STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950A
E-Mail: siting.council@ct.gov
Web Site: portal.ct.gov/csc

VIA ELECTRONIC MAIL

December 30, 2020

Victoria Masse
Northeast Site Solutions
420 Main Street, Unit 2
Sturbridge, MA 01566

RE: **EM-T-MOBILE-113-201109** – T-Mobile notice of intent to modify an existing telecommunications facility located at 95 High Street, Portland, Connecticut.

Dear Ms. Masse:

The Connecticut Siting Council (Council) is in receipt of your correspondence received via email on December 28, 2020 submitted in response to the Council's November 30, 2020 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

s/Melanie A. Bachman

Melanie A. Bachman
Executive Director

MAB/IN/emr

From: Deborah Chase <deborah@northeastsitesolutions.com>
Sent: Monday, December 28, 2020 1:43 PM
To: CSC-DL Siting Council <Siting.Council@ct.gov>; Bachman, Melanie <Melanie.Bachman@ct.gov>; Mathews, Lisa A <Lisa.A.Mathews@ct.gov>
Cc: Sheldon Freincle <sheldon@northeastsitesolutions.com>; victoria@northeastsitesolutions.com
Subject: RE: CTHA242A-ANCHOR-Fwd: Council Incomplete Letter for EM-T-MOBILE-113-201109 (95 High Street, Portland)
Importance: High

Siting Council
Please see attached the requested passing Mount Analysis and Structural per your correspondence letter.
Thank you

Deborah Chase
Senior Project Coordinator & Analyst
Mobile: 860-490-8839

Save a tree. Refuse.Reduce. Reuse. Recycle.

NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

Northeast Site Solutions
Victoria Masse
420 Main Street, Sturbridge MA 01566
860-306-2326
victoria@northeastsitesolutions.com

December 3, 2020

Members of the Siting Council
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

RE: Exempt Modification Application
95 High Street, Portland, CT 06480
Latitude: 41.58115
Longitude: -72.72622217
T-Mobile Site#: CTHA242A-Anchor
EM-T-MOBILE - 113-201109

Dear Ms. Bachman:

Please accept this revised letter for 95 High Street, Portland. EM-T-Mobile-113-201109 (attached).
The revision includes the 5G antenna statements, mount analysis, and signed and stamped structural analysis.

T-Mobile is requesting to file an exempt modification for an existing 120-foot lattice tower located at 95 High Street, Portland CT 06480. T-Mobile currently maintains nine (9) antennas at the 110-foot level of the existing 120-foot tower. The property and the tower are both owned by Town of Portland. T-Mobile now intends to replace three (3) existing antenna with three (3) new 2500MHZ **5G** antenna. The new antenna would be installed at the 110-foot and level of the tower. T-Mobile also proposes tower reinforcement modifications as shown in the enclosed drawings.

Planned Tower Modifications:
Remove: NONE

Remove and Replace:
(3) AIR21 B2A/B4P – Antenna (REMOVE) - (3) AIR6449 B41- Antenna 2500MHz **5G** (REPLACE)

Install New:
(3) Diplexers
(1) 6x12 Hybrid Line
(3) RRUS 4415 B25

Existing to Remain:
(3) TMA
(3) RRU 4449 B12/B71
(3) AIR32 B66Aa B2a Antenna –1900/2100MHz
(3) APXVARR24_43-C-NA20 – Antenna – 600/700/1900/2100MHz

NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

(6) 1-5/8" Coax
(3) 6x12 Hybrid Lines

This facility was approved by the CT Siting Council. Per the attached TS No. TS-T-MOBILE-139-060606 – Dated June, 27 2006. Please see attached original approval minutes from 2006.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to First Selectwoman Susan S. Bransfield and John Herring, Zoning Enforcement Officer of the Town of Portland, as well as the tower owner and property owner.

