	140.00	No Ice	6.00	6.00	256
						1/2" Ice	8.50	8.50	340
						1" Ice	11.00	11.00	409
						2" Ice	16.00	16.00	563
Platform Mount [LP 1201-1]	C	None		0.0000	140.00	No Ice	23.10	23.10	2100
						1/2" Ice	26.80	26.80	2500
						1" Ice	30.50	30.50	2900
						2" Ice	37.90	37.90	3700
***									

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp

Comb. No.	Description
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	167 - 118.25	24.089	48	1.3418	0.0007
L2	122.75 - 77.75	12.565	48	1.0563	0.0002
L3	83.25 - 38.25	5.414	48	0.6460	0.0001
L4	45 - 0	1.520	48	0.3099	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.00	Lightning Rod 5/8" x 6'	48	24.089	1.3418	0.0007	44650
162.00	Miscellaneous [NA 510-1]	48	22.700	1.3154	0.0006	44650
160.00	SBNH-1D6565C w/ Mount Pipe	48	22.146	1.3048	0.0006	31893
158.00	Miscellaneous [NA 509-3]	48	21.593	1.2940	0.0006	24805
150.00	PCS 1900MHz 4x45W-65MHz	48	19.407	1.2495	0.0005	13132
148.00	APXVTM14-ALU-I20 w/ Mount Pipe	48	18.869	1.2378	0.0005	11749
140.00	AIR -32 B2A/B66AA w/ Mount Pipe	48	16.760	1.1879	0.0004	8268

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	167 - 118.25	117.541	20	6.5594	0.0034
L2	122.75 - 77.75	61.318	20	5.1643	0.0011
L3	83.25 - 38.25	26.408	20	3.1551	0.0004
L4	45 - 0	7.411	22	1.5119	0.0002

Tower Engineering Professionals
326 Tryon Road
Raleigh, NC 27603
Phone: (919) 661-6351
FAX: (919) 661-6350

Critical Deflections and Radius of Curvature - Design Wind

Elevation *ft*	*Appurtenance*	*Gov. Load Comb.*	*Deflection* *in*	*Tilt* *°*	*Twist* *°*	*Radius of Curvature* *ft*
167.00	Lightning Rod 5/8" x 6'	20	117.541	6.5594	0.0034	9335
162.00	Miscellaneous [NA 510-1]	20	110.766	6.4309	0.0031	9335
160.00	SBNH-1D6565C w/ Mount Pipe	20	108.063	6.3789	0.0030	6667
158.00	Miscellaneous [NA 509-3]	20	105.368	6.3265	0.0029	5185
150.00	PCS 1900MHz 4x45W-65MHz	20	94.702	6.1088	0.0024	2743
148.00	APXVTM14-ALU-I20 w/ Mount Pipe	20	92.075	6.0517	0.0023	2454
140.00	AIR -32 B2A/B66AA w/ Mount Pipe	20	81.786	5.8080	0.0019	1724

Compression Checks

Pole Design Data

Section No.	*Elevation* *ft*	*Size*	*L* *ft*	*L_u* *ft*	*Kl/r*	*A* *in^2*	*P_u* *lb*	*ϕP_n* *lb*	*Ratio* $\frac{P_u}{\phi P_n}$
L1	167 - 118.25 (1)	TP35.36x24x0.25	48.75	0.00	0.0	27.0277	-22141	1800650	0.012
L2	118.25 - 77.75 (2)	TP44.297x33.8114x0.3125	45.00	0.00	0.0	42.3560	-32445	2818670	0.012
L3	77.75 - 38.25 (3)	TP52.877x42.3904x0.375	45.00	0.00	0.0	60.6183	-46571	4043450	0.012
L4	38.25 - 0 (4)	TP61.04x50.554x0.4375	45.00	0.00	0.0	84.1541	-66620	5570890	0.012

Pole Bending Design Data

Section No.	*Elevation* *ft*	*Size*	*M_{ux}* *lb-ft*	*ϕM_{nx}* *lb-ft*	*Ratio* $\frac{M_{ux}}{\phi M_{nx}}$	*M_{uy}* *lb-ft*	*ϕM_{ny}* *lb-ft*	*Ratio* $\frac{M_{uy}}{\phi M_{ny}}$
L1	167 - 118.25 (1)	TP35.36x24x0.25	798301	1261850	0.633	0	1261850	0.000
L2	118.25 - 77.75 (2)	TP44.297x33.8114x0.3125	1882292	2476442	0.760	0	2476442	0.000
L3	77.75 - 38.25 (3)	TP52.877x42.3904x0.375	3058842	4236658	0.722	0	4236658	0.000
L4	38.25 - 0 (4)	TP61.04x50.554x0.4375	4580300	6946783	0.659	0	6946783	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u lb-ft	ϕT_n lb-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	167 - 118.25 (1)	TP35.36x24x0.25	25729	474336	0.054	142	1394217	0.000
L2	118.25 - 77.75 (2)	TP44.297x33.8114x0.3125	29079	743347	0.039	142	2739367	0.000
L3	77.75 - 38.25 (3)	TP52.877x42.3904x0.375	32207	1063850	0.030	141	4675267	0.000
L4	38.25 - 0 (4)	TP61.04x50.554x0.4375	35271	1476910	0.024	141	7725558	0.000

Pole Interaction Design Data

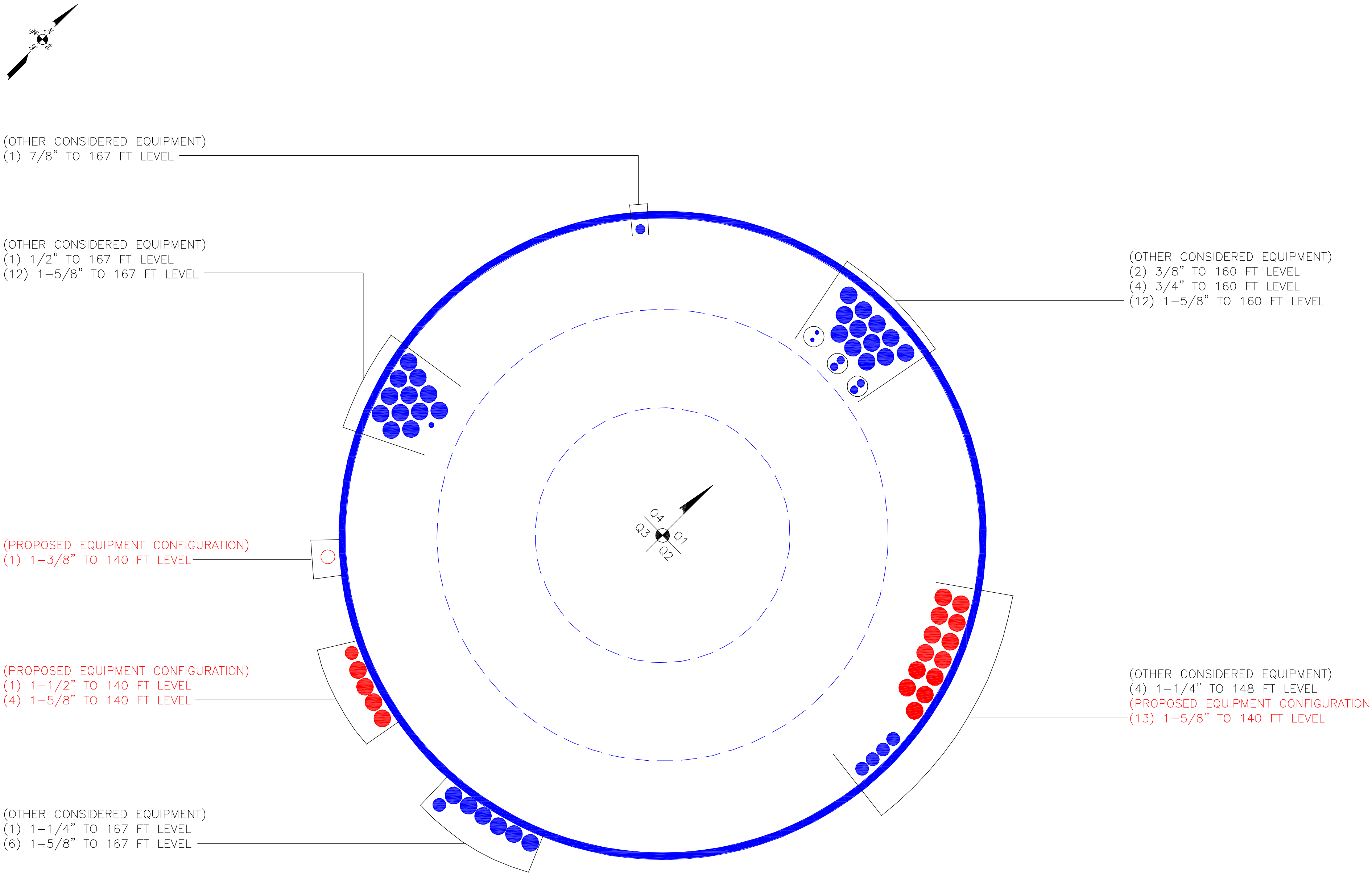
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	167 - 118.25 (1)	0.012	0.633	0.000	0.054	0.000	0.648	1.050	4.8.2
L2	118.25 - 77.75 (2)	0.012	0.760	0.000	0.039	0.000	0.773	1.050	4.8.2
L3	77.75 - 38.25 (3)	0.012	0.722	0.000	0.030	0.000	0.734	1.050	4.8.2
L4	38.25 - 0 (4)	0.012	0.659	0.000	0.024	0.000	0.672	1.050	4.8.2

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
L1	167 - 118.25	Pole	TP35.36x24x0.25	1	-22141	1890682	61.7	Pass
L2	118.25 - 77.75	Pole	TP44.297x33.8114x0.3125	2	-32445	2959603	73.6	Pass
L3	77.75 - 38.25	Pole	TP52.877x42.3904x0.375	3	-46571	4245622	69.9	Pass
L4	38.25 - 0	Pole	TP61.04x50.554x0.4375	4	-66620	5849434	64.0	Pass
							Summary	
						Pole (L2)	73.6	Pass
						RATING =	**73.6**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



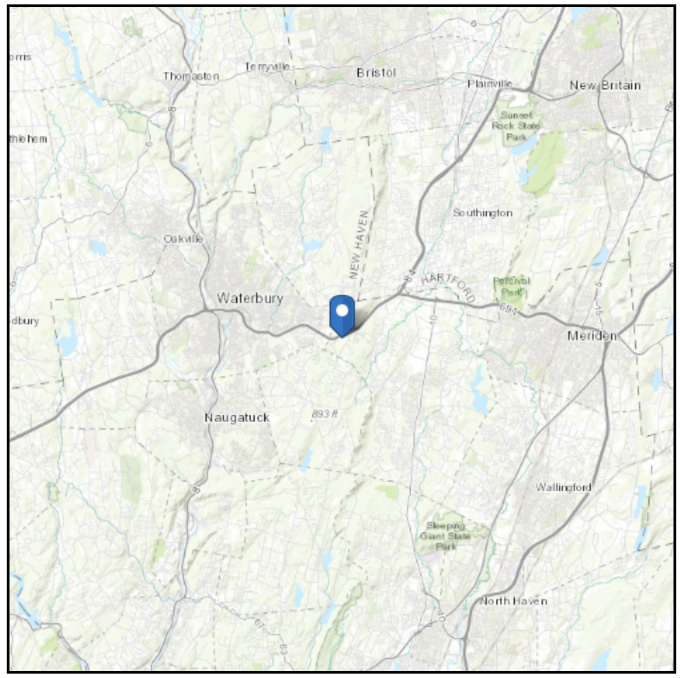
(OTHER CONSIDERED EQUIPMENT)
(1) 7/8" TO 167 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(1) 1/2" TO 167 FT LEVEL
(12) 1-5/8" TO 167 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(2) 3/8" TO 160 FT LEVEL
(4) 3/4" TO 160 FT LEVEL
(12) 1-5/8" TO 160 FT LEVEL
Q4
Q3
Q1
Q2
(PROPOSED EQUIPMENT CONFIGURATION)
(1) 1-3/8" TO 140 FT LEVEL
(PROPOSED EQUIPMENT CONFIGURATION)
(1) 1-1/2" TO 140 FT LEVEL
(4) 1-5/8" TO 140 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(4) 1-1/4" TO 148 FT LEVEL
(PROPOSED EQUIPMENT CONFIGURATION)
(13) 1-5/8" TO 140 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(1) 1-1/4" TO 167 FT LEVEL
(6) 1-5/8" TO 167 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

ASCE 7 Hazards Report

Address:		**Standard:**	ASCE/SEI 7-10	**Elevation:**	615.93 ft (NAVD 88)
No Address at This Location		**Risk Category:**	II	**Latitude:**	41.536444
		Soil Class:	D - Stiff Soil	**Longitude:**	-72.957306



Wind

Results:

Wind Speed:	122 Vmph	*125 mph ultimate 3-second gust wind speed considered per Appendix N Municipality of the Connecticut State Building Code
10-year MRI	76 Vmph	
25-year MRI	86 Vmph	
50-year MRI	92 Vmph	
100-year MRI	99 Vmph	

Data Source: ASCE/SEI 7-10, Fig. 26.5-1A and Figs. CC-1–CC-4, incorporating errata of March 12, 2014

Date Accessed: Wed Oct 24 2018

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.

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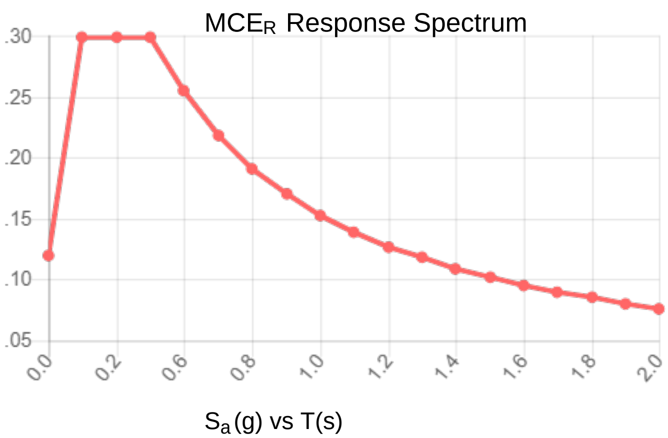
Seismic

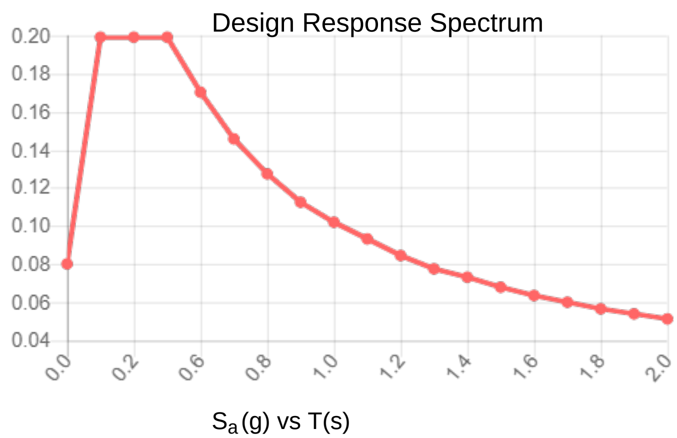
Site Soil Class: D - Stiff Soil

Results:

S_S :	0.187	S_{DS} :	0.199
S_1 :	0.064	S_{D1} :	0.102
F_a :	1.600	T_L :	6.000
F_v :	2.400	PGA :	0.097
S_{MS} :	0.299	PGA_M :	0.154
S_{M1} :	0.153	F_{PGA} :	1.600
		I_e :	1

Seismic Design Category B





Data Accessed: Wed Oct 24 2018

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

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Ice

Results:

Ice Thickness:	0.75 in.
Concurrent Temperature:	15 F
Gust Speed:	50 mph
Data Source:	Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8
Date Accessed:	Wed Oct 24 2018

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

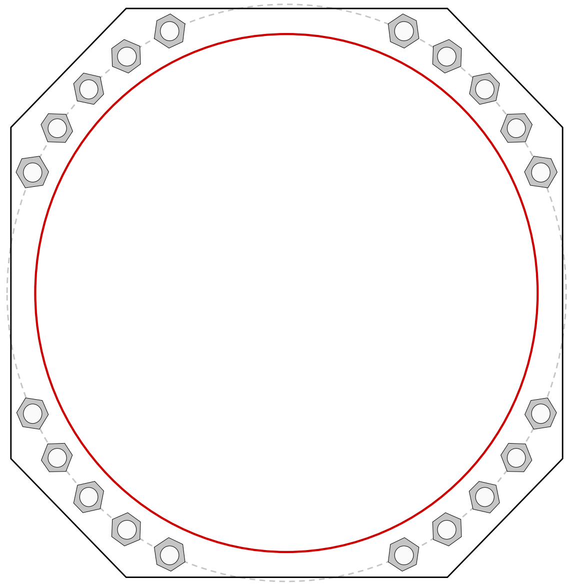
Monopole Base Plate Connection

Site Info	
BU #	801367
Site Name	NHV-2075 CAC 8013
Order #	446057 Rev. 0

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
I_{ar} (in)	1

Applied Loads	
Moment (kip-ft)	4580.30
Axial Force (kips)	66.64
Shear Force (kips)	35.23

**TIA-222-H Section 15.5 Applied*



Connection Properties

Anchor Rod Data

(20) 2-1/4" ø bolts (A615-75 N; Fy=75 ksi, Fu=100 ksi) on 68" BC

Base Plate Data

67" OD x 3" Plate (A572-55; Fy=55 ksi, Fu=70 ksi)

Stiffener Data

N/A

Pole Data

61.04" x 0.4375" 18-sided pole (A607-65; Fy=65 ksi, Fu=80 ksi)

Analysis Results

Anchor Rod Summary *(units of kips, kip-in)*

Pu_c = 164.92	ϕPn_c = 243.75	**Stress Rating**
Vu = 1.76	ϕVn = 73.13	**64.5%**
Mu = n/a	ϕMn = n/a	Pass

Base Plate Summary

Max Stress (ksi):	25.83	(Flexural)
Allowable Stress (ksi):	49.5	
Stress Rating:	**49.7%**	Pass

JOB:	CT NHV-2075 CAC 801367 (BU 801367): TEP# 25630.193451
SHEET NUMBER:	1 OF 2
CALCULATED BY:	CDC DATE 10/26/2018
CHECKED BY:	MGY DATE 10/26/2018

TOWER ENGINEERING PROFESSIONALS

Pad and Pier Foundation for Monopole - TIA-222-H - Perpendicular to Wind Direction

(For pads of unequal side dimensions and eccentric tower location)

q_a, ALLOWABLE SOIL PRESS. (ksf)	8.00
NET or GROSS	GROSS
SAFETY FACTOR IN q_a	2
SOIL DENSITY (pcf)	100

F'c (ksi) 3

Fy (ksi) 60

φq_n = 12.0 ksf

Base Reactions LC1: 1.2D + 1.0W

M, MOMENT (k-ft)	4580.3
P_t, TOTAL DOWNLOAD (k)	66.6
H, HORIZONTAL SHEAR (k)	35.2
Tower Eccentricity, e_{LT} (ft)	0.0
Tower Eccentricity, e_{BT} (ft)	0.0

Base Reaction LC 2: 0.9D + 1.0W

M (k-ft)	4580.3
P_t (k)	50.0
H (k)	35.2

Try:

L (ft.)	B (ft.)	t (ft.)	Depth to top of pad (ft.)	Pier dia./width (ft.)	Pier Height, h (cu.ft.)	Pier Shape
28	25	2.5	2.9	8.00	3.50	Round

W_m, Weight of Mat (k) =	262.5
W_p, Weight of Pier (k) =	26.4
W_s, Weight of Soil (k) =	188.4

Concrete Vol. (cu ft) 71.33

CHECK BEARING PRESSURE for LC1: 1.2D + 1.0W

$P = P_t + Wf + Ws$ =	639.4 k
e_L =	7.49 ft
L/4 =	7.00 ft
L' =	13.01 ft
e_B =	7.49 ft
B/4 =	6.25 ft
B' =	10.01 ft
Orthogonal: q_{max} =	2.28 ksf
Diag. Axis: q_{max} =	2.55 ksf

Capacity: 20.2%

CHECK BEARING STABILITY FOR LC2: 0.9D +1.0W

90° Axis	$M_{\varphi qn}$ =	5652.3 k-ft
	$M_{ot}/M_{\varphi qn}$ =	0.85
Diag. Axis	$M_{\varphi qn}$ =	6783.0 k-ft
	$M_{ot}/M_{\varphi qn}$ =	0.71

Capacity: 80.7%

' $M_{\varphi qn}$ is the overturning moment at which $q_{max} = \varphi q_n$

CHECK OVERTURNING: LC2 CONTROLS

$M_{st}=(P_t+0.9W_p)*(B/2-e_{BT})+(0.9W_{m+s}*B/2)$ =	5994.5 k-ft
$M_{ot} = M+H*(t+h)$ =	4791.7 k-ft
M_{ot}/M_{st} =	0.80

Capacity: 76.1%

JOB:	CT NHV-2075 CAC 801367 (BU 801367): TEP# 25630.193451		
SHEET NUMBER:	2	OF	2
CALCULATED BY:	CDC	DATE	10/26/2018
CHECKED BY:	MGY	DATE	10/26/2018

CALCULATE REINFORCING REQUIRED

$F'c$ = 3.0 ksi Fy = 60.0 ksi

Temp & Shrinkage reinforcing, $A_{s,t}$ = 0.32 in^2/ft (ACI 318 Sec. 10.5.4)

BOTTOM REINFORCING

Bar Size = 10
Bar Spacing, c-c: 9.0
d = 25.75 in.

Mu= 1024.6 in-k/ft

Mu= 2236.4 k-ft
φM_n= 5139.8 k-ft

φMn=0.9*As*Fy*d(1-0.59*As*Fy/(b*d*F'c))

Solution: As,req = 0.76 in^2/ft

Check, As = 1.69 in^2/ft

Capacity: 42.7%

TOP REINFORCING

Bar Size = 10
Bar Spacing, c-c: 9.0
d= 25.75 in.

Mu= 477.9 in-k/ft

Mu= 995.5 k-ft
φM_n= 5139.8 k-ft

φMn=0.9*As*Fy*d(1-0.59*As*Fy/(b*d*F'c))

Solution: As,req = 0.35 in^2/ft

Check, As = 1.69 in^2/ft

Capacity: 19.6%

	PASS	PASS	CT NHV-2075 CAC 801367 (BU 801367)		
Results Summary:	LC1	LC2	TEP #:	25630.193451	
Soil Interaction:	N/A	N/A	Analysis:	CDC	10/26/2018
Foundation Structural:	40.7%	10.5%	Check:	MGY	10/26/2018

Drilled Caisson Tool - Input

Code Revisions: TIA-222-H ACI 318-14

Tower Type: Monopole

	LC1	LC2	
Moment:	4,703.62	1,220.38	kip-ft
Axial (download):	66.64	105.83	kip
Shear:	35.23	8.85	kip
Axial (uplift):			kip

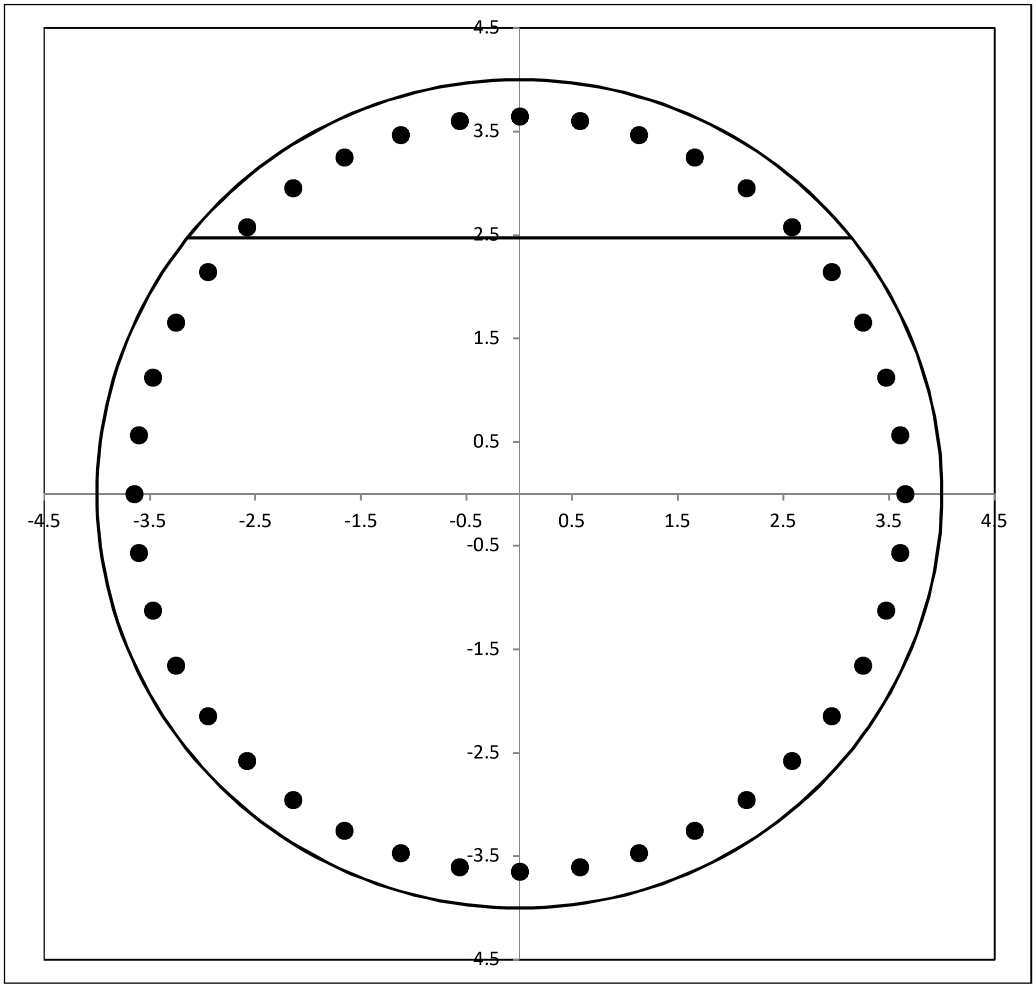
Shaft Information

Diameter:	8.00	ft
Projection:	0.60	ft
Caisson Length:	3.50	ft
f'c:	3.000	ksi
Max εc:	0.003	in/in

Cage 1 Reinforcement

Tie Bar Size:	4	*(fy = 40.0 ksi)*
Clear Cover to Tie:	3.00	*in (Cage Ø = 87.59in)*
Tie Bar Spacing:	6.00	in
Vertical Bar Size:	11	
Vertical Bar Quantity:	40	*(ρ =0.862%)*
fy:	60.0	ksi
E:	29,000	ksi

Reinforcement Capacity



		LC1	LC2	
	Vu =	45.8	45.8	kip
	Vc =	796.6	798.7	kip
fy,tie = 40.0	Vs =	244.4	244.4	kip
	ϕVn =	780.7	782.3	kip
	Capacity =	5.6%	5.6%	
		PASS	PASS	

	LC1	LC2	
Mu=	4703.6	1220.4	kip-ft
ϕMn =	10997.7	11099.2	kip-ft
Capacity =	40.7%	10.5%	
	PASS	PASS	

Date: **October 15, 2018**

Charles McGuirt
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
(704) 405-6607

MASER CONSULTING
— CONNECTICUT —
Maser Consulting Connecticut
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701
(732) 383-1950

Subject:	**Mount Modification Design Report**	
Carrier Designation:	**T-Mobile Tower Equipment**	
	Carrier Site Number:	CT11352C
	Carrier Site Name:	Crown Cheshire
Crown Castle Designation:	**Crown Castle BU Number:**	801367
	Crown Castle Site Name:	CT NHV-2075 CAC 801367
	Crown Castle JDE Job Number:	512587
	Crown Castle Order Number:	446057 Rev 0
Engineering Firm Designation:	Maser Consulting, P.A. **Report Designation:**	18922050A
Site Data:	**1121 Summit Road, Cheshire, New Haven County, CT, 06410**	
	Latitude 41°32'11.20" Longitude -72°57'26.30"	
Structure Information:	**Tower Height & Type:**	**167 ft Monopole**
	Mount Elevation:	**138 ft**
	Mount Type:	**14 ft Platform**

Dear Charles McGuirt,

Maser Consulting, P.A. is pleased to submit this **"Mount Modification Design Report"** to determine the structural integrity of T-Mobile's antenna mounting system with the proposed appurtenance and equipment addition on the abovementioned supporting tower structure. Analysis of the existing supporting tower structure is to be completed by others and therefore is not part of this analysis. Analysis of the antenna mounting system as a tie-off point for fall protection or rigging is not part of this document.

The purpose of the analysis is to determine acceptability of the mount stress level. Based on our analysis we have determined the mount stress level to be:

Platform	**Sufficient***

***Sufficient upon completion of the changes listed in the 'Recommendations' section of this report.**

The analysis has been performed in accordance with the TIA-222-H Standard. This analysis utilizes an ultimate 3-second gust wind speed of 125 mph from the 2012 International Building Code. Exposure Category B with a maximum topographic factor, Kzt, of 1.0 and Risk Category II was/were used in this analysis.

Mount structural analysis prepared by: Carol Luengas
Respectfully Submitted by:

STATE OF CONNECTICUT
PETROS TSOUKALAS
32577
LICENSED
PROFESSIONAL ENGINEER

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Carol Luengas, E.I.T.
Engineer

TABLE OF CONTENTS

1) INTRODUCTION

This mount is an existing 14 ft Platform mapped by Tower Engineering Professionals.This mount is installed at the 138 ft elevation on 3 sector(s) of the 167 ft monopole**.**

2) ANALYSIS CRITERIA

Building Code:	2012 IBC
TIA-222 Revision:	TIA-222-H
Risk Category:	II
Ultimate Wind Speed:	125 mph
Exposure Category:	B
Topographic Factor:	1.0
Ice Thickness:	0.75 in
Wind Speed with Ice:	50 mph
Live Loading Wind Speed:	30 mph
Man Live Load at Mid/End-Points:	250 lb
Man Live Load at Mount Pipes:	500 lb

Table 1 - Proposed Equipment Configuration

Mount Centerline (ft)	Antenna Centerline (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Mount Details
138	138	3	Ericsson	AIR-32 B2A/B66AA	Platform
			RFS	APX16DWV-16DWVS-E-A20	
			RFS	APXVAARR24_43-U-NA20	
			Ericsson	KRY112 134/1	
			Ericsson	KRY 112 89/5	
			Ericsson	Radio 4449 B12/B71	

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Remarks	Reference	Source
CT NHV-20750CAC 801367 Mount Mapping Dated September 14, 2018	Crown Castle	TEP# 25630.177476	Tower Engineering Professionals

3.1) Analysis Method

RISA-3D, a commercially available analysis software package, was used to create a three-dimensional model of the antenna mounting system and calculate member stresses for various loading cases.The program performs design checks of structures under user specified loads. The user specified loads have been calculated separately based on the requirements of the above referenced codes. The program performs an analysis based on the steel code to determine the adequacy of the members and produces the reactions at the connection points of the mounts to the existing structure.

Proprietary excel sheets were used to calculate appurtenance and member loading for various load cases. Selected output from the analysis is included in Appendix B.

This analysis was performed in accordance with Crown Castle's ENG-SOW-10208 *Tower Mount Analysis* (Revision B).

3.2) Assumptions

1) The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
2) The configuration of antennas, mounts, and other appurtenances are as specified in Table 1 and the referenced drawings.
3) All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
4) Steel grades have been assumed as follows, unless noted otherwise:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Rectangular)	ASTM 500 (GR B-46)
Pipe	ASTM A53 (GR 35)
Connection Bolts	ASTM A325

This analysis may be affected if any assumptions are not valid or have been made in error. Maser Consulting, P.A. should be notified to determine the effect on the structural integrity of the antenna mounting system.

4) ANALYSIS RESULTS

Table 3(a) - Mount Component Stresses vs. Capacity (Platform, All Sectors)

Notes	Component	Critical Member	Centerline (ft)	% Capacity	Pass / Fail
1,3	Single Platform Angles		138	77.9	Pass
1,3	Double Platform Angles		138	58.3	Pass
1,3	Standoff Arm		138	25.1	Pass
1,3	Standoff Arm Reinforcement		138	5.9	Pass
1,3	Antenna Pipes		138	41.9	Pass
2,3	Connection to Tower		138	27.7	Pass
1,3	Modification kickers		138	11.4	Pass
1,3	Handrail		138	12.7	Pass

Structure Rating (max from all components) =	77.9%

Notes:
1) See additional documentation in "Appendix C - Software Analysis Output" for calculations supporting the % capacity consumed.
2) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
3) All sectors are typical

4.1) Recommendations

The modification has sufficient capacity to support the proposed loading configuration with the proposd modifications, therefore, the proposed installation **can** be installed as intended, once the modifications are installed.The proposed modifications consists of:

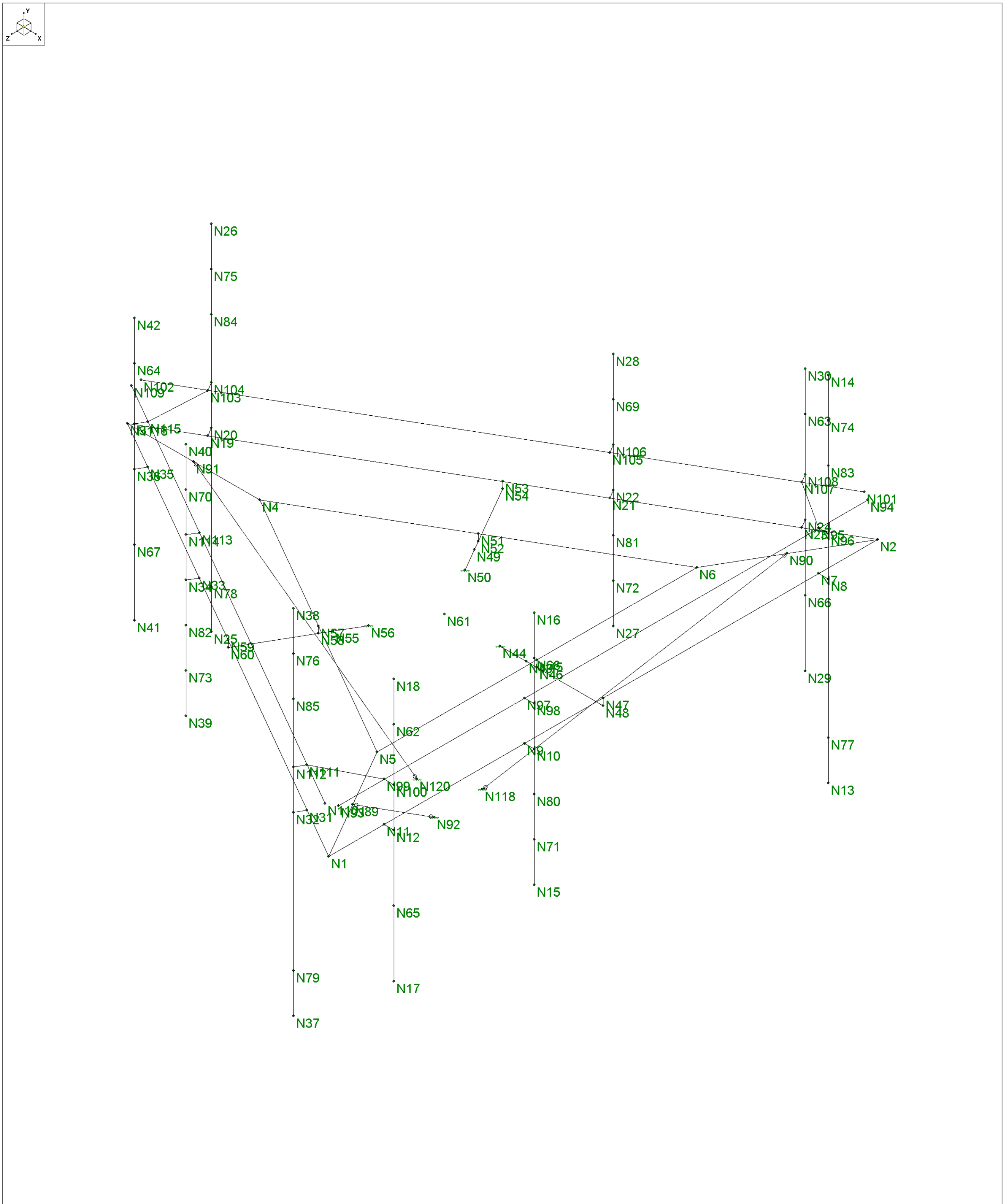
- Installing a Platform Kicker Kit (SitePro 1 P/N PRK-1245L or engineer approved equivalent) mid-way along the existing LL3x3x4 members and 4' below the existing platform.
- Installing a Handrail Kit (SitePro 1 P/N HRK14-U or engineer approved equivalent) 1'-6" above the existing platform. Contractor to cut the proposed pipe masts down to 13'-6". Please see Appendix E for the modification design details.

APPENDIX A

WIRE FRAME AND RENDERED MODELS

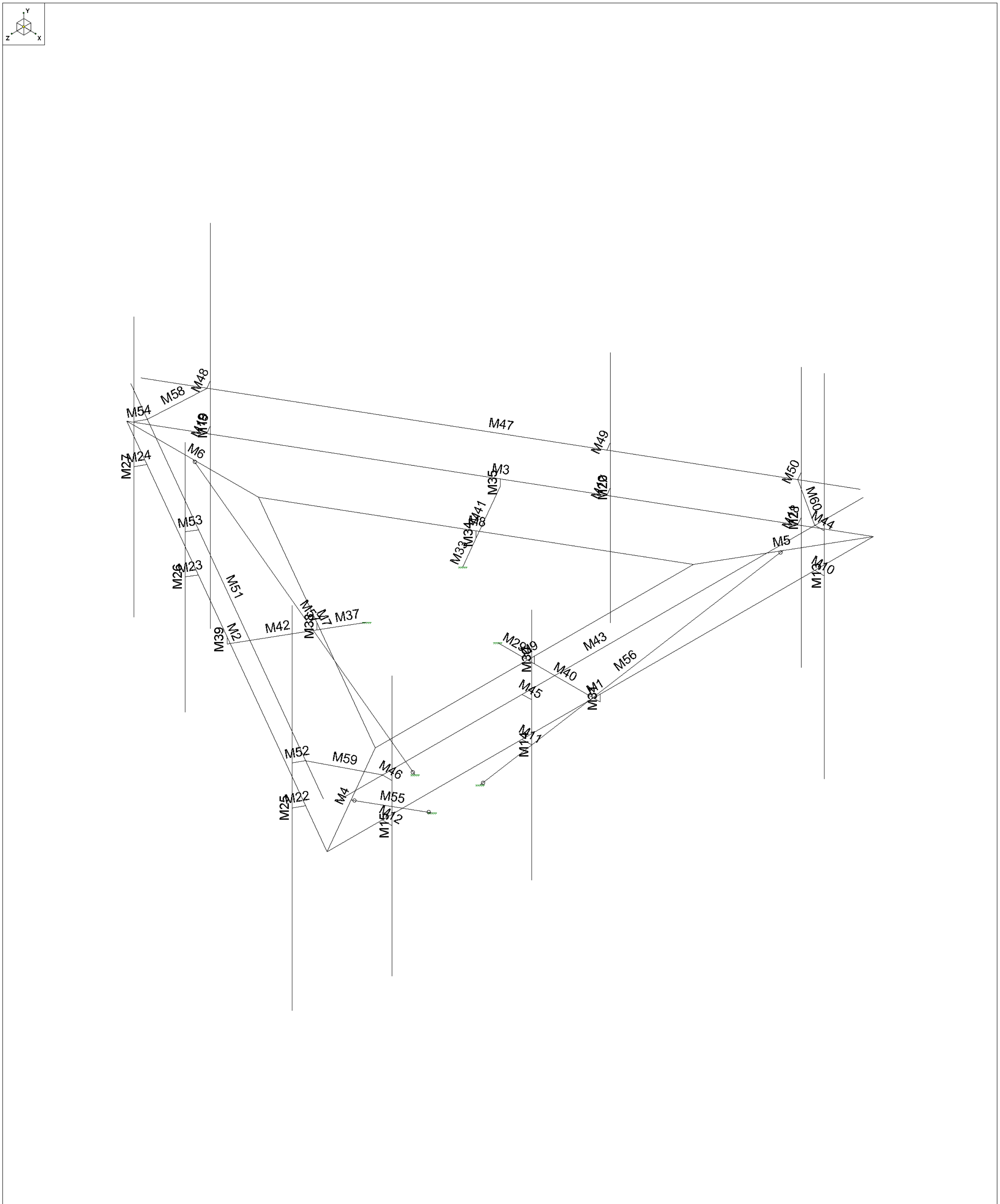
Envelope Only Solution

Maser Consulting P.A.		SK - 1
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:32 PM
18922050	Rendered Model	ACAD-18922050.R3D



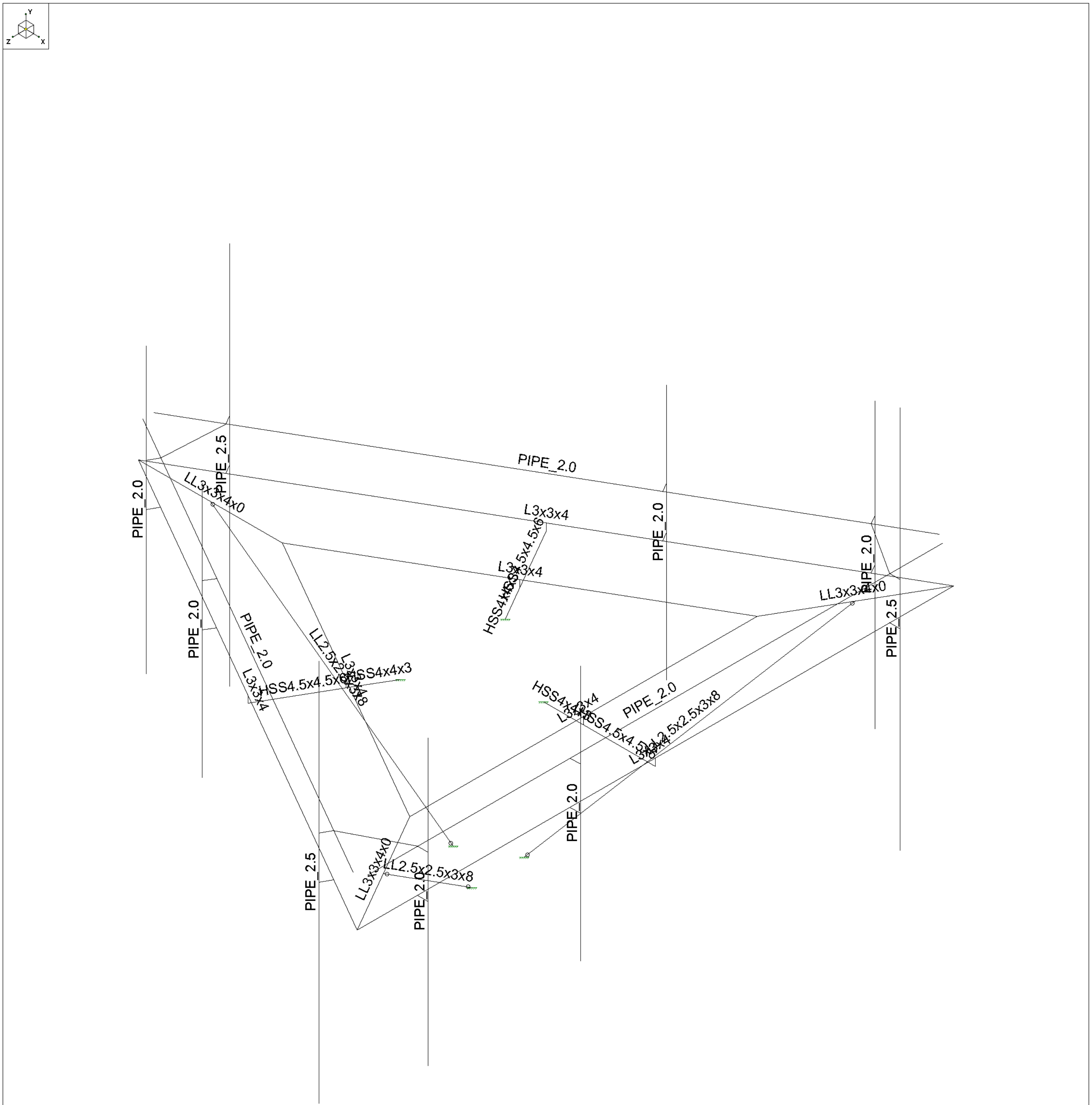
Envelope Only Solution

Maser Consulting P.A.		SK - 2
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:33 PM
18922050	Joint Labels	ACAD-18922050.R3D



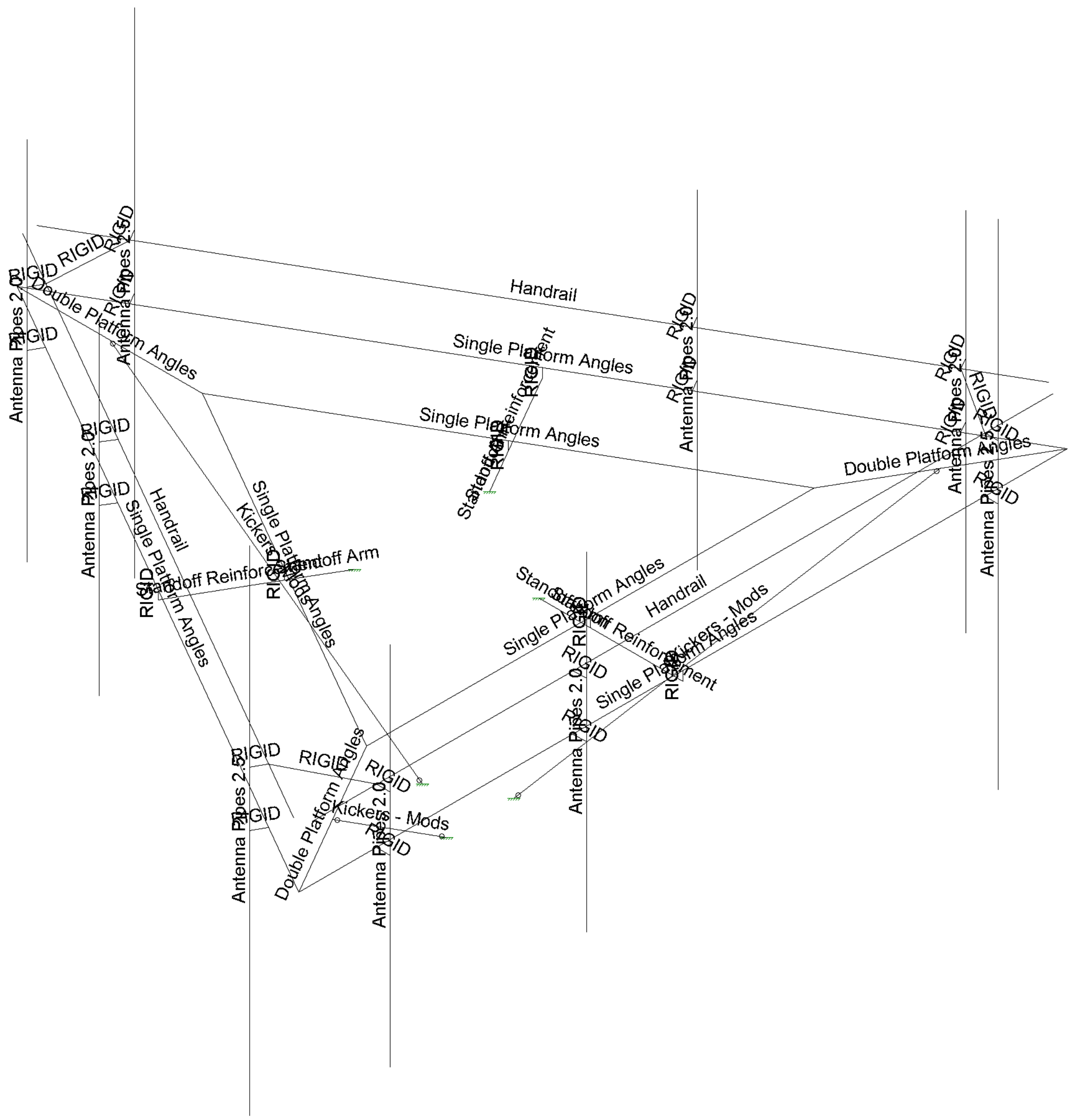
Envelope Only Solution

Maser Consulting P.A.		SK - 3
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:33 PM
18922050	Member Labels	ACAD-18922050.R3D



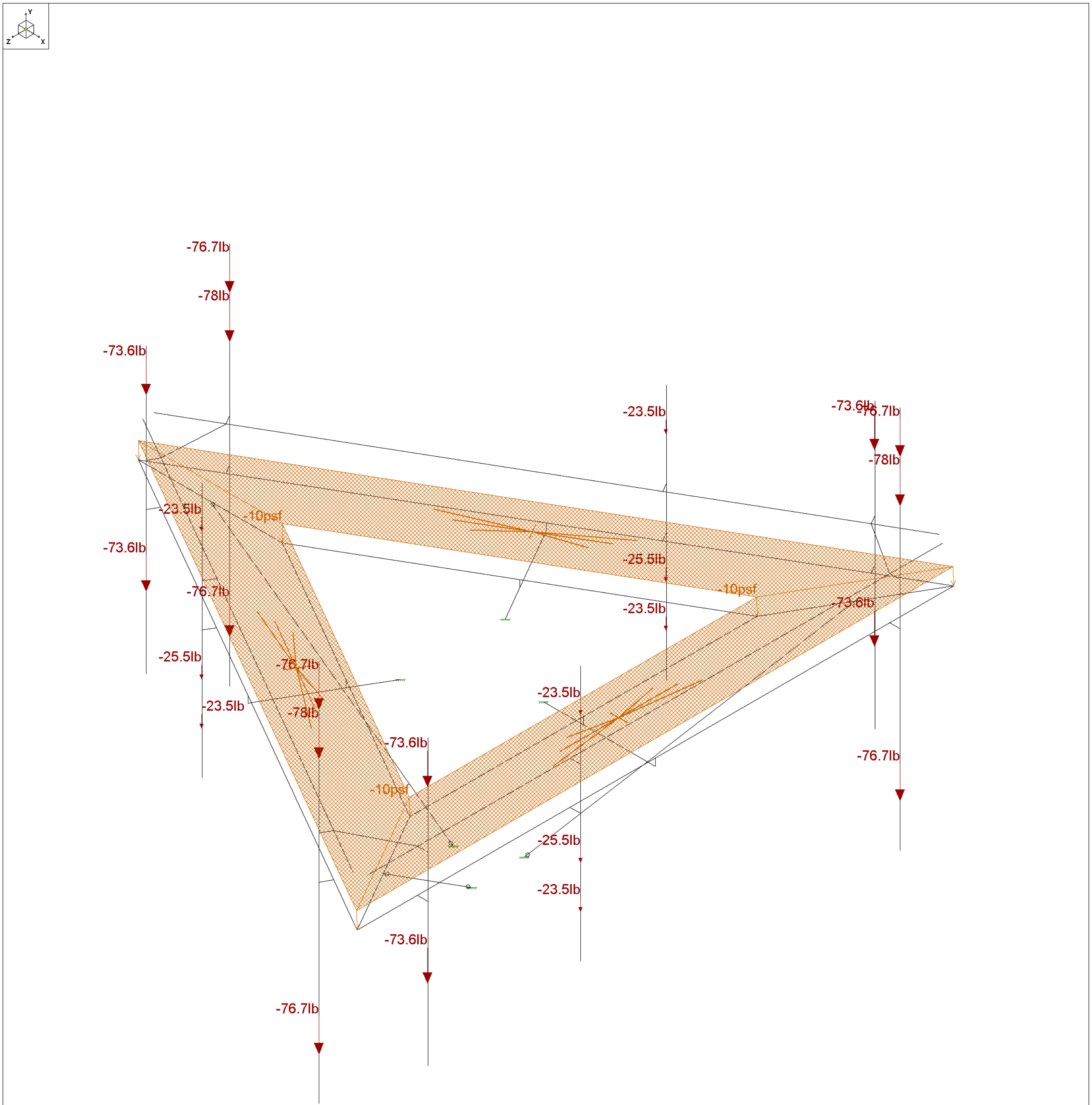
Envelope Only Solution

Maser Consulting P.A.		SK - 4
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:33 PM
18922050	Member Shapes	ACAD-18922050.R3D



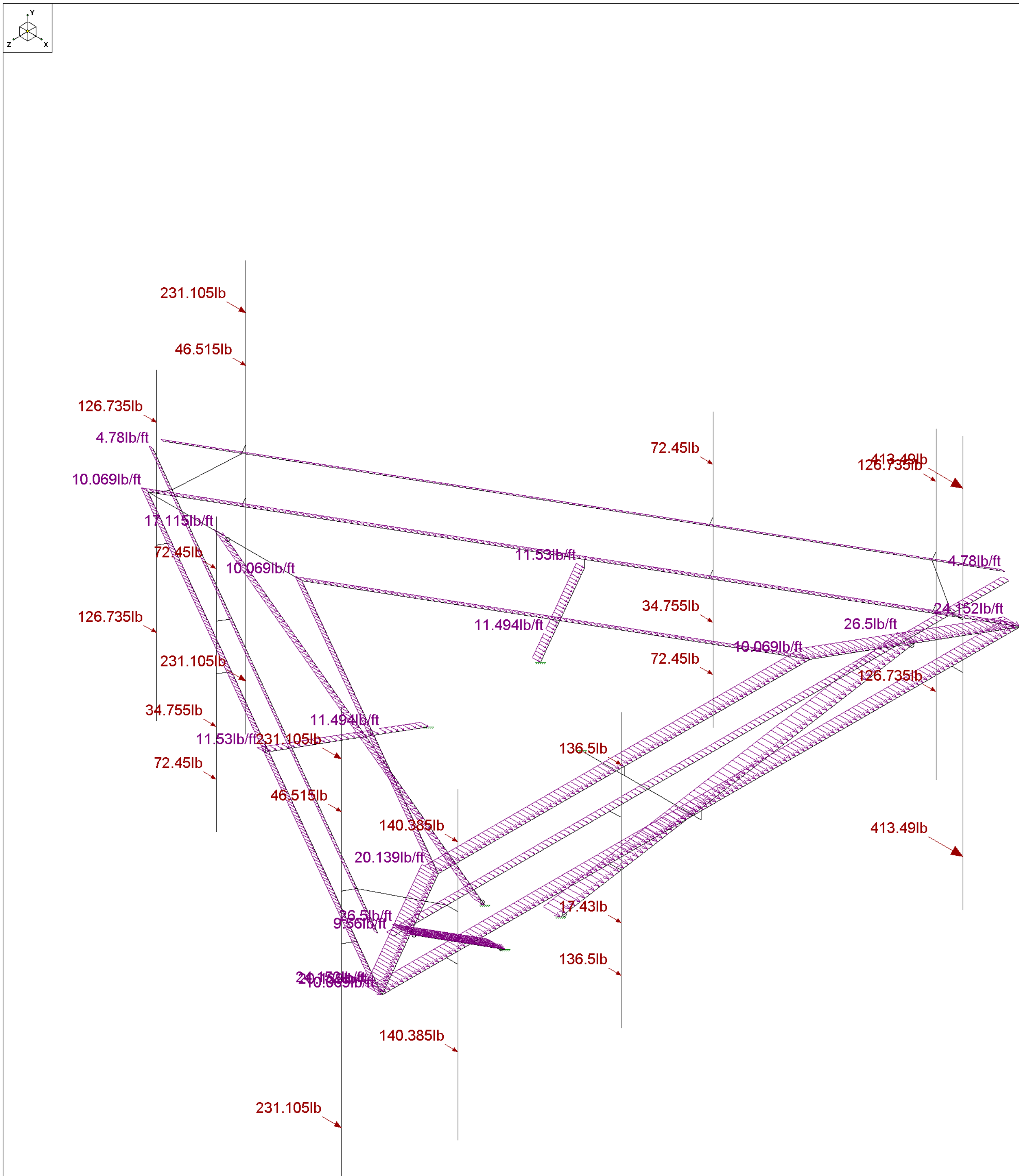
Envelope Only Solution

Maser Consulting P.A.		SK - 5
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:33 PM
18922050	Section Sets	ACAD-18922050.R3D



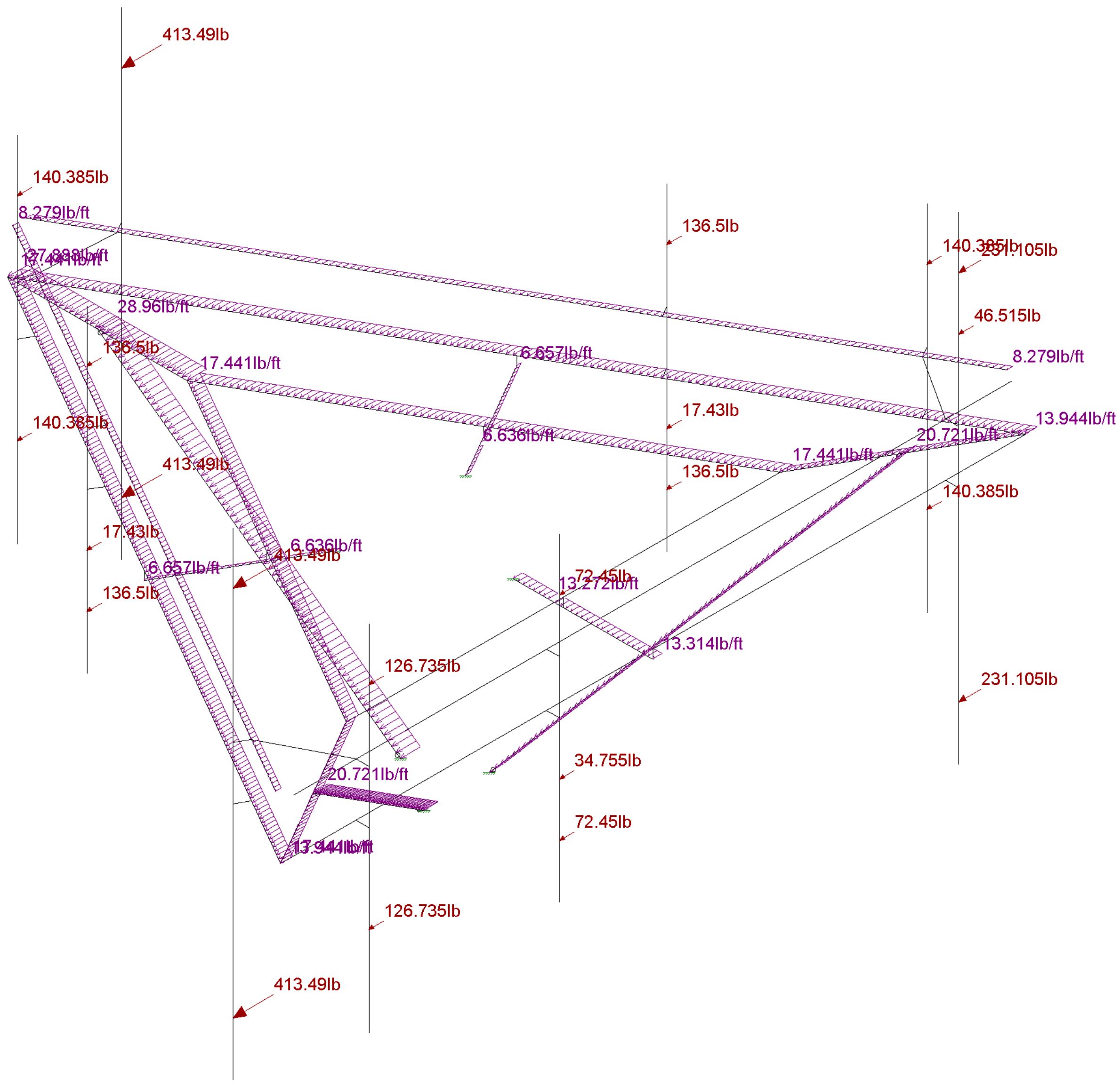
Loads: BLC 1, Dead
Envelope Only Solution

Maser Consulting P.A.		SK - 6
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:33 PM
18922050	Dead Load	ACAD-18922050.R3D



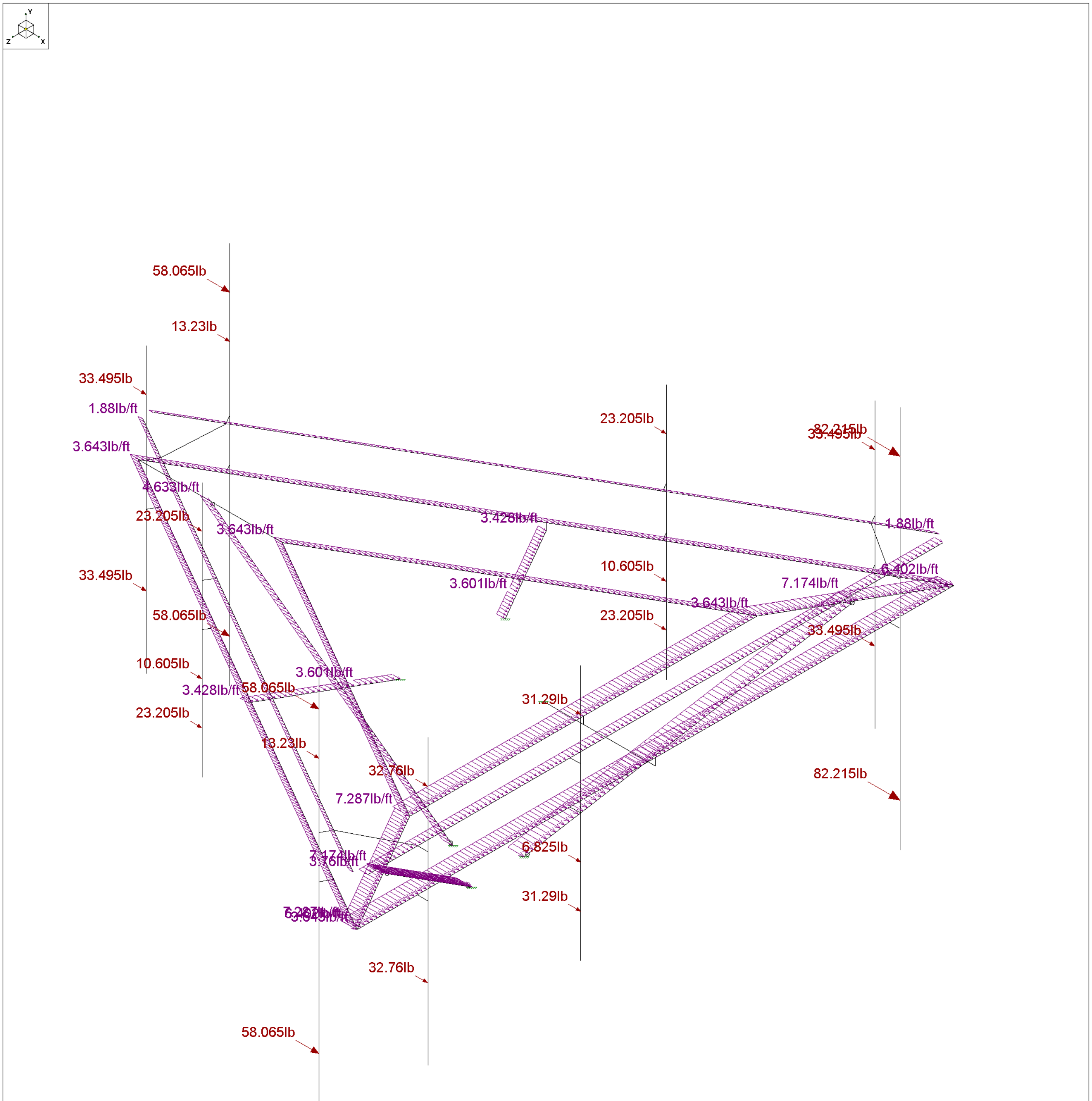
Loads: BLC 2, Wx
Envelope Only Solution

Maser Consulting P.A.		SK - 7
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:34 PM
18922050	Wind Load X	ACAD-18922050.R3D



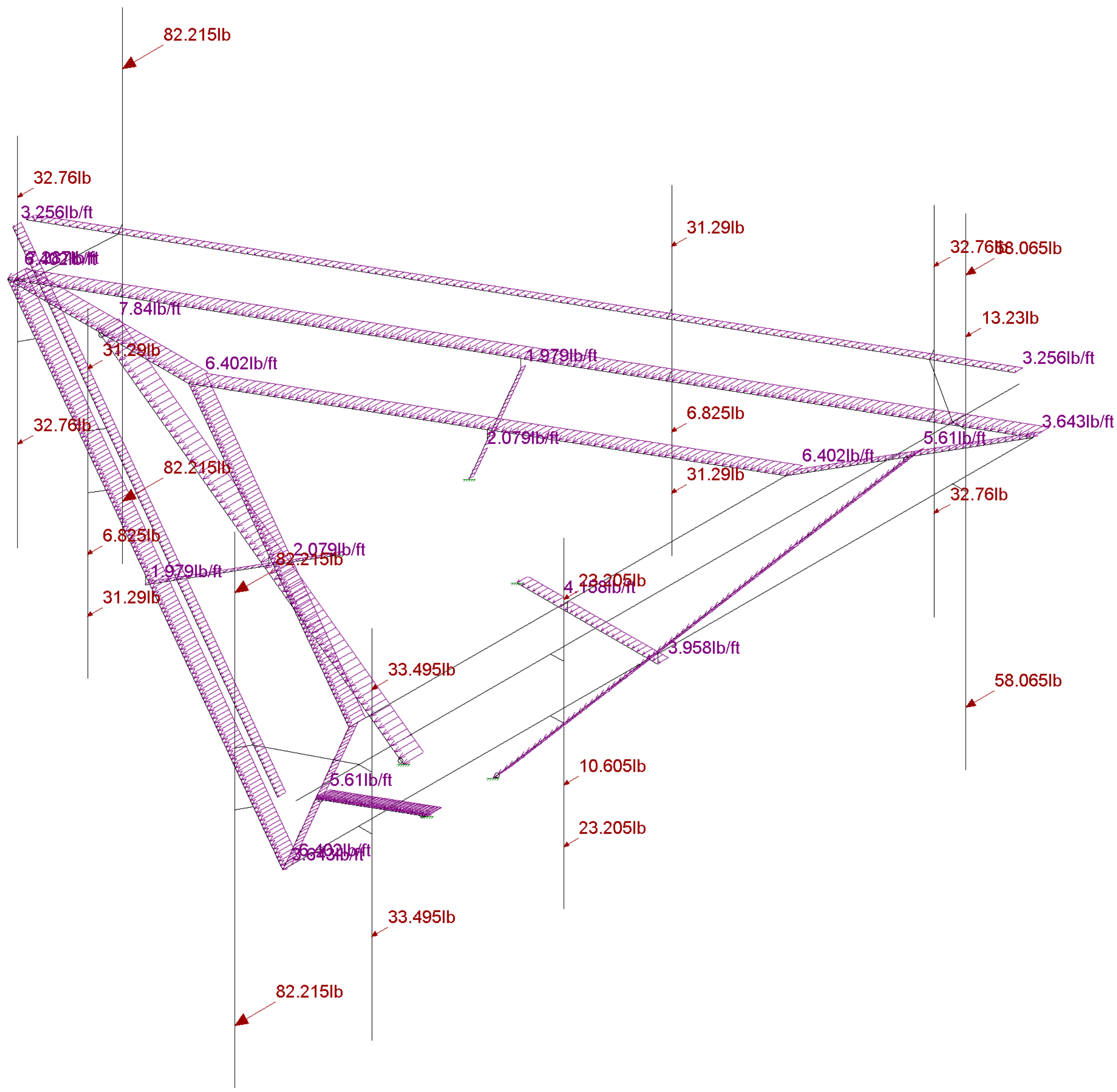
Loads: BLC 3, Wz
Envelope Only Solution

Maser Consulting P.A.		SK - 8
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:34 PM
18922050	Wind Load Z	ACAD-18922050.R3D



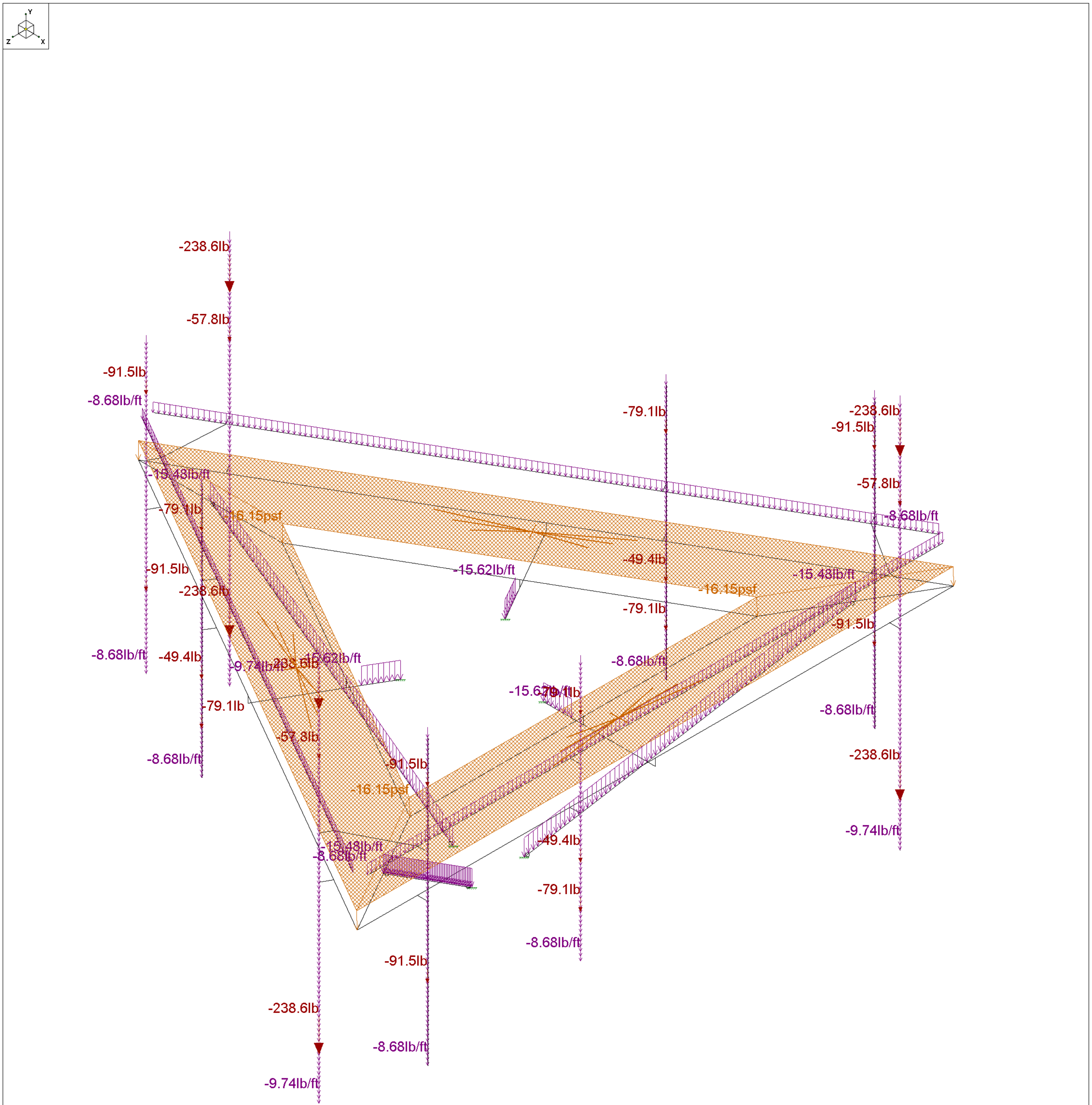
Loads: BLC 4, Ice Wx
Envelope Only Solution

Maser Consulting P.A.		SK - 9
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:34 PM
18922050	Ice Wind X	ACAD-18922050.R3D



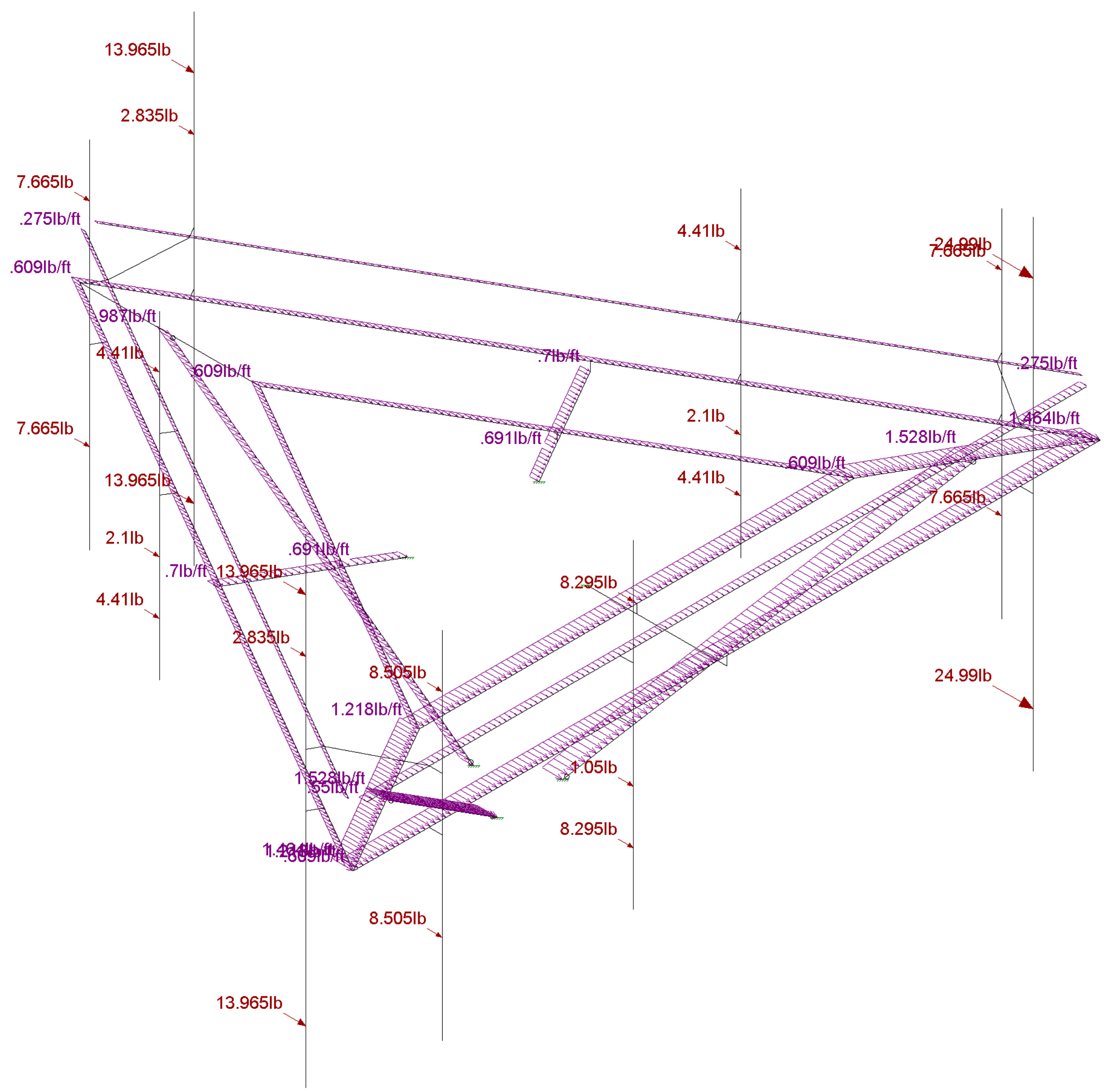
Loads: BLC 5, Ice Wz
Envelope Only Solution

Maser Consulting P.A.		SK - 10
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:34 PM
18922050	Ice Wind Z	ACAD-18922050.R3D



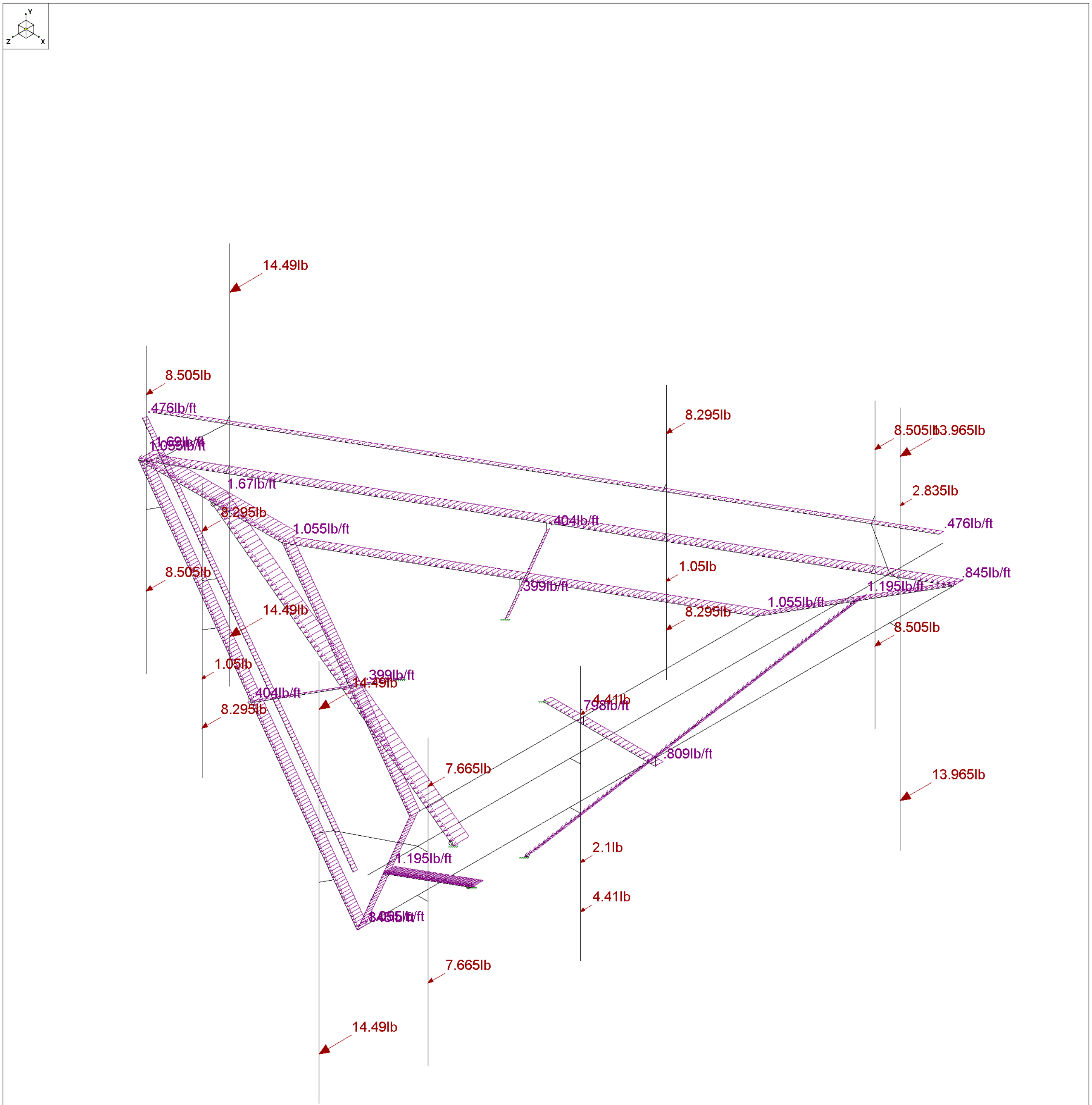
Loads: BLC 6, Ice weight
Envelope Only Solution

Maser Consulting P.A.		SK - 11
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:34 PM
18922050	Ice Weight	ACAD-18922050.R3D



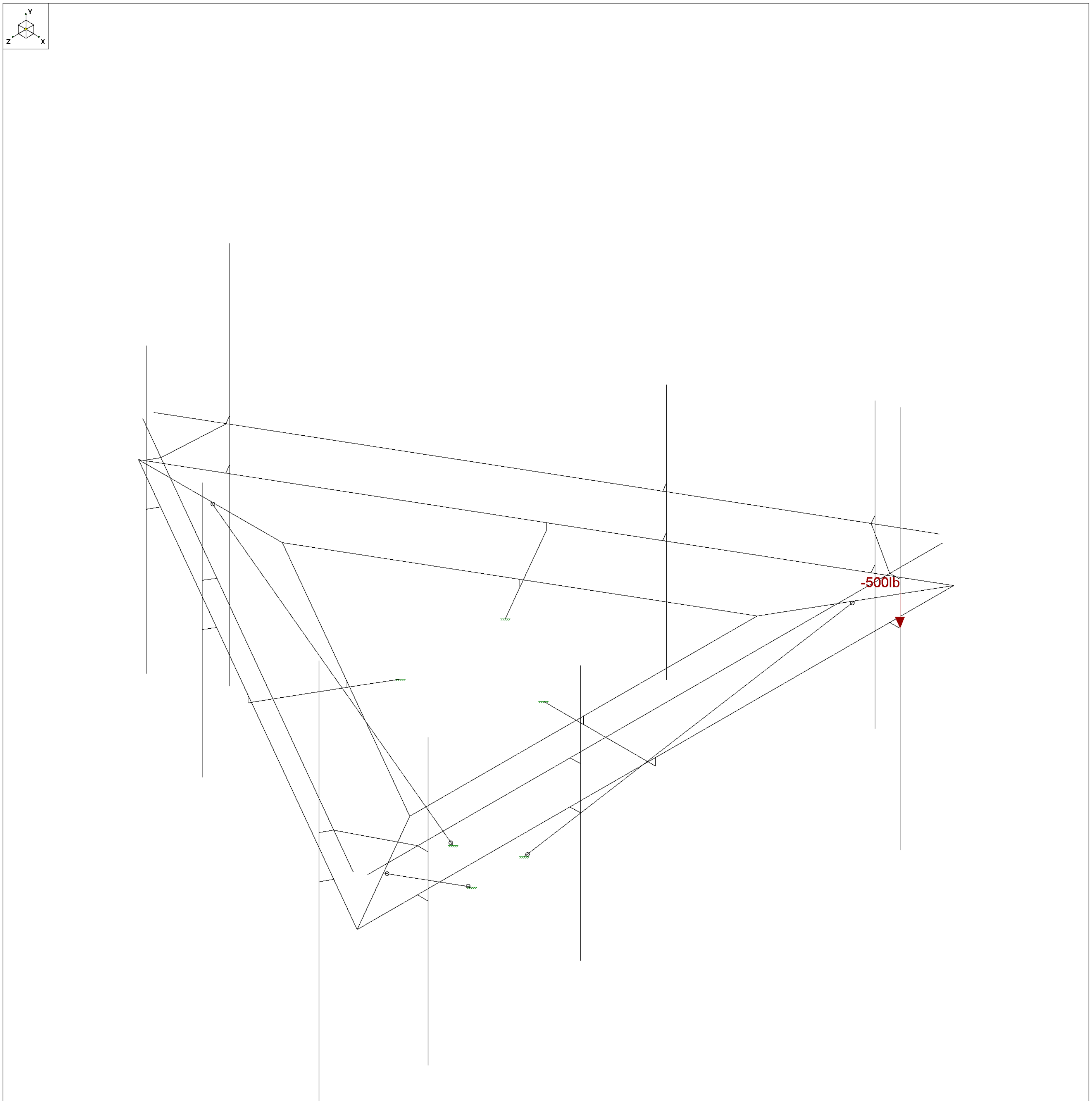
Loads: BLC 7, Service X
Envelope Only Solution

Maser Consulting P.A.		SK - 12
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:35 PM
18922050	Service Wind X	ACAD-18922050.R3D



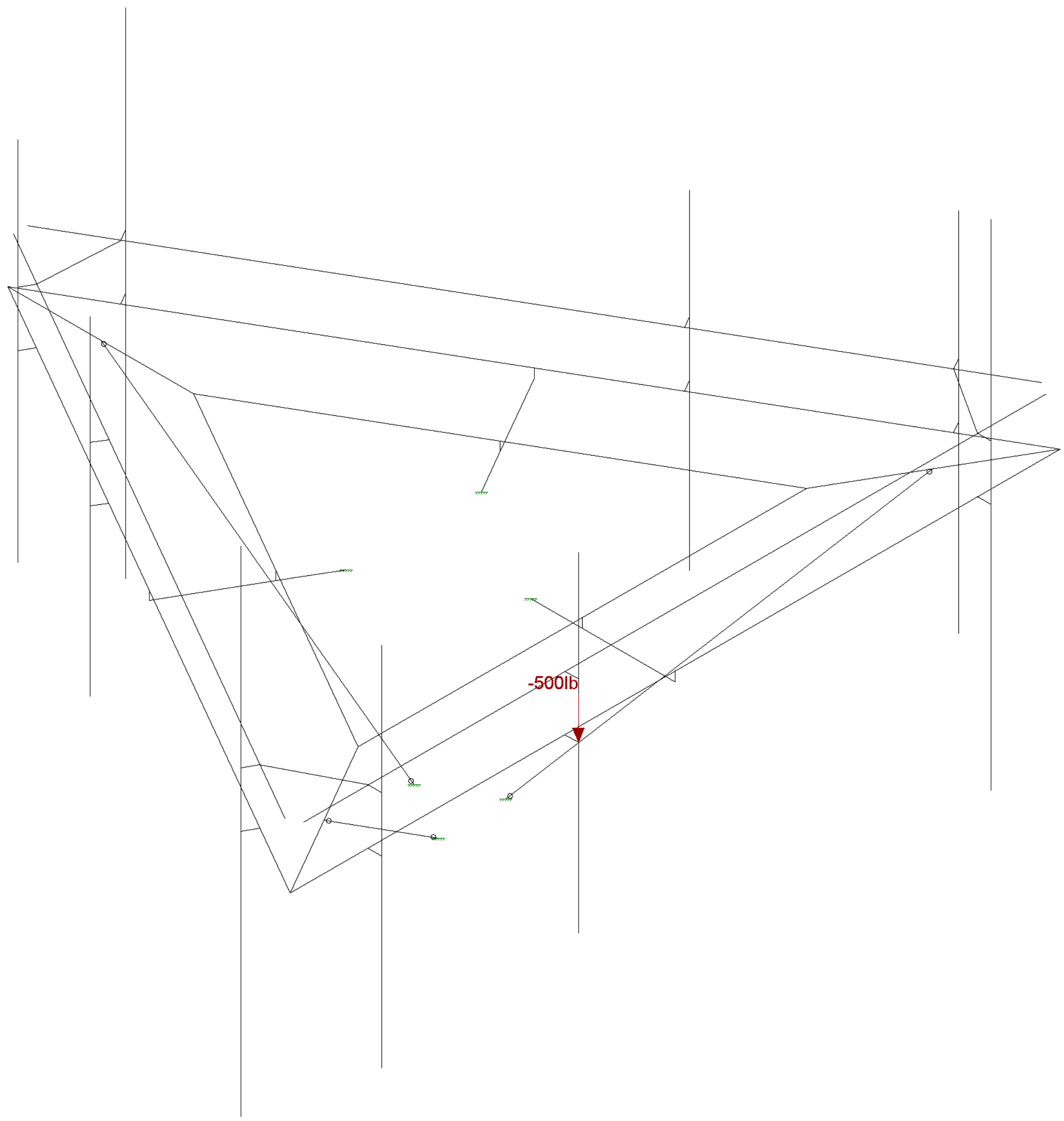
Loads: BLC 8, Service Z
Envelope Only Solution

Maser Consulting P.A.	Antenna Mount Analysis	SK - 13
CL		Oct 11, 2018 at 2:35 PM
18922050	Service Wind Z	ACAD-18922050.R3D



Loads: BLC 9, Service 1 Pipe
Envelope Only Solution

Maser Consulting P.A.		SK - 1
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:39 PM
18922050	Maintenance Load 1	ACAD-18922050.R3D



Loads: BLC 10, Service 2 Pipe
Envelope Only Solution

Maser Consulting P.A.		SK - 2
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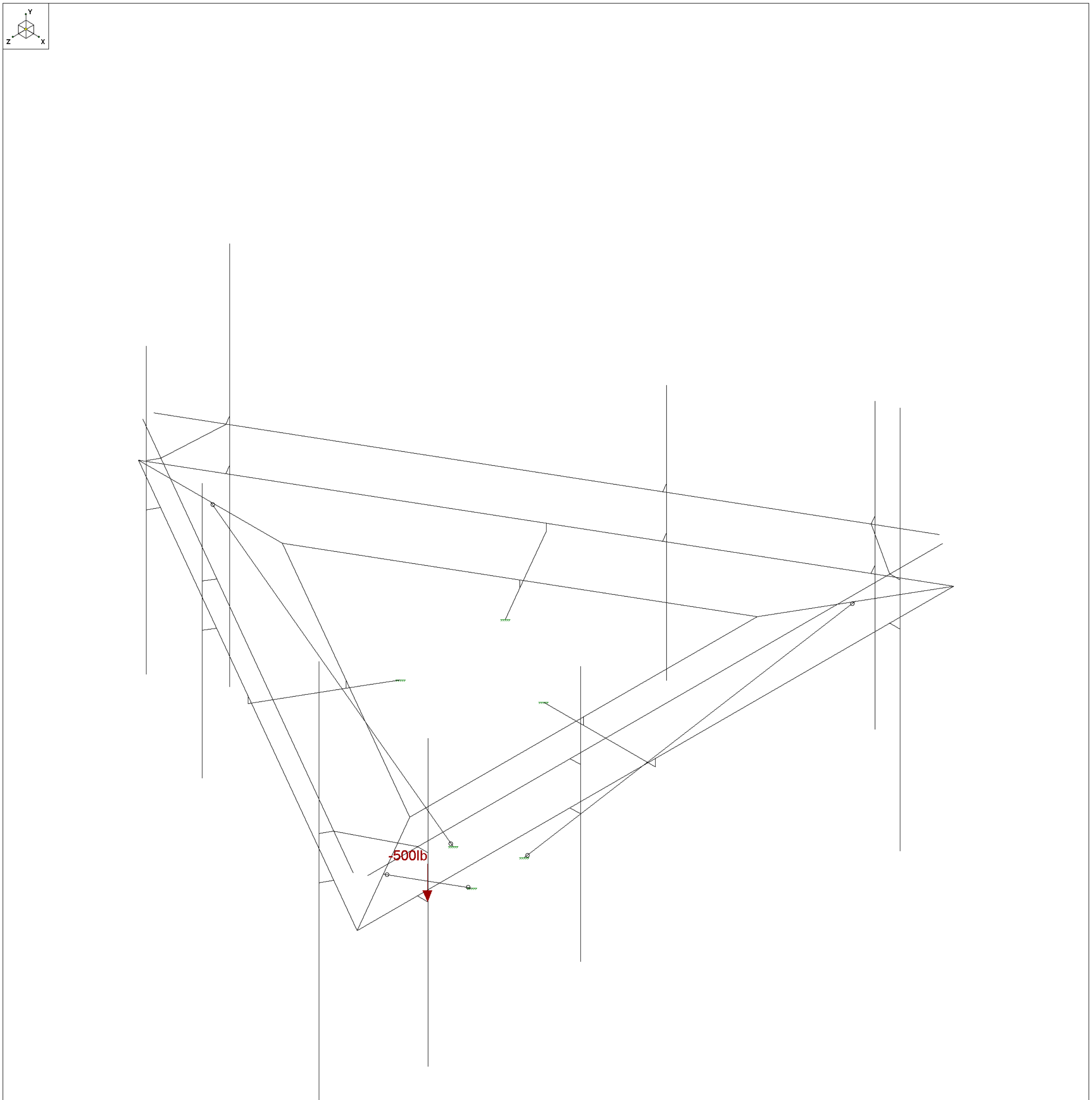
18922050	Maintenance Load 2	ACAD-18922050.R3D



Loads: BLC 11, Service 3 Pipe
Envelope Only Solution

Maser Consulting P.A.		SK - 3
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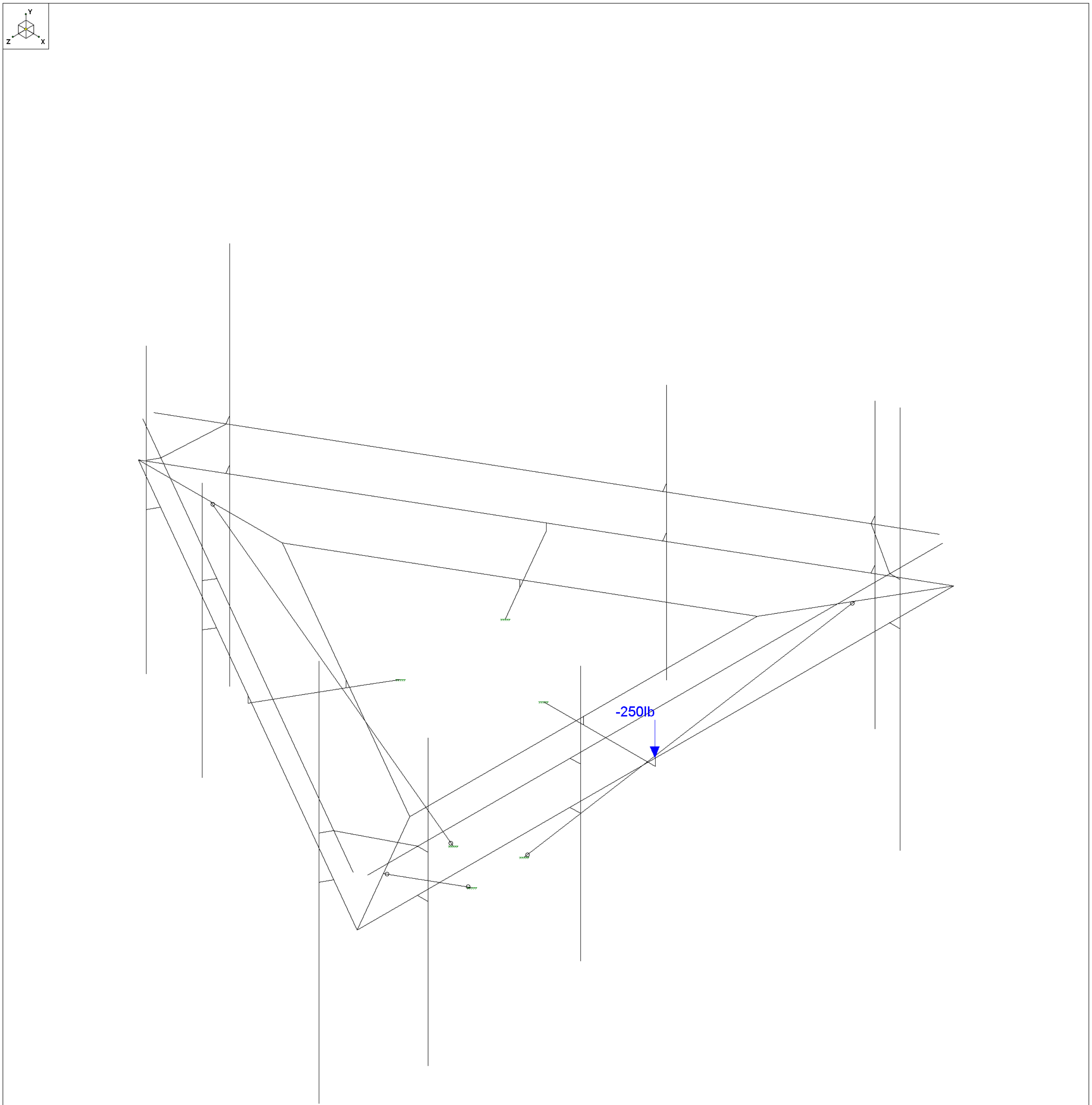
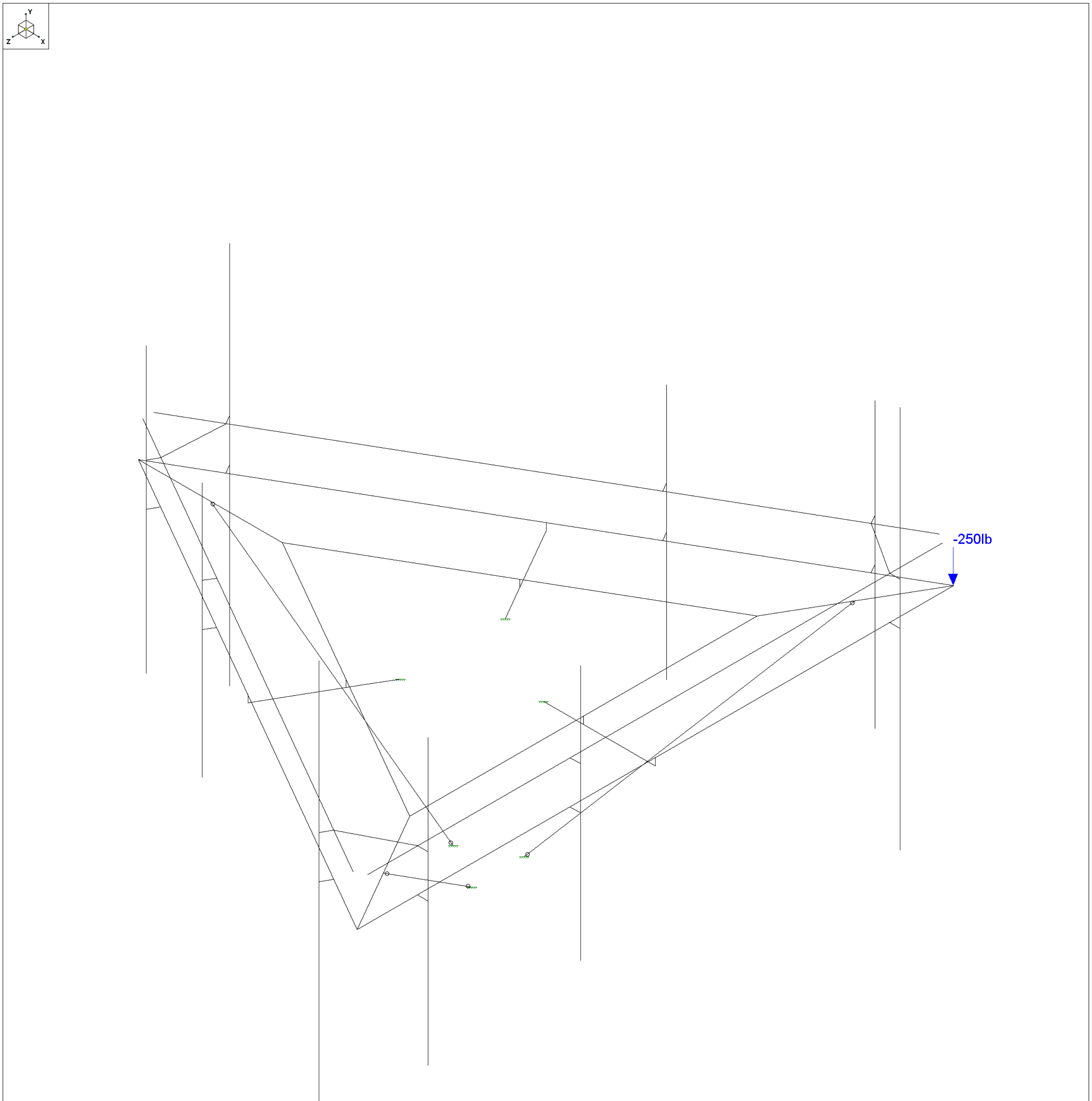
18922050	Maintenance Load 3	ACAD-18922050.R3D



Loads: BLC 13, Service 5 Middle
Envelope Only Solution

Maser Consulting P.A.		SK - 4
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:40 PM
18922050	Maintenance Load 4	ACAD-18922050.R3D



Loads: BLC 14, Service 6 End
Envelope Only Solution

Maser Consulting P.A.		SK - 5
CL	Antenna Mount Analysis	Oct 11, 2018 at 2:40 PM
18922050	Maintenance Load 5	ACAD-18922050.R3D

APPENDIX B

SOFTWARE INPUT CALCULATIONS

LOADING SUMMARY

Quantity	Manufacturer	Antenna/ Appurtenance	Status	Sector
3	*ERICSSON*	*Air 32 DB B2A B66Aa*	*Existing*	*Alpha, Beta, & Gamma*
3	**RFS**	**APX16DWV-16DWVS-E-A20**	**Proposed**	**Alpha, Beta, & Gamma**
3	**RFS**	**APXVAARR24_43-U-NA20**	**Proposed**	**Alpha, Beta, & Gamma**
3	*ERICSSON*	*KRY 112 134/1*	*Existing*	*Alpha, Beta, & Gamma*
3	*ERICSSON*	*KRY 112 89/5*	*Existing*	*Alpha, Beta, & Gamma*
3	**ERICSSON**	**RRU 4449 B71 + B12**	**Proposed**	**Alpha, Beta, & Gamma**

I. DESIGN INPUTS

Calculations for gravity and lateral loading on equipment and support mounts are determined as per the ANSI/TIA-222-H Code

Wind Load Inputs Parameters

				Reference	Equation
Antenna Centerline	z	138	ft		
Ultimate Wind Speed	V_u	125	mph		
Normal Wind Speed with Ice (3 sec. Gust):	V_i	50	mph	Figure B9, p. 238	
Maintenace Wind Speed:	V_s	30	mph	Section 2.8.3	
Design Ice Thickness	t_i	1.50	in	Figure B9, p. 238	
Surface Roughness:		B		Section 2.6.5.1.1	
Exposure Category:		B		Section 2.6.5.1.2	
Risk Category:		II		Table 2-1	
Rooftop Wind Speed-Up Factor	K_s	1.0		Section 2.6.7	
Ground Elevation:		615.0	ft		
Ground Elevation Factor:	K_e	0.97798		Table 2-6	
Gust Effect Factor:	G_h	1.00		Section 2.6.9	
Wind Directionality Factor:	K_d	0.95		Table 2-2	
Topographic Category:		1		Section 2.6.6.2	

Wind Load Coefficients

Importance Factors:					
Iced:	I_{ice}	1		Table 2-3	
Exposure Category Coefficients:					
3-s Gust-Speed Power Law Exponent:	α	7.0		Table 2-4	
Nominal Height of the Atmospheric Boundary Layer:	Z_g	1200	ft	Table 2-4	
Min. Value for k_z:	Kz_{min}	1.03		Table 2-4	
Terrain Constant:	K_e	1.10		Table 2-4	
Velocity Pressure Exposure Coefficient:	K_z	1.083		Section 2.6.5.2	$=2.01\cdot(z/z_g)^{2/\alpha'}$
Topographic Category Coefficients:					
Topographic Constant:	K_t	N/A		Table 2-5	
Height Attenuation Factor:	f	N/A		Table 2-5	
Height Reduction Factor:	K_h	N/A		Section 2.6.6.2.1	$=e^{(f\cdot z/H)}$
Topographic Factor:	K_{zt}	1.00		Section 2.6.6.2	$=[1+(K_c\cdot K_t/K_h)]^2$
Ice Accumulation:					
Ice Velocity Pressure Exposure Coefficient:	K_{iz}	1.15			$=(z/33)^{0.10}$
Factored Ice Thickness:	t_{iz}	1.73	in	Section 2.6.10	$=t_i\cdot I\cdot K_{iz}\cdot(K_{zt})^{0.35}$
Ice Density:	ρ_i	56.00	pcf		
Design Wind Pressures:					
Velocity Pressure:	q_z	40.27	psf	Section 2.6.11.6	$=0.00256\cdot K_z\cdot K_{zt\cdot Ks\cdot Ke}\cdot K_d\cdot V^2$
Velocity Pressure (With Ice):	q_{zi}	6.44	psf	Section 2.6.11.6	$=0.00256\cdot K_z\cdot K_{zt\cdot Ks\cdot Ke}\cdot K_d\cdot V_i^2$
Velocity Pressure (Maintenance):	q_{zm}	2.32	psf	Section 2.6.11.6	$=0.00256\cdot K_z\cdot K_{zt\cdot Ks\cdot Ke}\cdot K_d\cdot V_m^2$

II. CALCULATIONS

▪ ***Wind Load on Appurtenances***

Dimensions and Force Coefficients

Antenna/ Appurtenance	*Non-Iced Condition* Mounting Pipe Length (in)	Mounting Pipe Diameter (in)	Mounting Pipe Force Coefficient C_a	Equipment Height (in)	Equipment Width (in)	Equipment Depth (in)	Equipment Force Coefficient $C_{a\ Front}$	Equipment Force Coefficient $C_{a\ Side}$	*Iced Condition* Mounting Pipe Length (in)	Mounting Pipe Diameter (in)	Mounting Pipe Force Coefficient C_a	Equipment Height (in)	Equipment Width (in)	Equipment Depth (in)	Equipment Force Coefficient $C_{a\ Front}$	Equipment Force Coefficient $C_{a\ Side}$
Air 32 DB B2A B66Aa	80.0	2.375	1.200	56.60	12.90	8.70	1.28	1.38	83.5	5.8	0.962	60.06	16.36	12.16	1.25	1.31
APX16DWV-16DWVS-E-A20	72.0	2.375	1.200	55.90	13.00	3.20	1.28	1.75	75.5	5.8	0.932	59.36	16.46	6.66	1.25	1.46
APXVAARR24_43-U-NA20	108.0	2.875	1.200	95.90	24.00	8.70	1.27	1.53	111.5	6.3	1.035	99.36	27.46	12.16	1.25	1.44
KRY 112 134/1	0.0	0.000	0.000	13.11	7.91	3.82	1.20	1.24	0.0	0.0	0.000	16.57	11.37	7.28	1.20	1.20
KRY 112 89/5	0.0	0.000	0.000	4.00	6.00	11.00	1.20	1.20	0.0	0.0	0.000	7.46	9.46	14.46	1.20	1.20
RRU 4449 B71 + B12	0.0	0.000	0.000	14.90	13.20	9.30	1.20	1.20	0.0	0.0	0.000	18.36	16.66	12.76	1.20	1.20

Antenna/ Appurtenance	# of Brackets	Non-Iced Condition Wind Force (lbs.) F_N	Non-Iced Condition Wind Force (lbs.) F_T	Non-Iced Condition Gravity (lbs.)	Iced Condition Wind Force (lbs.) F_N	Iced Condition Wind Force (lbs.) F_T	Iced Condition Gravity (lbs.)	Maintenance Condition Wind Force (lbs.) F_N	Maintenance Condition Wind Force (lbs.) F_T	
Air 32 DB B2A B66Aa	2	140.4	126.7	**73.6**	31.2	31.9	**91.5**	8.1	7.3	
APX16DWV-16DWVS-E-A20	2	136.5	72.4	**23.5**	29.8	22.1	**79.1**	7.9	4.2	
APXVAARR24_43-U-NA20	2	413.4	231.0	**76.7**	78.3	55.3	**238.6**	23.8	13.3	
KRY 112 134/1	1	34.8	17.4	**10.1**	10.1	6.5	**30.7**	2.0	1.0	
KRY 112 89/5	1	8.1	14.8	**15.4**	3.8	5.8	**18.7**	0.5	0.9	
RRU 4449 B71 + B12	1	0.0	46.5	**78.0**	0.0	12.6	**57.8**	0.0	2.7	(Shielded by APXVAARR24_43-U-NA20)

**** ALL CALCULATED LOADS ARE PER MOUNTING BRACKET. TO GET THE TOTAL EQUIPMENT LOAD, MULTIPLY THE INDIVIDUAL LOADS BY THE NUMBER OF BRACKETS***

▪ ***Wind Load on Framing Members***

Member Category	Member Shape	Length (in)	Member Surface	Non-Iced Condition Exposed Wind Height (in)	Non-Iced Condition Force Coefficient C_a	Non-Iced Condition Wind Load (plf)	Iced Condition Exposed Wind Height (in)	Iced Condition Depth (in)	Iced Condition Length (in)	Iced Condition Force Coefficient C_a	Iced Condition Wind Load (plf)	Iced Condition Ice Weight (plf)	Maintenance Condition Wind Load (plf)
Pipe	Pipe 2.0	80	Round	2.38	1.20	9.56	5.84	5.84	83.46	1.20	3.76	8.68	0.55
Pipe	Pipe 2.5	108	Round	2.88	1.20	11.58	6.34	6.34	111.46	1.20	4.08	9.74	0.67
Square HSS	HSS 4x4x3/16	30	HSS	4.00	0.99	13.27	7.46	7.46	33.46	0.99	3.96	15.62	0.76
Square HSS	HSS 4.5x4.5x3/8	24	HSS	4.50	0.88	13.31	7.96	7.96	27.46	0.88	3.77	17.12	0.77
Equal Angle	L3x3	168	Square	3.00	2.00	20.13	6.46	6.46	171.46	2.00	6.94	12.63	1.16
Double Angle	2L3x3	40	Square	6.00	1.39	27.88	9.46	6.46	43.46	1.39	7.04	17.84	1.61
Grating												16.15	(psf)
Double Angle	2L2.5x2.5	84	Square	5.00	1.73	28.96	8.46	5.96	87.46	1.73	7.84	15.48	1.67
Pipe	Pipe 2.0	162	Round	2.38	1.20	9.56	5.84	5.84	165.46	1.20	3.76	8.68	0.55

BASIC EQUATIONS

ANSI/TIA-222-H Reference

Force Coefficient:
(Square)

$$C_{f\_square}(h,w) := \begin{cases} 1.2 & \text{if } \frac{h}{w} \le 2.5 \\ \left[1.2 + \frac{0.2}{4.5}\cdot\left(\frac{h}{w} - 2.5\right)\right] & \text{if } \frac{h}{w} > 2.5 \wedge \frac{h}{w} \le 7 \\ \left[1.4 + \frac{0.6}{18}\cdot\left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 2.0 & \text{otherwise} \end{cases}$$

Table 2-9

Force Coefficient:
(Round)

$$C_{f\_round}(h,w) := \begin{cases} 0.7 & \text{if } \frac{h}{w} \le 2.5 \\ \left[0.7 + \frac{0.1}{4.5}\cdot\left(\frac{h}{w} - 2.5\right)\right] & \text{if } \frac{h}{w} > 2.5 \wedge \frac{h}{w} \le 7 \\ \left[0.8 + \frac{0.4}{18}\cdot\left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 1.2 & \text{otherwise} \end{cases}$$

Table 2-9

Terrain Exposure Constants:

Table 2-5

$$\alpha := \begin{cases} 7.0 & \text{if } Exp = \text{"B"} \\ 9.5 & \text{if } Exp = \text{"C"} \\ 11.5 & \text{if } Exp = \text{"D"} \end{cases} \quad Z_g := \begin{cases} 1200ft & \text{if } Exp = \text{"B"} \\ 900ft & \text{if } Exp = \text{"C"} \\ 700ft & \text{if } Exp = \text{"D"} \end{cases} \quad K_{zmin} := \begin{cases} 0.70 & \text{if } Exp = \text{"B"} \\ 0.85 & \text{if } Exp = \text{"C"} \\ 1.03 & \text{if } Exp = \text{"D"} \end{cases}$$

BASIC EQUATIONS

ANSI/TIA-222-H Reference

Velocity Pressure Coefficient: Section 2.6.5.6

$$Kz(z) := \left| \begin{array}{l} K_z \leftarrow \max\left[2.01 \cdot \left(\dfrac{z}{Z_g} \right)^{\frac{2}{\alpha}}, K_{zmin} \right] \\ K_z \leftarrow \min(K_z, 2.01) \end{array} \right.$$

$$K_z := Kz(z)$$

Table 2-4

$$Kzt(z) := K_{zt} \leftarrow \left| \begin{array}{l} 1.0 \text{ if } Topo = \text{"1"} \\ \text{otherwise} \\ \quad \left| \begin{array}{l} K_e \leftarrow \left| \begin{array}{l} 0.90 \text{ if } Exp = \text{"B"} \\ 1.00 \text{ if } Exp = \text{"C"} \\ 1.10 \text{ if } Exp = \text{"D"} \end{array} \right. \\ K_t \leftarrow \left| \begin{array}{l} 0.43 \text{ if } Topo = \text{"2"} \\ 0.53 \text{ if } Topo = \text{"3"} \\ 0.72 \text{ if } Topo = \text{"4"} \end{array} \right. \\ f \leftarrow \left| \begin{array}{l} 1.25 \text{ if } Topo = \text{"2"} \\ 2.00 \text{ if } Topo = \text{"3"} \\ 1.50 \text{ if } Topo = \text{"4"} \end{array} \right. \\ K_h \leftarrow e^{\left(\frac{f \cdot z}{CH} \right)} \\ \left(1 + \dfrac{K_e \cdot K_t}{K_h} \right)^2 \end{array} \right. \end{array} \right.$$

$$K_{zt} := Kzt(z)$$

Velocity Pressure: Section 2.6.9.6

$$q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot V^2 \cdot psf$$

LOAD EQUATIONS

WIND LOAD

Area (Normal):	$AN_{area} = H_{ant} \cdot Want$
Area (Side):	$AT_{area} = H_{ant} \cdot Dant$
Force Coefficient (Normal):	$C_{fn} = C_{fsquare}(H_{ant}, Want)$
Force Coefficient (Side):	$C_{fs} = C_{fsquare}(H_{ant}, Dant)$
Pipe Area (Normal):	$AN_p = \max[(L_p - H_{ant}) * Dp\ , 0]$
Pipe Area (Side):	$AT_p = L_p \cdot Dp$
Force Coefficient (Normal):	$C_{fp} = C_{fround}(Lp, Dp)$
Normal Effective Projected Area:	$E_{pan} = (C_{fn} \cdot ANarea) + (Cfp \cdot ANp)$
Side Effective Projected Area:	$E_{pat} = (C_{fs} \cdot ATarea) + (Cfp \cdot ATp)$
Effective Projected Area:	$EPA = max(E_{pan}, Epat)$
Wind Force:	$F_{ant} = q_z \cdot Gh \cdot EPA$

APPENDIX C

SOFTWARE ANALYSIS OUTPUT

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2		270	Single Platform Angles	Beam	Single Angle	A36 Gr.36	Typical
2	M2	N1	N3			Single Platform Angles	Beam	Single Angle	A36 Gr.36	Typical
3	M3	N3	N2			Single Platform Angles	Beam	Single Angle	A36 Gr.36	Typical
4	M4	N1	N5		180	Double Platform Angl...	Beam	Double Angle ...	A36 Gr.36	Typical
5	M5	N2	N6		180	Double Platform Angl...	Beam	Double Angle ...	A36 Gr.36	Typical
6	M6	N3	N4		180	Double Platform Angl...	Beam	Double Angle ...	A36 Gr.36	Typical
7	M7	N4	N5			Single Platform Angles	Beam	Single Angle	A36 Gr.36	Typical
8	M8	N6	N4			Single Platform Angles	Beam	Single Angle	A36 Gr.36	Typical
9	M9	N5	N6			Single Platform Angles	Beam	Single Angle	A36 Gr.36	Typical
10	M10	N7	N8			RIGID	None	None	RIGID	Typical
11	M11	N9	N10			RIGID	None	None	RIGID	Typical
12	M12	N11	N12			RIGID	None	None	RIGID	Typical
13	M13	N13	N14			Antenna Pipes 2.5	Beam	Pipe	A53 Gr. B	Typical
14	M14	N15	N16			Antenna Pipes 2.0	Beam	Pipe	A53 Gr. B	Typical
15	M15	N17	N18			Antenna Pipes 2.0	Beam	Pipe	A53 Gr. B	Typical
16	M16	N19	N20			RIGID	None	None	RIGID	Typical
17	M17	N21	N22			RIGID	None	None	RIGID	Typical
18	M18	N23	N24			RIGID	None	None	RIGID	Typical
19	M19	N25	N26			Antenna Pipes 2.5	Beam	Pipe	A53 Gr. B	Typical
20	M20	N27	N28			Antenna Pipes 2.0	Beam	Pipe	A53 Gr. B	Typical
21	M21	N29	N30			Antenna Pipes 2.0	Beam	Pipe	A53 Gr. B	Typical
22	M22	N31	N32			RIGID	None	None	RIGID	Typical
23	M23	N33	N34			RIGID	None	None	RIGID	Typical
24	M24	N35	N36			RIGID	None	None	RIGID	Typical
25	M25	N37	N38			Antenna Pipes 2.5	Beam	Pipe	A53 Gr. B	Typical
26	M26	N39	N40			Antenna Pipes 2.0	Beam	Pipe	A53 Gr. B	Typical
27	M27	N41	N42			Antenna Pipes 2.0	Beam	Pipe	A53 Gr. B	Typical
28	M29	N43	N44			Standoff Arm	Beam	SquareTube	A500 Gr.46	Typical
29	M30	N45	N46			RIGID	None	None	RIGID	Typical
30	M31	N47	N48			RIGID	None	None	RIGID	Typical
31	M33	N49	N50			Standoff Arm	Beam	SquareTube	A500 Gr.46	Typical
32	M34	N51	N52			RIGID	None	None	RIGID	Typical
33	M35	N53	N54			RIGID	None	None	RIGID	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
34	M37	N55	N56			Standoff Arm	Beam	SquareTube	A500 Gr.46	Typical
35	M38	N57	N58			RIGID	None	None	RIGID	Typical
36	M39	N59	N60			RIGID	None	None	RIGID	Typical
37	M40	N48	N43			Standoff Reinforcem...	Beam	SquareTube	A500 Gr.46	Typical
38	M41	N54	N49			Standoff Reinforcem...	Beam	SquareTube	A500 Gr.46	Typical
39	M42	N60	N55			Standoff Reinforcem...	Beam	SquareTube	A500 Gr.46	Typical
40	M43	N93	N94		270	Handrail	Beam	Pipe	A53 Gr. B	Typical
41	M44	N95	N96			RIGID	None	None	RIGID	Typical
42	M45	N97	N98			RIGID	None	None	RIGID	Typical
43	M46	N99	N100			RIGID	None	None	RIGID	Typical
44	M47	N101	N102		270	Handrail	Beam	Pipe	A53 Gr. B	Typical
45	M48	N103	N104			RIGID	None	None	RIGID	Typical
46	M49	N105	N106			RIGID	None	None	RIGID	Typical
47	M50	N107	N108			RIGID	None	None	RIGID	Typical
48	M51	N109	N110		270	Handrail	Beam	Pipe	A53 Gr. B	Typical
49	M52	N111	N112			RIGID	None	None	RIGID	Typical
50	M53	N113	N114			RIGID	None	None	RIGID	Typical
51	M54	N115	N116			RIGID	None	None	RIGID	Typical
52	M55	N89	N92			Kickers - Mods	Beam	None	A36 Gr.36	Typical
53	M56	N90	N118			Kickers - Mods	Beam	None	A36 Gr.36	Typical
54	M57	N91	N120			Kickers - Mods	Beam	None	A36 Gr.36	Typical
55	M58	N115	N103			RIGID	None	None	RIGID	Typical
56	M59	N99	N111			RIGID	None	None	RIGID	Typical
57	M60	N95	N107			RIGID	None	None	RIGID	Typical

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	Y	-76.7
2	N77	L	Y	-76.7
3	N68	L	Y	-23.5
4	N71	L	Y	-23.5
5	N62	L	Y	-73.6
6	N65	L	Y	-73.6
7	N75	L	Y	-76.7
8	N76	L	Y	-76.7
9	N78	L	Y	-76.7
10	N79	L	Y	-76.7
11	N69	L	Y	-23.5
12	N70	L	Y	-23.5
13	N72	L	Y	-23.5
14	N73	L	Y	-23.5
15	N63	L	Y	-73.6
16	N64	L	Y	-73.6
17	N66	L	Y	-73.6
18	N67	L	Y	-73.6
19	N80	L	Y	-25.5
20	N81	L	Y	-25.5
21	N82	L	Y	-25.5
22	N83	L	Y	-78
23	N84	L	Y	-78

Joint Loads and Enforced Displacements (BLC 1 : Dead) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
24	N85	L	Y	-78

Joint Loads and Enforced Displacements (BLC 2 : Wx)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	X	413.49
2	N77	L	X	413.49
3	N68	L	X	136.5
4	N71	L	X	136.5
5	N62	L	X	140.385
6	N65	L	X	140.385
7	N75	L	X	231.105
8	N76	L	X	231.105
9	N78	L	X	231.105
10	N79	L	X	231.105
11	N69	L	X	72.45
12	N70	L	X	72.45
13	N72	L	X	72.45
14	N73	L	X	72.45
15	N63	L	X	126.735
16	N64	L	X	126.735
17	N66	L	X	126.735
18	N67	L	X	126.735
19	N80	L	X	17.43
20	N81	L	X	34.755
21	N82	L	X	34.755
22	N84	L	X	46.515
23	N85	L	X	46.515

Joint Loads and Enforced Displacements (BLC 3 : Wz)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	Z	231.105
2	N77	L	Z	231.105
3	N68	L	Z	72.45
4	N71	L	Z	72.45
5	N62	L	Z	126.735
6	N65	L	Z	126.735
7	N75	L	Z	413.49
8	N76	L	Z	413.49
9	N78	L	Z	413.49
10	N79	L	Z	413.49
11	N69	L	Z	136.5
12	N70	L	Z	136.5
13	N72	L	Z	136.5
14	N73	L	Z	136.5
15	N63	L	Z	140.385
16	N64	L	Z	140.385
17	N66	L	Z	140.385
18	N67	L	Z	140.385
19	N80	L	Z	34.755
20	N81	L	Z	17.43
21	N82	L	Z	17.43

Joint Loads and Enforced Displacements (BLC 3 : Wz) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
22	N83	L	Z	46.515

Joint Loads and Enforced Displacements (BLC 4 : Ice Wx)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	X	82.215
2	N77	L	X	82.215
3	N68	L	X	31.29
4	N71	L	X	31.29
5	N62	L	X	32.76
6	N65	L	X	32.76
7	N75	L	X	58.065
8	N76	L	X	58.065
9	N78	L	X	58.065
10	N79	L	X	58.065
11	N69	L	X	23.205
12	N70	L	X	23.205
13	N72	L	X	23.205
14	N73	L	X	23.205
15	N63	L	X	33.495
16	N64	L	X	33.495
17	N66	L	X	33.495
18	N67	L	X	33.495
19	N80	L	X	6.825
20	N81	L	X	10.605
21	N82	L	X	10.605
22	N84	L	X	13.23
23	N85	L	X	13.23

Joint Loads and Enforced Displacements (BLC 5 : Ice Wz)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	Z	58.065
2	N77	L	Z	58.065
3	N68	L	Z	23.205
4	N71	L	Z	23.205
5	N62	L	Z	33.495
6	N65	L	Z	33.495
7	N75	L	Z	82.215
8	N76	L	Z	82.215
9	N78	L	Z	82.215
10	N79	L	Z	82.215
11	N69	L	Z	31.29
12	N70	L	Z	31.29
13	N72	L	Z	31.29
14	N73	L	Z	31.29
15	N63	L	Z	32.76
16	N64	L	Z	32.76
17	N66	L	Z	32.76
18	N67	L	Z	32.76
19	N80	L	Z	10.605
20	N81	L	Z	6.825
21	N82	L	Z	6.825

Joint Loads and Enforced Displacements (BLC 5 : Ice Wz) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
22	N83	L	Z	13.23

Joint Loads and Enforced Displacements (BLC 6 : Ice weight)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	Y	-238.6
2	N77	L	Y	-238.6
3	N68	L	Y	-79.1
4	N71	L	Y	-79.1
5	N62	L	Y	-91.5
6	N65	L	Y	-91.5
7	N75	L	Y	-238.6
8	N76	L	Y	-238.6
9	N78	L	Y	-238.6
10	N79	L	Y	-238.6
11	N69	L	Y	-79.1
12	N70	L	Y	-79.1
13	N72	L	Y	-79.1
14	N73	L	Y	-79.1
15	N63	L	Y	-91.5
16	N64	L	Y	-91.5
17	N66	L	Y	-91.5
18	N67	L	Y	-91.5
19	N80	L	Y	-49.4
20	N81	L	Y	-49.4
21	N82	L	Y	-49.4
22	N83	L	Y	-57.8
23	N84	L	Y	-57.8
24	N85	L	Y	-57.8

Joint Loads and Enforced Displacements (BLC 7 : Service X)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	X	24.99
2	N77	L	X	24.99
3	N68	L	X	8.295
4	N71	L	X	8.295
5	N62	L	X	8.505
6	N65	L	X	8.505
7	N75	L	X	13.965
8	N76	L	X	13.965
9	N78	L	X	13.965
10	N79	L	X	13.965
11	N69	L	X	4.41
12	N70	L	X	4.41
13	N72	L	X	4.41
14	N73	L	X	4.41
15	N63	L	X	7.665
16	N64	L	X	7.665
17	N66	L	X	7.665
18	N67	L	X	7.665
19	N80	L	X	1.05
20	N81	L	X	2.1

Joint Loads and Enforced Displacements (BLC 7 : Service X) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
21	N82	L	X	2.1
22	N84	L	X	2.835
23	N85	L	X	2.835

Joint Loads and Enforced Displacements (BLC 8 : Service Z)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N74	L	Z	13.965
2	N77	L	Z	13.965
3	N68	L	Z	4.41
4	N71	L	Z	4.41
5	N62	L	Z	7.665
6	N65	L	Z	7.665
7	N75	L	Z	14.49
8	N76	L	Z	14.49
9	N78	L	Z	14.49
10	N79	L	Z	14.49
11	N69	L	Z	8.295
12	N70	L	Z	8.295
13	N72	L	Z	8.295
14	N73	L	Z	8.295
15	N63	L	Z	8.505
16	N64	L	Z	8.505
17	N66	L	Z	8.505
18	N67	L	Z	8.505
19	N80	L	Z	2.1
20	N81	L	Z	1.05
21	N82	L	Z	1.05
22	N83	L	Z	2.835

Joint Loads and Enforced Displacements (BLC 9 : Service 1 Pipe)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N8	L	Y	-500

Joint Loads and Enforced Displacements (BLC 10 : Service 2 Pipe)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N10	L	Y	-500

Joint Loads and Enforced Displacements (BLC 11 : Service 3 Pipe)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N12	L	Y	-500

Member Point Loads (BLC 13 : Service 5 Middle)

	Member Label	Direction	Magnitude[lb,k-ft]	Location[in,%]
1	M1	Y	-250	%50

Member Point Loads (BLC 14 : Service 6 End)

	Member Label	Direction	Magnitude[lb,k-ft]	Location[in,%]
1	M1	Y	-250	%100

Member Distributed Loads (BLC 2 : Wx)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in..	End Location[in,...
1	M1	PX	20.139	20.139	0	0
2	M2	PX	20.139	20.139	0	0
3	M3	PX	20.139	20.139	0	0
4	M7	PX	20.139	20.139	0	0
5	M8	PX	20.139	20.139	0	0
6	M9	PX	20.139	20.139	0	0
7	M4	PX	27.888	27.888	0	0
8	M5	PX	27.888	27.888	0	0
9	M6	PX	27.888	27.888	0	0
10	M29	PX	13.272	13.272	0	0
11	M33	PX	13.272	13.272	0	0
12	M37	PX	13.272	13.272	0	0
13	M40	PX	13.314	13.314	0	22
14	M41	PX	13.314	13.314	0	22
15	M42	PX	13.314	13.314	0	22
16	M55	PX	28.96	28.96	0	0
17	M56	PX	28.96	28.96	0	0
18	M57	PX	28.96	28.96	0	0
19	M43	PX	9.56	9.56	0	0
20	M51	PX	9.56	9.56	0	0
21	M47	PX	9.56	9.56	0	0

Member Distributed Loads (BLC 3 : Wz)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in..	End Location[in,...
1	M1	PZ	20.139	20.139	0	0
2	M2	PZ	20.139	20.139	0	0
3	M3	PZ	20.139	20.139	0	0
4	M7	PZ	20.139	20.139	0	0
5	M8	PZ	20.139	20.139	0	0
6	M9	PZ	20.139	20.139	0	0
7	M4	PZ	27.888	27.888	0	0
8	M5	PZ	27.888	27.888	0	0
9	M6	PZ	27.888	27.888	0	0
10	M29	PZ	13.272	13.272	0	0
11	M33	PZ	13.272	13.272	0	0
12	M37	PZ	13.272	13.272	0	0
13	M40	PZ	13.314	13.314	0	22
14	M41	PZ	13.314	13.314	0	22
15	M42	PZ	13.314	13.314	0	22
16	M43	PZ	20.139	20.139	0	0
17	M55	PZ	28.96	28.96	0	0
18	M57	PZ	28.96	28.96	0	0
19	M56	PZ	28.96	28.96	0	0
20	M51	PZ	9.56	9.56	0	0
21	M47	PZ	9.56	9.56	0	0

Member Distributed Loads (BLC 4 : Ice Wx)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in..	End Location[in,...
1	M1	PX	7.287	7.287	0	0
2	M2	PX	7.287	7.287	0	0

Member Distributed Loads (BLC 4 : Ice Wx) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
3	M3	PX	7.287	7.287	0	0
4	M7	PX	7.287	7.287	0	0
5	M8	PX	7.287	7.287	0	0
6	M9	PX	7.287	7.287	0	0
7	M4	PX	7.392	7.392	0	0
8	M5	PX	7.392	7.392	0	0
9	M6	PX	7.392	7.392	0	0
10	M29	PX	4.158	4.158	0	0
11	M33	PX	4.158	4.158	0	0
12	M37	PX	4.158	4.158	0	0
13	M40	PX	3.958	3.958	0	22
14	M41	PX	3.958	3.958	0	22
15	M42	PX	3.958	3.958	0	22
16	M55	PX	7.84	7.84	0	0
17	M57	PX	7.84	7.84	0	0
18	M56	PX	7.84	7.84	0	0
19	M51	PX	3.76	3.76	0	0
20	M43	PX	3.76	3.76	0	0
21	M47	PX	3.76	3.76	0	0

Member Distributed Loads (BLC 5 : Ice Wz)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
1	M1	PZ	7.392	7.392	0	0
2	M2	PZ	7.392	7.392	0	0
3	M3	PZ	7.392	7.392	0	0
4	M7	PZ	7.392	7.392	0	0
5	M8	PZ	7.392	7.392	0	0
6	M9	PZ	7.392	7.392	0	0
7	M4	PZ	7.287	7.287	0	0
8	M5	PZ	7.287	7.287	0	0
9	M6	PZ	7.287	7.287	0	0
10	M29	PZ	4.158	4.158	0	0
11	M33	PZ	4.158	4.158	0	0
12	M37	PZ	4.158	4.158	0	0
13	M40	PZ	3.958	3.958	0	22
14	M41	PZ	3.958	3.958	0	22
15	M42	PZ	3.958	3.958	0	22
16	M43	PZ	7.392	7.392	0	0
17	M55	PZ	7.84	7.84	0	0
18	M57	PZ	7.84	7.84	0	0
19	M56	PZ	7.84	7.84	0	0
20	M51	PZ	3.76	3.76	0	0
21	M47	PZ	3.76	3.76	0	0

Member Distributed Loads (BLC 6 : Ice weight)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
1	M29	Y	-15.62	-15.62	0	0
2	M33	Y	-15.62	-15.62	0	0
3	M37	Y	-15.62	-15.62	0	0
4	M14	Y	-8.68	-8.68	0	0
5	M15	Y	-8.68	-8.68	0	0

Member Distributed Loads (BLC 6 : Ice weight) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
6	M20	Y	-8.68	-8.68	0	0
7	M21	Y	-8.68	-8.68	0	0
8	M26	Y	-8.68	-8.68	0	0
9	M27	Y	-8.68	-8.68	0	0
10	M13	Y	-9.74	-9.74	0	0
11	M19	Y	-9.74	-9.74	0	0
12	M25	Y	-9.74	-9.74	0	0
13	M55	Y	-15.48	-15.48	0	0
14	M57	Y	-15.48	-15.48	0	0
15	M56	Y	-15.48	-15.48	0	0
16	M43	Y	-8.68	-8.68	0	0
17	M51	Y	-8.68	-8.68	0	0
18	M47	Y	-8.68	-8.68	0	0

Member Distributed Loads (BLC 7 : Service X)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
1	M1	PX	1.218	1.218	0	0
2	M2	PX	1.218	1.218	0	0
3	M3	PX	1.218	1.218	0	0
4	M7	PX	1.218	1.218	0	0
5	M8	PX	1.218	1.218	0	0
6	M9	PX	1.218	1.218	0	0
7	M4	PX	1.69	1.69	0	0
8	M5	PX	1.69	1.69	0	0
9	M6	PX	1.69	1.69	0	0
10	M29	PX	.798	.798	0	0
11	M33	PX	.798	.798	0	0
12	M37	PX	.798	.798	0	0
13	M40	PX	.809	.809	0	22
14	M41	PX	.809	.809	0	22
15	M42	PX	.809	.809	0	22
16	M55	PX	1.67	1.67	0	0
17	M57	PX	1.67	1.67	0	0
18	M56	PX	1.67	1.67	0	0
19	M51	PX	.55	.55	0	0
20	M43	PX	.55	.55	0	0
21	M47	PX	.55	.55	0	0

Member Distributed Loads (BLC 8 : Service Z)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
1	M1	PZ	1.218	1.218	0	0
2	M2	PZ	1.218	1.218	0	0
3	M3	PZ	1.218	1.218	0	0
4	M7	PZ	1.218	1.218	0	0
5	M8	PZ	1.218	1.218	0	0
6	M9	PZ	1.218	1.218	0	0
7	M4	PZ	1.69	1.69	0	0
8	M5	PZ	1.69	1.69	0	0
9	M6	PZ	1.69	1.69	0	0
10	M29	PZ	.798	.798	0	0
11	M33	PZ	.798	.798	0	0

Member Distributed Loads (BLC 8 : Service Z) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
12	M37	PZ	.798	.798	0	0
13	M40	PZ	.809	.809	0	22
14	M41	PZ	.809	.809	0	22
15	M42	PZ	.809	.809	0	22
16	M43	PZ	1.218	1.218	0	0
17	M55	PZ	1.67	1.67	0	0
18	M57	PZ	1.67	1.67	0	0
19	M56	PZ	1.67	1.67	0	0
20	M51	PZ	.55	.55	0	0
21	M47	PZ	.55	.55	0	0

Member Distributed Loads (BLC 15 : BLC 1 Transient Area Loads)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
1	M2	Y	-.716	-5.408	0	24
2	M2	Y	-5.408	-8.281	24	48
3	M2	Y	-8.281	-8.676	48	72
4	M2	Y	-8.676	-8.483	72	96
5	M2	Y	-8.483	-8.216	96	120
6	M2	Y	-8.216	-5.54	120	144
7	M2	Y	-5.54	-.598	144	168
8	M4	Y	-.745	-4.005	0	8.1
9	M4	Y	-4.005	-6.691	8.1	16.2
10	M4	Y	-6.691	-10.617	16.2	24.3
11	M4	Y	-10.617	-14.023	24.3	32.4
12	M4	Y	-14.023	-15.099	32.4	40.5
13	M6	Y	-.745	-4.005	0	8.1
14	M6	Y	-4.005	-6.691	8.1	16.2
15	M6	Y	-6.691	-10.617	16.2	24.3
16	M6	Y	-10.617	-14.023	24.3	32.4
17	M6	Y	-14.023	-15.099	32.4	40.5
18	M7	Y	-6.464	-8.21	0	19.57
19	M7	Y	-8.21	-8.519	19.57	39.141
20	M7	Y	-8.519	-8.148	39.141	58.711
21	M7	Y	-8.148	-8.577	58.711	78.282
22	M7	Y	-8.577	-9.049	78.282	97.852
23	M3	Y	-.716	-5.408	0	24
24	M3	Y	-5.408	-8.281	24	48
25	M3	Y	-8.281	-8.676	48	72
26	M3	Y	-8.676	-8.483	72	96
27	M3	Y	-8.483	-8.216	96	120
28	M3	Y	-8.216	-5.54	120	144
29	M3	Y	-5.54	-.598	144	168
30	M5	Y	-.745	-4.005	0	8.1
31	M5	Y	-4.005	-6.691	8.1	16.2
32	M5	Y	-6.691	-10.617	16.2	24.3
33	M5	Y	-10.617	-14.023	24.3	32.4
34	M5	Y	-14.023	-15.099	32.4	40.5
35	M8	Y	-6.464	-8.21	0	19.57
36	M8	Y	-8.21	-8.519	19.57	39.141
37	M8	Y	-8.519	-8.148	39.141	58.711
38	M8	Y	-8.148	-8.577	58.711	78.282

Member Distributed Loads (BLC 15 : BLC 1 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
39	M8	Y	-8.577	-9.049	78.282	97.852
40	M1	Y	-.598	-5.54	0	24
41	M1	Y	-5.54	-8.216	24	48
42	M1	Y	-8.216	-8.483	48	72
43	M1	Y	-8.483	-8.676	72	96
44	M1	Y	-8.676	-8.281	96	120
45	M1	Y	-8.281	-5.408	120	144
46	M1	Y	-5.408	-.716	144	168
47	M9	Y	-6.464	-8.21	0	19.57
48	M9	Y	-8.21	-8.519	19.57	39.141
49	M9	Y	-8.519	-8.148	39.141	58.711
50	M9	Y	-8.148	-8.577	58.711	78.282
51	M9	Y	-8.577	-9.049	78.282	97.852

Member Distributed Loads (BLC 16 : BLC 6 Transient Area Loads)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
1	M2	Y	-1.156	-8.735	0	24
2	M2	Y	-8.735	-13.373	24	48
3	M2	Y	-13.373	-14.011	48	72
4	M2	Y	-14.011	-13.7	72	96
5	M2	Y	-13.7	-13.269	96	120
6	M2	Y	-13.269	-8.947	120	144
7	M2	Y	-8.947	-.965	144	168
8	M4	Y	-1.203	-6.468	0	8.1
9	M4	Y	-6.468	-10.807	8.1	16.2
10	M4	Y	-10.807	-17.146	16.2	24.3
11	M4	Y	-17.146	-22.648	24.3	32.4
12	M4	Y	-22.648	-24.384	32.4	40.5
13	M6	Y	-1.203	-6.468	0	8.1
14	M6	Y	-6.468	-10.807	8.1	16.2
15	M6	Y	-10.807	-17.146	16.2	24.3
16	M6	Y	-17.146	-22.648	24.3	32.4
17	M6	Y	-22.648	-24.384	32.4	40.5
18	M7	Y	-10.439	-13.259	0	19.57
19	M7	Y	-13.259	-13.758	19.57	39.141
20	M7	Y	-13.758	-13.159	39.141	58.711
21	M7	Y	-13.159	-13.851	58.711	78.282
22	M7	Y	-13.851	-14.614	78.282	97.852
23	M3	Y	-1.156	-8.735	0	24
24	M3	Y	-8.735	-13.373	24	48
25	M3	Y	-13.373	-14.011	48	72
26	M3	Y	-14.011	-13.7	72	96
27	M3	Y	-13.7	-13.269	96	120
28	M3	Y	-13.269	-8.947	120	144
29	M3	Y	-8.947	-.965	144	168
30	M5	Y	-1.203	-6.468	0	8.1
31	M5	Y	-6.468	-10.807	8.1	16.2
32	M5	Y	-10.807	-17.146	16.2	24.3
33	M5	Y	-17.146	-22.648	24.3	32.4
34	M5	Y	-22.648	-24.384	32.4	40.5
35	M8	Y	-10.439	-13.259	0	19.57

Member Distributed Loads (BLC 16 : BLC 6 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in...	End Location[in,...
36	M8	Y	-13.259	-13.758	19.57	39.141
37	M8	Y	-13.758	-13.159	39.141	58.711
38	M8	Y	-13.159	-13.851	58.711	78.282
39	M8	Y	-13.851	-14.614	78.282	97.852
40	M1	Y	-.965	-8.947	0	24
41	M1	Y	-8.947	-13.269	24	48
42	M1	Y	-13.269	-13.7	48	72
43	M1	Y	-13.7	-14.011	72	96
44	M1	Y	-14.011	-13.373	96	120
45	M1	Y	-13.373	-8.735	120	144
46	M1	Y	-8.735	-1.156	144	168
47	M9	Y	-10.439	-13.259	0	19.57
48	M9	Y	-13.259	-13.758	19.57	39.141
49	M9	Y	-13.758	-13.159	39.141	58.711
50	M9	Y	-13.159	-13.851	58.711	78.282
51	M9	Y	-13.851	-14.614	78.282	97.852

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribut...	Area(M...	Surface...
1	Dead	DL		-1.05		24			3	
2	Wx	WL				23		21		
3	Wz	WL				22		21		
4	Ice Wx	WL				23		21		
5	Ice Wz	WL				22		21		
6	Ice weight	DL				24		18	3	
7	Service X	WL				23		21		
8	Service Z	WL				22		21		
9	Service 1 Pipe	OL1				1				
10	Service 2 Pipe	OL1				1				
11	Service 3 Pipe	OL1				1				
12	Service 4 Pipe	OL1								
13	Service 5 Middle	OL1					1			
14	Service 6 End	OL1					1			
15	BLC 1 Transient Area Loa...	None						51		
16	BLC 6 Transient Area Loa...	None						51		

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac...	BLC	Fac..	B...	Fac..	B...	Fac..	B...	Fac..	B...	Fac..	B...	Fac..	B...	Fac...
1	1.4D	Yes	Y		1	1.4														
2	1.2D+1.0W1	Yes	Y		1	1.2	2	1	3											
3	1.2D+1.0W2	Yes	Y		1	1.2	2	.866	3	.5										
4	1.2D+1.0W3	Yes	Y		1	1.2	2	.5	3	.866										
5	1.2D+1.0W4	Yes	Y		1	1.2	2		3	1										
6	1.2D+1.0W5	Yes	Y		1	1.2	2	-.5	3	.866										
7	1.2D+1.0W6	Yes	Y		1	1.2	2	-.866	3	.5										
8	1.2D+1.0W7	Yes	Y		1	1.2	2	-1	3											
9	1.2D+1.0W8	Yes	Y		1	1.2	2	-.866	3	-.5										
10	1.2D+1.0W9	Yes	Y		1	1.2	2	-.5	3	-.866										
11	1.2D+1.0W10	Yes	Y		1	1.2	2		3	-1										

Load Combinations (Continued)

	Description	Solve	PDelta	S...	BLC	Fac...	BLC	Fac...	B...	Fac...	B...	Fac...	B...	Fac...	B...	Fac...	B...	Fac...	B...	Fac...
12	1.2D+1.0W11	Yes	Y		1	1.2	2	.5	3	-.866										
13	1.2D+1.0W12	Yes	Y		1	1.2	2	.866	3	-.5										
14	1.2D+1.0 Ice	Yes	Y		1	1.2	6	1												
15	1.2D+1.0ICE+1.0W1ICE	Yes	Y		1	1.2	6	1	4	1	5									
16	1.2D+1.0ICE+1.0W2ICE	Yes	Y		1	1.2	6	1	4	.866	5	.5								
17	1.2D+1.0ICE+1.0W3ICE	Yes	Y		1	1.2	6	1	4	.5	5	.866								
18	1.2D+1.0ICE+1.0W4ICE	Yes	Y		1	1.2	6	1	4		5	1								
19	1.2D+1.0ICE+1.0W5ICE	Yes	Y		1	1.2	6	1	4	-.5	5	.866								
20	1.2D+1.0ICE+1.0W6ICE	Yes	Y		1	1.2	6	1	4	-.866	5	.5								
21	1.2D+1.0ICE+1.0W7ICE	Yes	Y		1	1.2	6	1	4	-1	5									
22	1.2D+1.0ICE+1.0W8ICE	Yes	Y		1	1.2	6	1	4	-.866	5	-.5								
23	1.2D+1.0ICE+1.0W9ICE	Yes	Y		1	1.2	6	1	4	-.5	5	-.866								
24	1.2D+1.0ICE+1.0W10ICE	Yes	Y		1	1.2	6	1	4		5	-1								
25	1.2D+1.0ICE+1.0W11ICE	Yes	Y		1	1.2	6	1	4	.5	5	-.866								
26	1.2D+1.0ICE+1.0W12ICE	Yes	Y		1	1.2	6	1	4	.866	5	-.5								
27	1.2D+1.5LM1+1.0W1SER	Yes	Y		1	1.2	9	1.5	7	1	8									
28	1.2D+1.5LM1+1.0W2SER	Yes	Y		1	1.2	9	1.5	7	.866	8	.5								
29	1.2D+1.5LM1+1.0W3SER	Yes	Y		1	1.2	9	1.5	7	.5	8	.866								
30	1.2D+1.5LM1+1.0W4SER	Yes	Y		1	1.2	9	1.5	7		8	1								
31	1.2D+1.5LM1+1.0W5SER	Yes	Y		1	1.2	9	1.5	7	-.5	8	.866								
32	1.2D+1.5LM1+1.0W6SER	Yes	Y		1	1.2	9	1.5	7	-.866	8	.5								
33	1.2D+1.5LM1+1.0W7SER	Yes	Y		1	1.2	9	1.5	7	-1	8									
34	1.2D+1.5LM1+1.0W8SER	Yes	Y		1	1.2	9	1.5	7	-.866	8	-.5								
35	1.2D+1.5LM1+1.0W9SER	Yes	Y		1	1.2	9	1.5	7	-.5	8	-.866								
36	1.2D+1.5LM1+1.0W10S...	Yes	Y		1	1.2	9	1.5	7		8	-1								
37	1.2D+1.5LM1+1.0W11S...	Yes	Y		1	1.2	9	1.5	7	.5	8	-.866								
38	1.2D+1.5LM1+1.0W12S...	Yes	Y		1	1.2	9	1.5	7	.866	8	-.5								
39																				
40	1.2D+1.5LM2+1.0W1SER	Yes	Y		1	1.2	10	1.5	7	1	8									
41	1.2D+1.5LM2+1.0W2SER	Yes	Y		1	1.2	10	1.5	7	.866	8	.5								
42	1.2D+1.5LM2+1.0W3SER	Yes	Y		1	1.2	10	1.5	7	.5	8	.866								
43	1.2D+1.5LM2+1.0W4SER	Yes	Y		1	1.2	10	1.5	7		8	1								
44	1.2D+1.5LM2+1.0W5SER	Yes	Y		1	1.2	10	1.5	7	-.5	8	.866								
45	1.2D+1.5LM2+1.0W6SER	Yes	Y		1	1.2	10	1.5	7	-.866	8	.5								
46	1.2D+1.5LM2+1.0W7SER	Yes	Y		1	1.2	10	1.5	7	-1	8									
47	1.2D+1.5LM2+1.0W8SER	Yes	Y		1	1.2	10	1.5	7	-.866	8	-.5								
48	1.2D+1.5LM2+1.0W9SER	Yes	Y		1	1.2	10	1.5	7	-.5	8	-.866								
49	1.2D+1.5LM2+1.0W10S...	Yes	Y		1	1.2	10	1.5	7		8	-1								
50	1.2D+1.5LM2+1.0W11S...	Yes	Y		1	1.2	10	1.5	7	.5	8	-.866								
51	1.2D+1.5LM2+1.0W12S...	Yes	Y		1	1.2	10	1.5	7	.866	8	-.5								
52																				
53	1.2D+1.5LV1	Yes	Y		1	1.2	13	1.5												
54	1.2D+1.5LV2	Yes	Y		1	1.2	14	1.5												
55			Y																	
56	1.2D+1.5LM3+1.0W1SER	Yes	Y		1	1.2	11	1.5	7	1	8									
57	1.2D+1.5LM3+1.0W2SER	Yes	Y		1	1.2	11	1.5	7	.866	8	.5								
58	1.2D+1.5LM3+1.0W3SER	Yes	Y		1	1.2	11	1.5	7	.5	8	.866								
59	1.2D+1.5LM3+1.0W4SER	Yes	Y		1	1.2	11	1.5	7		8	1								
60	1.2D+1.5LM3+1.0W5SER	Yes	Y		1	1.2	11	1.5	7	-.5	8	.866								
61	1.2D+1.5LM3+1.0W6SER	Yes	Y		1	1.2	11	1.5	7	-.866	8	.5								
62	1.2D+1.5LM3+1.0W7SER	Yes	Y		1	1.2	11	1.5	7	-1	8									
63	1.2D+1.5LM3+1.0W8SER	Yes	Y		1	1.2	11	1.5	7	-.866	8	-.5								

Load Combinations (Continued)

	Description	Solve	PDelta	S...	BLC	Fac...	BLC	Fac...	B...	Fac...	B...	Fac...	B...	Fac...	B...	Fac...	B...	Fac...	B...	Fac...
64	1.2D+1.5LM3+1.0W9SER	Yes	Y		1	1.2	11	1.5	7	-.5	8	-.866								
65	1.2D+1.5LM3+1.0W10S...	Yes	Y		1	1.2	11	1.5	7		8	-1								
66	1.2D+1.5LM3+1.0W11S...	Yes	Y		1	1.2	11	1.5	7	.5	8	-.866								
67	1.2D+1.5LM3+1.0W12S...	Yes	Y		1	1.2	11	1.5	7	.866	8	-.5								
68			Y																	
69	1.2D+1.5LM4+1.0W1SER	Yes	Y		1	1.2	12	1.5	7	1	8									
70	1.2D+1.5LM4+1.0W2SER	Yes	Y		1	1.2	12	1.5	7	.866	8	.5								
71	1.2D+1.5LM4+1.0W3SER	Yes	Y		1	1.2	12	1.5	7	.5	8	.866								
72	1.2D+1.5LM4+1.0W4SER	Yes	Y		1	1.2	12	1.5	7		8	1								
73	1.2D+1.5LM4+1.0W5SER	Yes	Y		1	1.2	12	1.5	7	-.5	8	.866								
74	1.2D+1.5LM4+1.0W6SER	Yes	Y		1	1.2	12	1.5	7	-.866	8	.5								
75	1.2D+1.5LM4+1.0W7SER	Yes	Y		1	1.2	12	1.5	7	-1	8									
76	1.2D+1.5LM4+1.0W8SER	Yes	Y		1	1.2	12	1.5	7	-.866	8	-.5								
77	1.2D+1.5LM4+1.0W9SER	Yes	Y		1	1.2	12	1.5	7	-.5	8	-.866								
78	1.2D+1.5LM4+1.0W10S...	Yes	Y		1	1.2	12	1.5	7		8	-1								
79	1.2D+1.5LM4+1.0W11S...	Yes	Y		1	1.2	12	1.5	7	.5	8	-.866								
80	1.2D+1.5LM4+1.0W12S...	Yes	Y		1	1.2	12	1.5	7	.866	8	-.5								

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	...	MY [k-ft]	...	MZ [k-ft]	...
1	N44	max	710.577	8	790.46	48	2483.557	11	.347	11	1.155	5	2.064	50
2		min	-549.927	2	254.717	4	-2490.205	5	-.466	43	-1.162	...	.613	6
3	N50	max	2719.442	7	646.539	19	1737.374	12	1.566	25	2.269	...	.152	13
4		min	-2805.147	13	234.43	12	-1874.345	6	.548	6	-2.276	7	-.864	20
5	N56	max	2481.551	9	644.57	16	1808.647	10	-.274	9	2.028	...	-.124	3
6		min	-2555.38	3	244.824	9	-1665.048	4	-1.503	16	-2.033	4	-1.037	22
7	N92	max	1519.719	20	2289.612	18	2594.618	17	.05	13	.137	7	.087	13
8		min	494.004	13	837.803	11	1017.91	9	-.05	7	-.138	...	-.087	7
9	N118	max	1510.017	23	2295.192	26	-944.777	8	.056	8	.152	2	.096	2
10		min	538.613	3	814.556	7	-2611.522	15	-.056	2	-.153	8	-.097	8
11	N120	max	-1104.651	57	2296.98	22	133.878	11	.149	11	.204	...	0	1
12		min	-3010.51	22	809.734	3	-134.697	5	-.15	5	-.205	5	0	1
13	Totals:	max	5147.262	8	8671.252	24	5485.627	11						
14		min	-5147.264	2	3685.781	5	-5485.628	5						

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Mem...	Shape	Code Check	Loc...	LC	Shear ...	Loc...	Dir	LC	phi...	phi...	phi*Mn y-y [k-ft]	phi*Mn...	...Eqn
1	M1	L3x3...	.779	168	13	.107	168	y	8	39...	46...	1.688	2.748	...H...
2	M2	L3x3...	.762	0	5	.092	0	z	12	39...	46...	1.688	3.024	...H...
3	M3	L3x3...	.716	0	10	.100	0	z	5	39...	46...	1.688	2.808	...H...
4	M4	LL3x...	.579	0	19	.071	20.25	y	20	80...	93...	6.48	3.069	...H...
5	M5	LL3x...	.582	0	15	.071	20.25	y	16	80...	93...	6.48	3.069	...H...
6	M6	LL3x...	.583	0	24	.071	20.25	y	24	80...	93...	6.48	3.069	...H...
7	M7	L3x3...	.193	49....	10	.014	0	y	24	11...	46...	1.688	3.359	...H...
8	M8	L3x3...	.226	47....	6	.015	97....	y	18	11...	46...	1.688	3.366	...H...
9	M9	L3x3...	.181	0	18	.014	97....	y	21	11...	46...	1.688	3.487	...H...
10	M13	PIP...	.418	54	8	.111	54		13	26...	50...	3.596	3.596	...H...
11	M14	PIP...	.181	36	13	.096	36		13	20...	32...	1.872	1.872	...H...
12	M15	PIP...	.209	40	3	.070	40		16	18...	32...	1.872	1.872	...H...

Envelope AISC 14th(360-10): LRFD Steel Code Checks (Continued)

	Mem..	Shape	Code Check	Loc...	LC	Shear ..	Loc...	Dir	LC	phi...	phi...	phi*Mn y-y [k-ft]	phi*Mn....	.	Eqn
13	M19	PIP...	.419	54	11	.079	54		9	26...	50...	3.596	3.596	..	H...
14	M20	PIP...	.185	36	6	.083	36		10	20...	32...	1.872	1.872	..	H...
15	M21	PIP...	.192	40	11	.070	40		25	18...	32...	1.872	1.872	..	H...
16	M25	PIP...	.411	54	11	.121	54		5	26...	50...	3.596	3.596	..	H...
17	M26	PIP...	.186	36	4	.095	36		5	20...	32...	1.872	1.872	..	H...
18	M27	PIP...	.203	40	6	.070	40		20	18...	32...	1.872	1.872	..	H...
19	M29	HSS...	.175	8	43	.124	8	z	5	10...	10...	12.662	12.662	..	H...
20	M33	HSS...	.251	8	7	.157	8	z	13	10...	10...	12.662	12.662	..	H...
21	M37	HSS...	.234	8	4	.143	8	z	9	10...	10...	12.662	12.662	..	H...
22	M40	HSS...	.059	20....	11	.059	22....	z	5	22...	22...	28.842	28.842	..	H...
23	M41	HSS...	.048	23.5	18	.075	22....	z	13	22...	22...	28.842	28.842	..	H...
24	M42	HSS...	.049	20....	3	.068	22....	z	9	22...	22...	28.842	28.842	..	H...
25	M43	PIP...	.127	15....	42	.034	15....		40	53...	32...	1.872	1.872	..	H...
26	M47	PIP...	.118	15....	12	.026	15....		23	53...	32...	1.872	1.872	..	H...
27	M51	PIP...	.112	15....	8	.025	57....		24	53...	32...	1.872	1.872	..	H...
28	M55	LL2....	.114	40....	16	.006	84....	z	13	31...	58...	4.246	2.614	..	H...
29	M56	LL2....	.114	42....	25	.007	84....	z	9	31...	58...	4.246	2.614	..	H...
30	M57	LL2....	.112	40....	20	.009	84....	z	5	31...	58...	4.246	2.614	..	H...

APPENDIX D

ADDITIONAL CALCUATIONS

Rectangular Weld Check (Existing 5/16" weld all around):

X-Direction Tension (lbs): $T_x := 711 \cdot lbf$ (From RISA 3-D, resulting in worst case reaction combination)

Y-Direction Shear (lbs): $V_y := 790 \cdot lbf$ (From RISA 3-D, resulting in worst case reaction combination)

Z-Direction Shear (lbs): $V_z := 2490 \cdot lbf$ (From RISA 3-D, resulting in worst case reaction combination)

X-Moment (lbs): $M_x := 0.5 \cdot kip \cdot ft$ (From RISA 3-D, resulting in worst case reaction combination)

Y-Moment (lbs): $M_y := 1.16 \cdot kip \cdot ft$ (From RISA 3-D, resulting in worst case reaction combination)

Z-Moment (lbs): $M_z := 2.06 \cdot kip \cdot ft$ (From RISA 3-D, resulting in worst case reaction combination)

Length of Weld, d (in): $d := 4in$ (Length of Weld)

Width of Weld, b (in): $b := 4in$ (Width of Weld)

Section Modulus Bending: $Sx\_z := b \cdot d + \frac{d^2}{3} = 21.333 \cdot in^2$ $\quad Sx\_y := b \cdot d + \frac{b^2}{3} = 21.333 \cdot in^2$

Polar Moment of Inertia: $Jw := \frac{(b + d)^3}{6} = 85.333 \cdot in^3$

Shear Component on Weld:

Shear from Concentrated Load: $f_{vx} := \frac{V_y}{2d} = 98.8 \cdot \frac{lbf}{in}$ $\quad f_{vz} := \frac{V_z}{2b} = 311.3 \cdot \frac{lbf}{in}$

Shear from Moment Load: $f_{vh\_my} := \frac{M_x \cdot \left(\frac{d}{2}\right)}{Jw} = 140.625 \cdot \frac{lbf}{in}$ $\quad f_{vv\_my} := \frac{M_x \cdot \left(\frac{b}{2}\right)}{Jw} = 140.625 \cdot \frac{lbf}{in}$

Horizontal Shear: $f_{vh} := f_{vh\_my} + f_{vz} = 451.875 \cdot \frac{lbf}{in}$

Vertical Shear: $f_{vv} := f_{vv\_my} + f_{vx} = 239.375 \cdot \frac{lbf}{in}$

Resultant Shear: $F_v := \sqrt{f_{vh}^2 + f_{vv}^2} = 511.362 \cdot \frac{lbf}{in}$

Tensile Component on Weld:

Tension from Concentrated Load: $f_{ty} := \frac{T_x}{2d + 2 \cdot b} = 44.4 \cdot \frac{lbf}{in}$

Tension from Moment Load: $f_{t\_mx} := \frac{M_y}{Sx\_y} = 652.5 \cdot \frac{lbf}{in}$ $\quad f_{t\_mz} := \frac{M_z}{Sx\_y} = 1158.75 \cdot \frac{lbf}{in}$

Resultant Tension: $F_t := f_{ty} + f_{t\_mx} + f_{t\_mz} = 1.856 \cdot \frac{kip}{in}$

Total Force on Weld:
(force per linear inch): $f_r := \sqrt{F_v^{\,2} + F_t^{\,2}} = 1924.9 \cdot \frac{lbf}{in}$

Weld sized (1/16 inch): $D := 5$ (Used)

Weld Capacity using 1/4"
weld (kip/in): $Weld_{Cap} := 1.392 \cdot D \cdot \frac{kip}{in} = 6.96 \cdot \frac{kip}{in}$

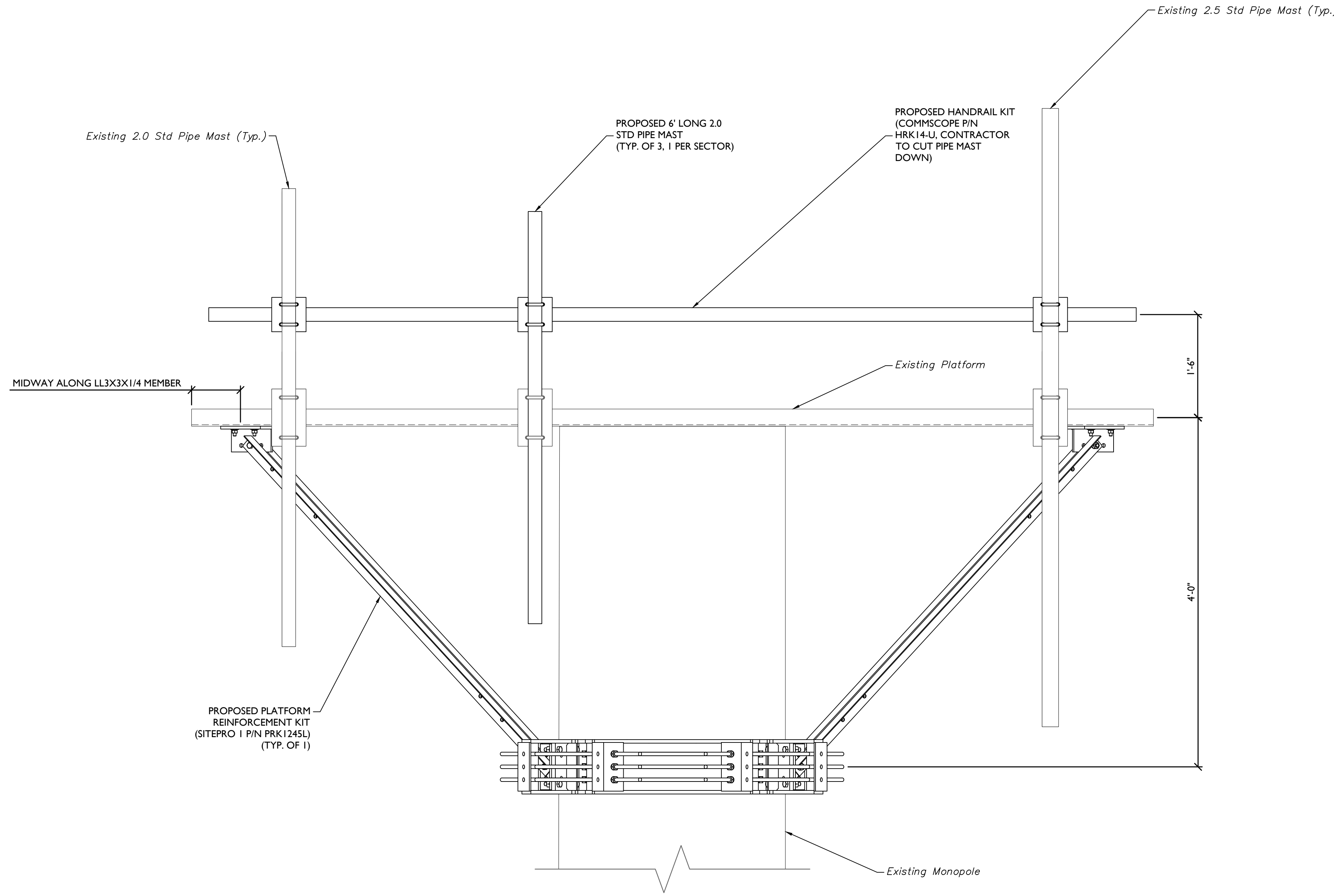
$$Check := \begin{cases} \text{"OK, connection can be used"} & \text{if } f_r \le Weld_{Cap} \\ \text{"No Good"} & \text{otherwise} \end{cases}$$

Check = "OK, connection can be used"

$$Interaction := \frac{f_r}{Weld_{Cap}} = 27.7 \cdot \%$$

APPENDIX E

MOUNT MODIFICATION DESIGN DRAWINGS (MDD)



PLATFORM MODIFICATION DETAILS ELEVATION VIEW

NOT TO SCALE

LOADING SUMMARY

Quantity	Manufacturer	Antenna/ Appurtenance	Status	Sector
3	*ERICSSON*	*Air 32 DB B2A B66Aa*	*Existing*	*Alpha, Beta, & Gamma*
3	**RFS**	**APX16DWV-16DWVS-E-A20**	**Proposed**	**Alpha, Beta, & Gamma**
3	**RFS**	**APXVAARR24_43-U-NA20**	**Proposed**	**Alpha, Beta, & Gamma**
3	*ERICSSON*	*KRY 112 134/1*	*Existing*	*Alpha, Beta, & Gamma*
3	*ERICSSON*	*KRY 112 89/5*	*Existing*	*Alpha, Beta, & Gamma*
3	**ERICSSON**	**RRU 4449 B71 + B12**	**Proposed**	**Alpha, Beta, & Gamma**

NOTE:

MASER CONSULTING P.A. HAS DETERMINED THAT THE SUPPORT MOUNTS, WITH THE PROPOSED MODIFICATIONS, HAVE ADEQUATE STRUCTURAL CAPACITY TO SUPPORT THE EXISTING AND PROPOSED LOADING. THE SUPPORT MOUNTS HAVE BEEN DETERMINED TO BE STRESSED TO A MAXIMUM OF 77.9% OF ITS STRUCTURAL CAPACITY, ONCE THE PROPOSED MODIFICATIONS IN THIS DRAWING ARE INSTALLED AS INTENDED AT EACH SUPPORT MOUNT.

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CROWN CASTLE

SCALE :	JOB NUMBER :
AS SHOWN	18922050A

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STATE OF CONNECTICUT
PETROS TSOUKALAS
No. 32577
LICENSED
PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: 3257

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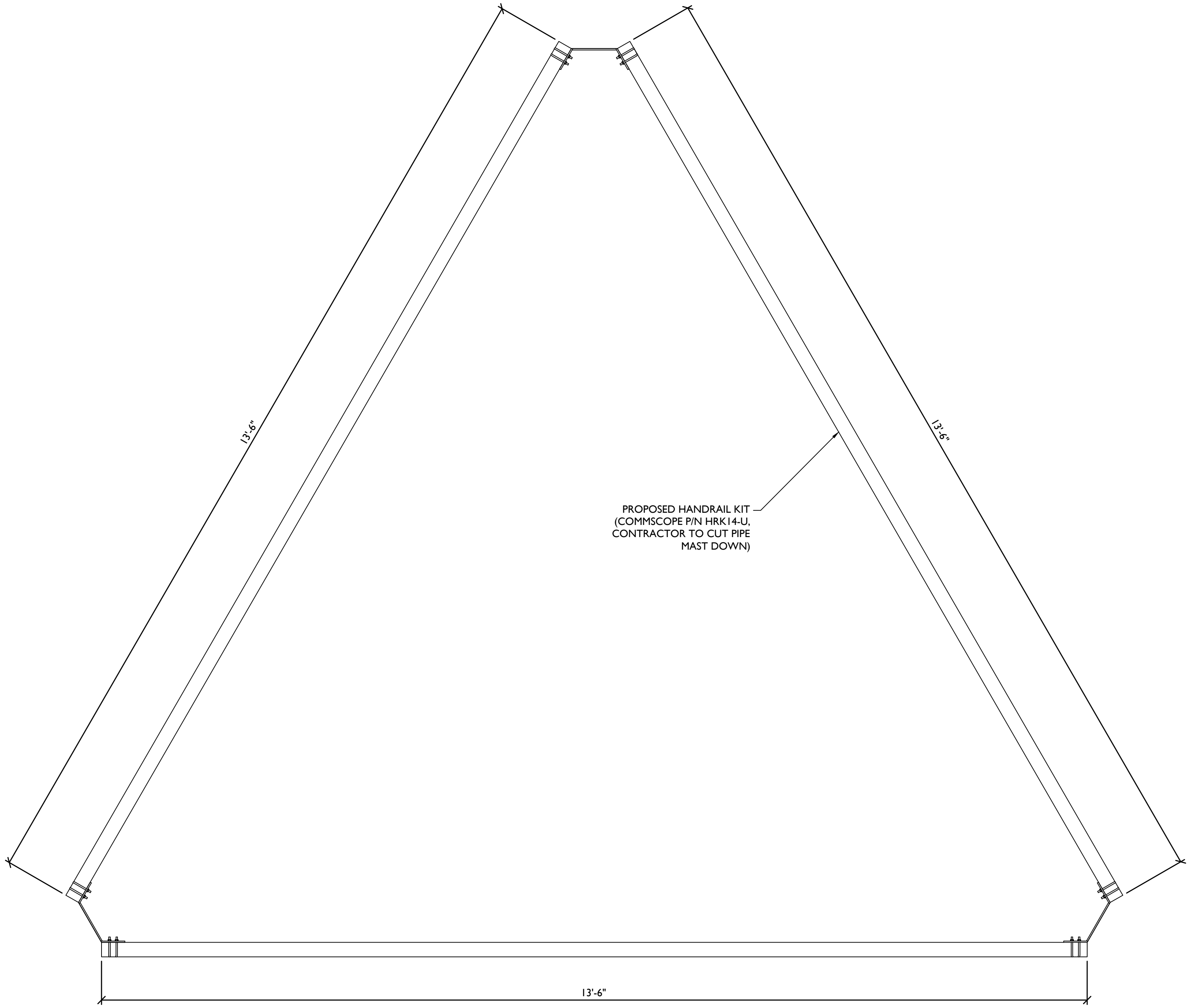
CHESHIRE, CT 06410
NEW HAVEN COUNTY

MT. LAUREL OFFICE
2000 Midlantic Drive
Suite 100
Mt. Laurel NJ 08054
Phone: .856.797.0412
Fax: .856.722.1120
email: solutions@maserconsulting.com

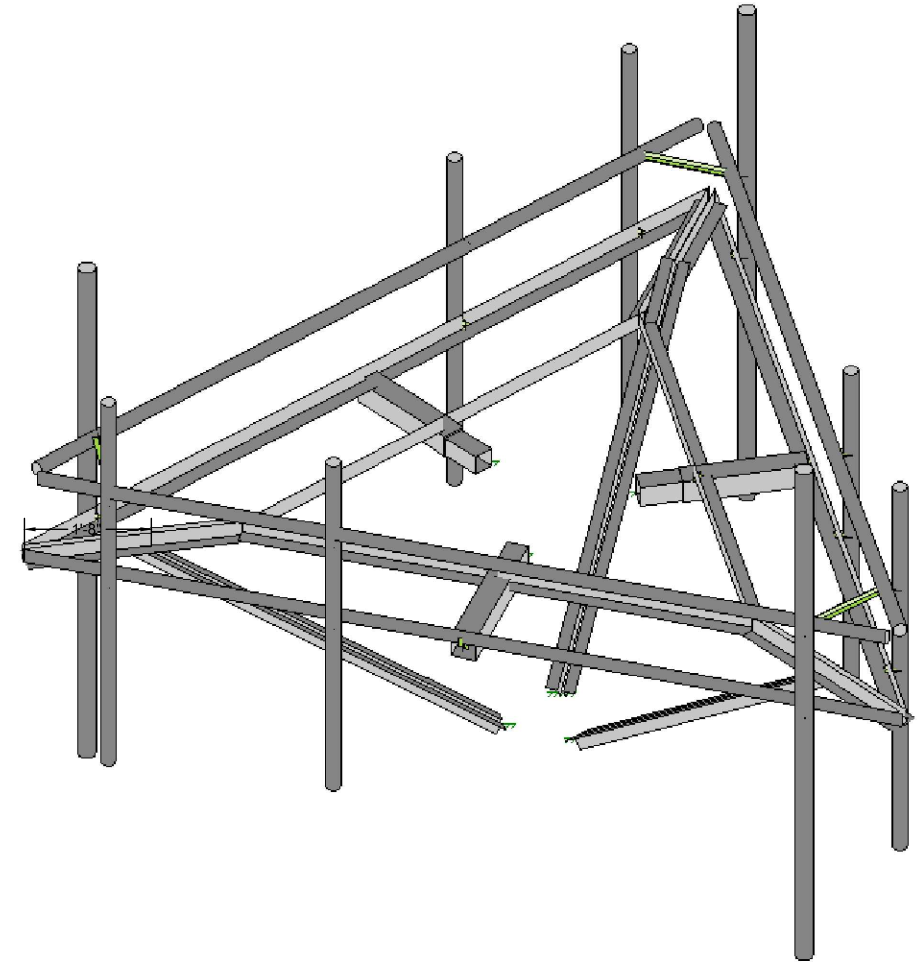
SHEET TITLE :
STRUCTURAL MODIFICATION DETAILS

SHEET NUMBER :
S-1



PROPOSED HANDRAIL DETAILS PLAN VIEW

NOT TO SCALE



MOUNT MODIFICATIONS RISA 3D MODEL

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REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
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1121 SUMMIT ROAD
CHESHIRE, CT 06410
NEW HAVEN COUNTY

MT. LAUREL OFFICE
2000 Midlantic Drive
Suite 100
Mt. Laurel NJ 08054
Phone: .856.797.0412
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email: solutions@maserconsulting.com

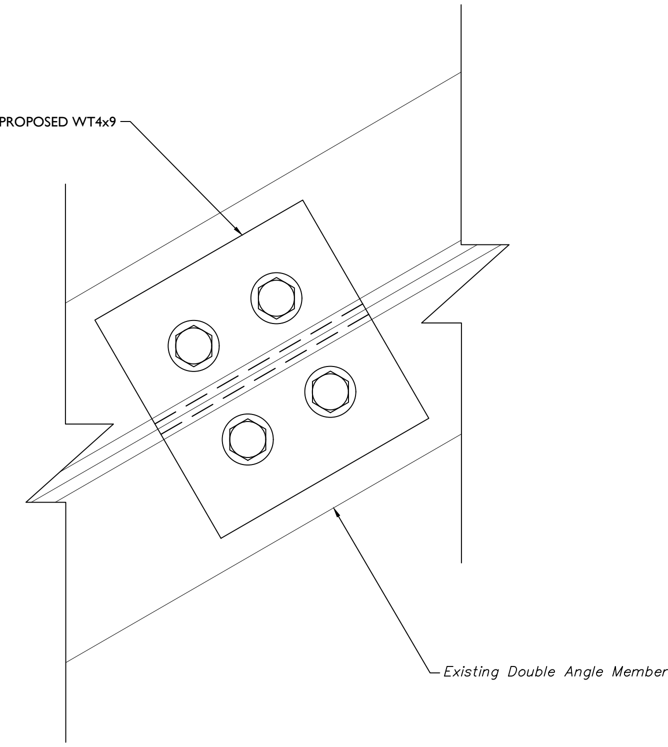
SHEET TITLE :
STRUCTURAL
MODIFICATION DETAILS

SHEET NUMBER :
S-2

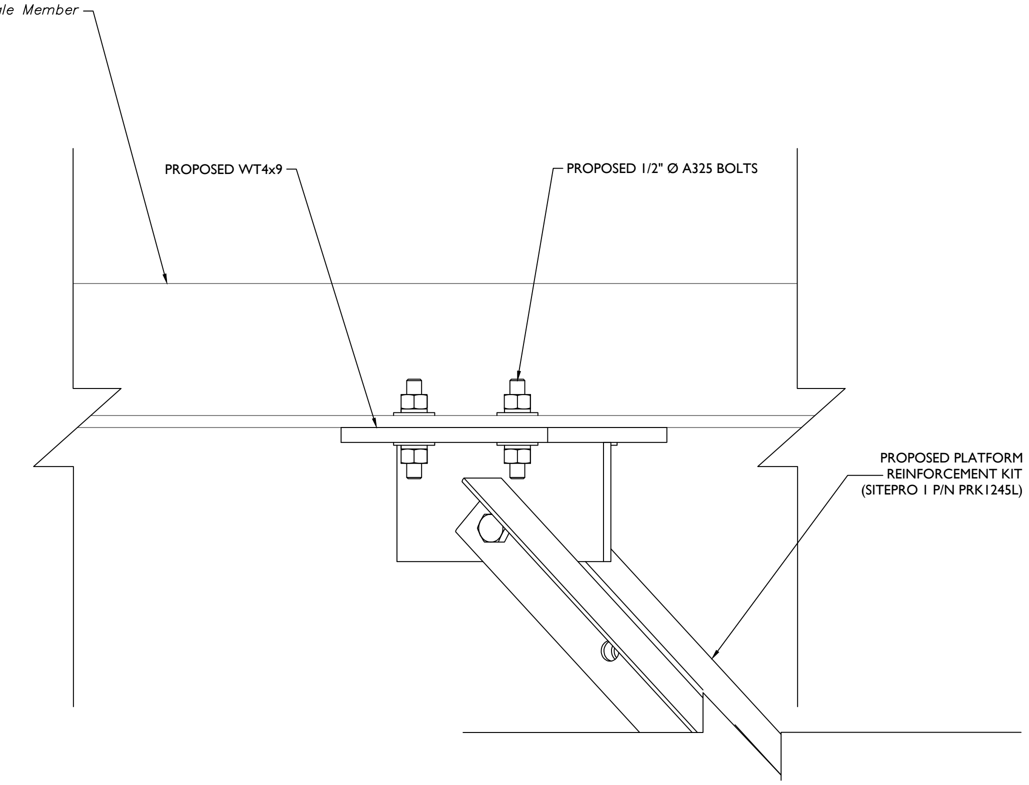
STRUCTURAL STEEL

1. DESIGN, FABRICATION, ERECTION AND WORKMANSHIP SHALL CONFORM TO AISC MANUAL OF STEEL CONSTRUCTION, THIRTEENTH EDITION.
2. CONNECTION BOLTS SHALL BE 3/4"Ø ASTM A325N UNLESS OTHERWISE NOTED.
3. FIELD WELDING SHALL BE PERFORMED BY WELDERS THAT ARE CERTIFIED (AWS "STANDARD QUALIFICATION PROCEDURE") TO PERFORM THE TYPE OF WORK REQUIRED. WELDS SHALL CONFORM TO AMERICAN WELDING SOCIETY (AWS) D1.1 "STRUCTURAL WELDING CODE - STEEL". PROVIDE THE MINIMUM SIZE PER PART 8 IN THE AISC "MANUAL OF STEEL CONSTRUCTION", LRFD 3RD EDITION, WHEN WELD SIZES ARE NOT SHOWN. USE E70XX ELECTRODES FOR ALL WELDING.
4. RETURN ALL WELDS AT CORNERS TWICE THE NOMINAL SIZE OF THE WELD MINIMUM, UNLESS OTHERWISE NOTED.
5. TO REDUCE WARPING TO A MINIMUM WHEN WELDING TO EXISTING MEMBERS CARRYING LOAD, SHORE OR BRACE EXISTING MEMBER DURING WELDING.
6. ALL COPES, BLOCKS, CUT OUTS, AND OTHER CUTTING OF STRUCTURAL MEMBERS SHALL HAVE ALL RE-ENTRANT CORNERS SHAPED, NOTCHED FREE TO A RADIUS OF AT LEAST 1/2".
7. CONTRACTOR IS RESPONSIBLE FOR ADEQUATE BRACING OF STEEL CONSTRUCTION.
8. ALL NEW STRUCTURAL STEEL SHAPES SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A123.
9. ALL NEW STEEL BOLTS, NUTS, AND HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153.
10. DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.
11. ALL STRUCTURAL STEEL SHALL ABIDE BY THE FOLLOWING MATERIAL STRENGTH LIST UNLESS OTHERWISE NOTED:

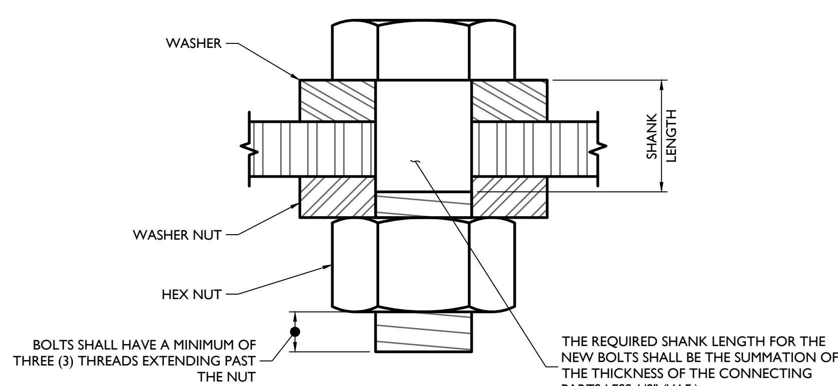
PLATES	ASTM A572 (GR 50)
ANGLES	ASTM A36 (GR 36)
PIPES	ASTM A53 (GR B)
SOLID ROUND	ASTM A572 (GR 50)
BOLTS	ASTM A325 (ALL BOLT HOLES STANDARD SIZE U.N.O.
NUTS	ASTM A194-2H
WASHERS	ASTM F436
HOT-DIPPED GALVANIZING	ASTM A123
WELDS	E70XX



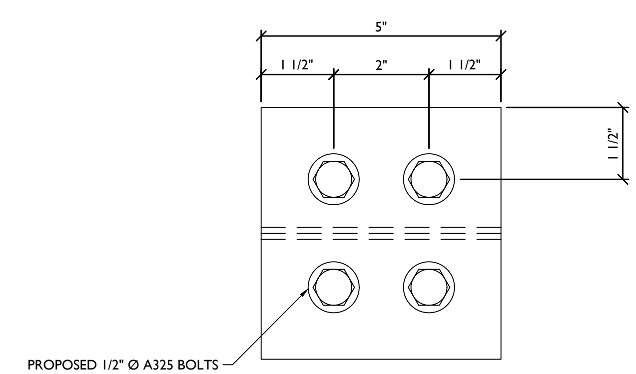
CUSTOM MOUNTING BRACKET PLAN VIEW
NOT TO SCALE



CUSTOM MOUNTING BRACKET ELEVATION VIEW
NOT TO SCALE



BOLT DETAIL
NOT TO SCALE



WT4x9 DETAIL
NOT TO SCALE

NOTE:

1. CONTRACTOR SHALL FIELD DRILL INTO THE EXISTING STEEL AS REQUIRED FOR THE PROPOSED CONNECTIONS. DAMAGED GALVANIZED SURFACES, SUCH AS THE PROPOSED BOLT HOLE LOCATIONS, SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.

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T-Mobile

CROWN CASTLE

SCALE :	JOB NUMBER :
AS SHOWN	18922050A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
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0	10/11/18	FOR CONSTRUCTION	CL	SMS

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: 3257

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF THE RESPONSIBLE LICENSED PROFFESIONAL ENGINEER, TO ALTER THIS DOCUMENT.

SITE NAME:

BU: 801367
SITE NAME: CT NHV-2075
CAC 801367
CARRIER SITE NUMBER: CT11352C
1121 SUMMIT ROAD
CHESHIRE, CT 06410
NEW HAVEN COUNTY

MT. LAUREL OFFICE
2000 Midlantic Drive
Suite 100
Mt. Laurel NJ 08054
Phone: .856.797.0412
Fax: .856.722.1120
email: solutions@maserconsulting.com

SHEET TITLE :
STRUCTURAL MODIFICATION DETAILS

SHEET NUMBER :
S-3

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR DISSEMINATION OF REVISIONS TO CONTRACT DOCUMENTS AND REQUIREMENTS TO ALL SUBCONTRACTORS. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER TRADES AND EQUIPMENT MANUFACTURERS.

2. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND EXISTING FIELD CONDITIONS BEFORE PROCEEDING WITH CONSTRUCTION. DETERMINE EXACT LOCATIONS OF EXISTING UTILITIES, GROUNDS, DRAIN PIPES AND VENTS BEFORE COMMENCING WORK. CONTRACTOR SHALL NOTIFY ENGINEER IF ACTUAL CONDITIONS DIFFER SIGNIFICANTLY FROM WHAT IS SHOWN ON DRAWINGS.

3. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING A NEAT AND ORDERLY PROJECT SITE, REMOVE AND DISPOSE OF OFF SITE RUBBISH, WASTE MATERIALS, LITTER, AND ALL FOREIGN SUBSTANCES DAILY.

4. INCORRECTLY FABRICATED, DAMAGED, OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS SHALL BE REPORTED TO THE ENGINEER PRIOR TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE OWNER'S WRITTEN APPROVAL.

5. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUCH COVERING, SHIELDING, AND BARRICADES AS REQUIRED TO PROTECT BYSTANDERS AND PASSERSBY, EQUIPMENT, SUPPLIES, ETC. FROM DUST, DEBRIS AND OTHER CAUSE OF DAMAGE RESULTING FROM CONSTRUCTION. ANY DAMAGE DURING CONSTRUCTION SHALL BE RESTORED TO PREVIOUS CONDITIONS.

6. IN AREAS WHERE EXISTING ANTENNA MOUNTS, TRANSMISSION LINES OR OTHER SUPPORTING EQUIPMENT IS TO BE REMOVED, THE EXISTING STRUCTURE SHALL BE REPAIRED AS REQUIRED.

7. ALL SAFETY AND OSHA REGULATIONS SHALL BE FOLLOWED STRICTLY. METHODS OF CONSTRUCTION AND ERECTION OF STRUCTURAL MATERIAL ARE THE CONTRACTOR'S RESPONSIBILITY.

8. CONTRACTOR TO PROVIDE TEMPORARY SUPPORT FOR ALL EXISTING ANTENNAS, TRANSMISSION LINES OR OTHER APPURTENANCES DURING CONSTRUCTION.

9. CONTRACTOR SHALL PROTECT EXISTING APPURTENANCES FROM DAMAGE DURING CONSTRUCTION.

10. NO ANTENNAS, CABLES, OR OTHER APPURTENANCES SHALL BE ADDED TO THE TOWER UNTIL THE MODIFICATION WORK IS COMPLETE.

11. ALL DIMENSIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL COORDINATE DIMENSIONS WITH TOWER MANUFACTURER OR FIELD VERIFY DIMENSIONS PRIOR TO FABRICATING MEMBERS.

12. THE CONTRACTOR SHALL LOCATE ALL UTILITIES IN THE AREA OF CONSTRUCTION AND PREVENT DAMAGE TO THEM. SHOULD DAMAGE OCCUR TO ANY UTILITIES, THE CONTRACTOR IS REQUIRED TO REPAIR THE DAMAGE TO THE SATISFACTION OF THE OWNER AT HIS OWN EXPENSE.

13. ALL EXISTING PLANS, DETAILS, DIMENSIONS, AND ELEVATIONS INDICATE EXISTING CONDITIONS AS KNOWN. THE EXISTING INFORMATION SHOWN IS NOT INTENDED TO BE "AS BUILT" AND THE ACTUAL CONSTRUCTION MAY DIFFER FROM THAT SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS INCLUDING DIMENSIONS AND ELEVATIONS PRIOR TO STARTING CONSTRUCTION. MINOR VARIATIONS CAN BE EXPECTED AND ANY REQUIRED DEVIATION FROM THE CONTRACT DOCUMENTS SHALL BE APPROVED BY THE ENGINEER PRIOR TO PROCEEDING WITH CONSTRUCTION.

14. MODIFICATION DETAILS REPRESENTS TYPICAL CONDITIONS. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY DEVIATION AS A RESULT OF SITE SPECIFIC CONDITIONS. REINFORCE ALL TOWER FACES IDENTICALLY, UNLESS OTHERWISE NOTED.

15. IN AREAS TO BE MODIFIED, ANY ANTENNA, COAX, OR CONDUIT SHALL BE TEMPORARILY MOVED AND THEN REPLACED AFTER COMPLETION OF WORK. COORDINATE WITH OWNER.

16. CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF ALL MATERIAL TO BE REMOVED.

17. CONTRACTOR SHALL ENSURE STABILITY OF THE ANTENNA PLATFORM DURING ALL WORK.

18. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE TEMPORARY BRACING OF THE STRUCTURE DURING ALL STAGES OF CONSTRUCTION. THE STRUCTURE IS DESIGNED FOR A COMPLETED CONDITION ONLY AND THEREFORE MAY REQUIRE ADDITIONAL SUPPORT BEFORE COMPLETIONS.

19. THIS DESIGN ASSUMES THE ANTENNA PLATFORM HAVE BEEN WELL MAINTAINED, IN GOOD CONDITION, AND ARE WITHOUT DEFECT. BENT MEMBERS, CORRODED MEMBERS, LOOSE BOLTS, CRACKED WELDS AND OTHER MEMBER DEFECTS HAVE NOT BEEN CONSIDERED. THE TOWER IS ASSUMED TO BE PLUMB AND THE SITE IS ASSUMED TO BE LEVEL. THIS DESIGN IS BEING PROVIDED WITHOUT THE BENEFIT OF A CONDITION BY MASER CONSULTING P.A.. CONTRACTOR SHALL COMMISSION A COMPLETE CONDITION ASSESSMENT PRIOR TO ORDERING ANY REINFORCING MATERIALS. CONTRACTOR SHALL SUPPLY CONDITION ASSESSMENT TD ENGINEER FOR REVIEW. SEE CONTRACTOR NOTES.

20. ALL SUBSTITUTES PROPOSED BY THE CONTRACTOR SHALL BE APPROVED IN WRITING BY THE ENGINEER. CONTRACTOR SHALL PROVIDE DOCUMENTATION TO ENGINEER FOR DETERMINING IF SUBSTITUTE IS SUITABLE FOR USE AND MEETS THE ORIGINAL DESIGN CRITERIA. DIFFERENCES FROM THE ORIGINAL DESIGN, INCLUDING MAINTENANCE. REPAIR AND REPLACEMENT, SHALL BE NOTED. ESTIMATES OF COSTS/CREDITS ASSOCIATED WITH THE SUBSTITUTION (INCLUDING RE-DESIGN COSTS AND COSTS TO SUB-CONTRACTORS) SHALL BE PROVIDED TO THE ENGINEER. CONTRACTOR SHALL PROVIDE ADDITIONAL DOCUMENTATION AND/OR SPECIFICATIONS TO THE ENGINEER AS REQUESTED.

21. PROVIDE STRUCTURAL STEEL SHOP DRAWINGS TO ENGINEER FOR APPROVAL PRIOR TO FABRICATION.

22. INSPECTION OF THE MODIFICATIONS SHALL BE COMPLETED BY A THIRD PARTY. INSPECTION SHALL TAKE PLACE WITHIN 72 HOURS OF THE COMPLETION OF THE ANTENNA PLATFORM MODIFICATIONS. NO PROPOSED LOADING SHALL BE INSTALLED PRIOR TO INSPECTOR APPROVAL.

DESIGN LOADS

1. WIND: ANSI/TIA/EIA-222-H
ULTIMATE WIND SPEED: 125 MPH

2. ANTENNA PLATFORM MODIFICATIONS WERE DESIGNED IN ACCORDANCE TO TIA-222-H AND 2016 CONNECTICUT STATE BUILDING CODE, INCORPORATING THE 2012 IBC, AS WELL AS APPLICABLE LOCAL BUILDING CODES.

STRUCTURAL STEEL

1. DESIGN, FABRICATION, ERECTION AND WORKMANSHIP SHALL CONFORM TO AISC MANUAL OF STEEL CONSTRUCTION, FOURTEENTH EDITION.

2. CONNECTION BOLTS SHALL BE 3/4"Ø ASTM A325N UNLESS OTHERWISE NOTED.

3. FIELD WELDING SHALL BE PERFORMED BY WELDERS THAT ARE CERTIFIED (AWS "STANDARD QUALIFICATION PROCEDURE") TO PERFORM THE TYPE OF WORK REQUIRED. WELDS SHALL CONFORM TO AMERICAN WELDING SOCIETY (AWS) D1.1 "STRUCTURAL WELDING CODE - STEEL". PROVIDE THE MINIMUM SIZE PER PART 8 IN THE AISC "MANUAL OF STEEL CONSTRUCTION", LRFD 3RD EDITION, WHEN WELD SIZES ARE NOT SHOWN. USE E70XX ELECTRODES FOR ALL WELDING.

4. RETURN ALL WELDS AT CORNERS TWICE THE NOMINAL SIZE OF THE WELD MINIMUM, UNLESS OTHERWISE NOTED.

5. TO REDUCE WARPING TO A MINIMUM WHEN WELDING TO EXISTING MEMBERS CARRYING LOAD, SHORE OR BRACE EXISTING MEMBER DURING WELDING.

6. ALL COPES, BLOCKS, CUT OUTS, AND OTHER CUTTING OF STRUCTURAL MEMBERS SHALL HAVE ALL RE-ENTRANT CORNERS SHAPED, NOTCHED FREE TO A RADIUS OF AT LEAST 1/2".

7. CONTRACTOR IS RESPONSIBLE FOR ADEQUATE BRACING OF STEEL CONSTRUCTION.

8. ALL NEW STRUCTURAL STEEL SHAPES SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A123.

9. ALL NEW STEEL BOLTS, NUTS, AND HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153.

10. DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.

11. ALL STRUCTURAL STEEL SHALL ABIDE BY THE FOLLOWING MATERIAL STRENGTH LIST UNLESS OTHERWISE NOTED:

PIPES	A-53 (GR B)
PLATES	ASTM A572 (GR 50)
ANGLES	ASTM A36 (GR 36)
SOLID ROUND	ASTM A572 (GR 50)
BOLTS	ASTM A325 (ALL BOLT HOLES STANDARD SIZE U.N.O.)
NUTS	ASTM A194-2H
WASHERS	ASTM F436
HOT-DIPPED GALVANIZING	ASTM A123
WELDS	E70XX
PAINT	NEW STEEL TO BE PAINTED TO MATCH EXISTING TOWER

CONTRACTOR NOTES

1. ALL CONTRACTORS AND LOWER TIER CONTRACTORS MUST ACKNOWLEDGE IN WRITING TO TOWER OWNER AND MASER CONSULTING P.A. THAT THEY HAVE OBTAINED, UNDERSTAND, AND WILL FOLLOW TOWER OWNER STANDARDS OF PRACTICE, CONSTRUCTION GUIDELINES, ALL SITE AND TOWER SAFETY PROCEDURES, ALL PRODUCT LIMITATIONS AND INSTALLATION PROCEDURES USED ON SITE, AND PROPOSED MODIFICATIONS DESCRIBED. RECEIPT OF ACKNOWLEDGMENT MUST OCCUR PRIOR TO BEGINNING CONSTRUCTION OR CLIMBING. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO PROVIDE THIS DOCUMENTATION FOR TOWER OWNER AND MASER CONSULTING P.A. ON COMPANY LETTERHEAD AND THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO OBTAIN THIS DOCUMENTATION FROM LOWER TIER SUBCONTRACTORS (ON SUBCONTRACTOR LETTERHEAD) AND DELIVER IT TO TOWER OWNER AND MASER CONSULTING P.A.

2. IF THE CONTRACTOR DISCOVERS ANY EXISTING CONDITIONS THAT ARE NOT REPRESENTED ON THESE DRAWINGS, OR ANY CONDITIONS THAT WOULD INTERFERE WITH THE INSTALLATION OF THE MODIFICATIONS, MASER CONSULTING P.A. SHALL BE CONTACTED IMMEDIATELY TO EVALUATE THE SIGNIFICANCE OF THE DEVIATION.

3. IT IS ASSUMED THAT ANY STRUCTURAL MODIFICATION WORK SPECIFIED ON THESE PLANS WILL BE ACCOMPLISHED BY KNOWLEDGEABLE WORKMEN WITH TELECOMMUNICATION CONSTRUCTION EXPERIENCE. THIS INCLUDES PROVIDING THE NECESSARY CERTIFICATIONS TO THE TOWER OWNER AND ENGINEER.

4. THESE DRAWINGS DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION METHODS, MEANS, TECHNIQUES, SEQUENCES, AND PROCEDURES.

5. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PROGRAMS AND PRECAUTIONS IN CONNECTION WITH THIS WORK.

6. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING; ANY PROBLEMS WITH ACCESS, INTERFERENCE, ETC. SHALL BE RESOLVED PRIOR TO MOBILIZATION. THE CONTRACTOR MUST VISIT THE SITE PRIOR TO ORDERING ANY MATERIAL AND MUST RESOLVE ALL ISSUES WITH THE OWNER PREVENTING A CONTINUOUS INSTALLATION. CONTRACTOR SHALL NOTE ALL ANTENNAS, MOUNTS, COAX, LIGHTING AND ANY OTHER TOWER APPURTENANCES IN THE REGION OF THE MODIFICATIONS.

7. CONTRACTOR IS RESPONSIBLE FOR TEMPORARILY REMOVING ALL COAX, T-BRACKETS, ANTENNA MOUNTS, AND ANY OTHER TOWER APPURTENANCE THAT MAY INTERFERE WITH THE ANTENNA PLATFORM MODIFICATIONS. ALL TOWER APPURTENANCES MUST BE REPLACED AND/OR RESTORED TO ITS ORIGINAL LOCATION. ANY CARRIER DOWNTIME MUST BE COORDINATED WITH THE TOWER OWNER IN WRITING.

8. SOME ATTACHMENTS MAY REQUIRE CUSTOM MODIFICATIONS TO PROPERLY FIT THE MODIFIED REGION OF THE STRUCTURE. THESE CUSTOMIZATIONS ARE DESIGNED BY OTHERS AND MUST BE APPROVED BY THE ENGINEER PRIOR TO REMOVING SUCH ATTACHMENTS. ANY CARRIER DOWNTIME MUST BE COORDINATED WITH THE TOWER OWNER IN WRITING.

9. CONTRACTOR SHALL ONLY WORK WITHIN THE LIMITS OF THE TOWER OWNER'S PROPERTY OR LEASE AREA AND APPROVED EASEMENTS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY WORK IS WITHIN THESE BOUNDARIES. CONTRACTOR SHALL EMPLOY A SURVEYOR AS REQUIRED. ANY WORK OUTSIDE THESE BOUNDARIES SHALL BE APPROVED IN WRITING BY THE LAND OWNER PRIOR TO MOBILIZATION. CONSTRUCTION STAKING AND BOUNDARY MARKING IS THE RESPONSIBILITY OF THE CONTRACTOR.

10. WORK SHALL ONLY BE PERFORMED DURING CALM DRY DAYS (WINDS LESS THAN 10-MPH) CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY LOCAL ANTENNA PLATFORM SHORING, TEMPORARY GLOBAL ANTENNA PLATFORM SHORING, AND ALL SHORING OF SURROUNDING BUILDINGS, PADS, AND OTHER OUTDOOR SITE OBSTRUCTIONS. ALL SHORING. TEMPORARY BRACING, AND TEMPORARY SUPPORTS ARE THE RESPONSIBILITY OF THE CONTRACTOR.

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T-Mobile

CROWN CASTLE

SCALE : AS SHOWN
JOB NUMBER : 18922050A

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STATE OF CONNECTICUT
PETROS TSOUKALAS
LICENSED PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: 3257

SITE NAME:

BU: 801367
SITE NAME: CT NHV-2075
CAC 801367
CARRIER SITE NUMBER:
CT11352C
1121 SUMMIT ROAD
CHESHIRE, CT 06410
NEW HAVEN COUNTY

MT. LAUREL OFFICE
2000 Midlantic Drive
Suite 100
Mt. Laurel NJ 08054
Phone: .856.797.0412
Fax: .856.722.1120
email: solutions@maserconsulting.com

SHEET TITLE :
STRUCTURAL NOTES

SHEET NUMBER :
S-4

EBI Consulting

environmental | engineering | due diligence

RADIO FREQUENCY EMISSIONS ANALYSIS REPORT
EVALUATION OF HUMAN EXPOSURE POTENTIAL
TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CT11352C

Crowne Cheshire
1119 Summit Road
Cheshire, CT 06410

October 5, 2018

EBI Project Number: 6218006519

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**7.27 %**

21 B Street · Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

EBI Consulting

environmental | engineering | due diligence

October 5, 2018

T-Mobile USA
Attn: Jason Overbey, RF Manager
35 Griffin Road South
Bloomfield, CT 06002

Emissions Analysis for Site: **CT11352C – Crowne Cheshire**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **1119 Summit Road, Cheshire, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

<u>General population/uncontrolled exposure</u> limits apply to situations in which the general population may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general population would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 600 MHz and 700 MHz frequency bands are approximately 400 $\mu W/cm^2$ and 467 $\mu W/cm^2$ respectively. The general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) frequency bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

<u>Occupational/controlled exposure</u> limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **1119 Summit Road, Cheshire, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

1) 1 GSM channels (PCS Band - 1900 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 15 Watts per Channel.

2) 1 UMTS channel (PCS Band - 1900 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

3) 1 UMTS channel (AWS Band – 2100 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

4) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

5) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

6) 2 LTE channels (600 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.

7) 1 microwave backhaul channel (10GHz) was considered for the proposed facility. This channel has a transmit power of 1 Watt.

8) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

9) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

10) The antennas used in this modeling are the **Ericsson AIR32 KRD901146-1 B66A/B2A** & **RFS APX16DWV-16DWVS-E-A20** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **RFS APXVAARR24_43-U-NA20** for 600 MHz and 700 MHz channels. This is based on feedback from the carrier with regard to anticipated antenna selection. All Antenna gain values and associated transmit power levels are shown in the Site Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

11) The antenna mounting height centerline of the proposed antennas is **138 feet** above ground level (AGL).

12) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

13) All calculations were done with respect to uncontrolled / general population threshold limits.

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T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	Ericsson AIR32 KRD901146-1 B66A/B2A	Make / Model:	Ericsson AIR32 KRD901146-1 B66A/B2A	Make / Model:	Ericsson AIR32 KRD901146-1 B66A/B2A
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	138 feet	Height (AGL):	138 feet	Height (AGL):	138 feet
Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	200	Total TX Power(W):	200	Total TX Power(W):	200
ERP (W):	7,780.90	ERP (W):	7,780.90	ERP (W):	7,780.90
Antenna A1 MPE%	**1.60**	Antenna B1 MPE%	**1.60**	Antenna C1 MPE%	**1.60**
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20
Gain:	16.3 dBd	Gain:	16.3 dBd	Gain:	16.3 dBd
Height (AGL):	138 feet	Height (AGL):	138 feet	Height (AGL):	138 feet
Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)
Channel Count	3	Channel Count	3	Channel Count	3
Total TX Power(W):	95	Total TX Power(W):	95	Total TX Power(W):	95
ERP (W):	4,052.51	ERP (W):	4,052.51	ERP (W):	4,052.51
Antenna A2 MPE%	**0.84**	Antenna B2 MPE%	**0.84**	Antenna C2 MPE%	**0.84**
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20
Gain:	12.95 / 13.35 dBd	Gain:	12.95 / 13.35 dBd	Gain:	12.95 / 13.35 dBd
Height (AGL):	138 feet	Height (AGL):	138 feet	Height (AGL):	138 feet
Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	120	Total TX Power(W):	120	Total TX Power(W):	120
ERP (W):	2,443.03	ERP (W):	2,443.03	ERP (W):	2,443.03
Antenna A3 MPE%	**1.20**	Antenna B3 MPE%	**1.20**	Antenna C3 MPE%	**1.20**

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile (Per Sector Max)	**3.64 %**
Verizon Wireless	**1.41** %
Sprint	**0.77** %
AT&T	**1.45** %
Site Total MPE %:	**7.27 %**

T-Mobile Sector A Total:	3.64 %
T-Mobile Sector B Total:	3.64 %
T-Mobile Sector C Total:	3.64 %
Site Total:	7.27 %

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T-Mobile Maximum MPE Power Values (Per Sector)

T-Mobile _Frequency Band / Technology (Per Sector)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
T-Mobile PCS - 1900 MHz LTE	2	2,334.27	138	9.63	PCS - 1900 MHz	1000.00	0.96%
T-Mobile AWS - 2100 MHz LTE	2	1,556.18	138	6.42	AWS - 2100 MHz	1000.00	0.64%
T-Mobile PCS - 1900 MHz GSM	1	639.87	138	1.35	PCS - 1900 MHz	1000.00	0.14%
T-Mobile PCS - 1900 MHz UMTS	1	1,706.32	138	3.52	PCS - 1900 MHz	1000.00	0.35%
T-Mobile AWS - 2100 MHz UMTS	1	1,706.32	138	3.52	AWS - 2100 MHz	1000.00	0.35%
T-Mobile 600 MHz LTE	2	788.97	138	3.27	600 MHz	400.00	0.82%
T-Mobile 700 MHz LTE	2	432.54	138	1.78	700 MHz	467.00	0.38%
						Total:	**3.64%**

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general population exposure to RF Emissions.

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general population exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	3.64 %
Sector B:	3.64 %
Sector C:	3.64 %
T-Mobile Maximum MPE % (Per Sector):	3.64 %
Site Total:	7.27 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **7.27%** of the allowable FCC established general population limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.