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

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

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

3. The proposed modifications 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 Communications 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 referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Victoria Masse
Mobile: 860-306-2326
Fax: 413-521-0558
Office: 420 Main Street, Unit 2, Sturbridge MA 01566
Email: victoria@northeastsitesolutions.com

NORTHEAST
SITE SOLUTIONS
Turnkey Wireless Development

Attachments
cc: First Selectwoman Susan S. Bransfield, as elected official
John Herring, Zoning Enforcement Director
Town of Portland - as tower owner & property owner

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Web Site: portal.ct.gov/csc

VIA ELECTRONIC MAIL

November 30, 2020

Victoria Masse
Northeast Site Solutions
42 Main Street, Unit 2
Sturbridge, MA 01566

RE: **EM-T-MOBILE-113-201109** – T-Mobile notice of intent to modify an existing telecommunications facility located at 95 High Street, Portland, Connecticut.

Dear Ms. Masse:

The Connecticut Siting Council (Council) received a notice of intent to modify the above-referenced facility on November 9, 2020.

According to Section 16-50j-71 of the Regulations of Connecticut State Agencies, "…any modification, as defined in Section 16-50j-2a of the Regulations of Connecticut State Agencies, to an existing tower site, except as specified in Sections 16-50j-72 and 16-50j-88 of the Regulations of Connecticut State Agencies, may have a substantial adverse environmental effect."

Staff has reviewed this exempt modification request for completeness and has identified the following deficiencies:

1. The construction drawings provided with the request references a mount analysis (MA) prepared by Tectonic Engineering and dated August 25, 2020. However, no mount analysis has been provided with the request: therefore, it is unclear whether the existing antenna mount is capable of supporting the proposed loading and if modifications or a replacement would be required;
2. The structural analysis (SA) prepared by Tectonic Engineering and dated October 2, 2020, is not signed and stamped by a Professional Engineer licensed in the State of Connecticut; and
3. The exempt modification request lacks a description of the wireless services to be provided, including, but not limited to, any 5G services and those frequencies associated with 5G services as stated in the Council's memorandum to Telecommunications Industry Representatives dated October 26, 2020 (attached).

Therefore, the exempt modification request is incomplete at this time. The Council recommends that Northeast Site Solutions provide a passing (<100%) MA and SA that are signed and stamped by a Professional Engineer licensed in the State of Connecticut and a statement clarifying if 5G services or frequencies associated with 5G services are part of the proposed modifications, on or before January 4, 2021. If additional time is needed to gather the requested information, please submit a written request for an extension of time prior to January 4, 2021. **Please provide an electronic version of the requested information for the incomplete exempt modification to be rendered complete and processed. Please include the Council's exempt modification identification number referenced above with the submittal.**

This notice of incompletion shall have the effect of tolling the Federal Communications Commission (FCC) 60-day timeframe in accordance with Paragraph 217 of the FCC Wireless Infrastructure Report and Order issued on October 21, 2014 (FCC 14-153).

Thank you for your attention to this matter. Should you have any questions, please feel free to contact me at 860-827-2951.

Sincerely,

s/ Melanie A. Bachman

Melanie Bachman
Executive Director

MAB/IN/emr

Enclosure: Council's memo dated October 26, 2020 to Telecommunications Industry Representatives

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Web Site: portal.ct.gov/csc

VIA ELECTRONIC MAIL

October 26, 2020

TO: Telecommunications Industry Representatives

FROM: Melanie A. Bachman, Executive Director MAB

RE: Exempt Modification/Tower Share Filings

Pursuant to Section 16-50aa of the Connecticut General Statutes, the Connecticut Siting Council (Council) shall issue an order approving shared use of a telecommunications facility if the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns.

Pursuant to Section 16-50j-72(b)(2) of the Regulations of Connecticut State Agencies, changes on an existing telecommunications tower site that meet the regulatory criteria shall not constitute a modification.

The Council is receiving inquiries from the municipalities and the public as to whether the equipment associated with requests for tower sharing and/or exempt modifications will provide 5G services.

Effective immediately, the Council hereby requests that a description of the wireless services to be provided by a proposed equipment installation, including, but not limited to, any 5G services and those frequencies associated with 5G services, be specifically identified in requests for tower sharing and requests for exempt modifications.

Pursuant to Sections 16-50j-39a and 16-50j-90, no request shall be approved until a complete submission containing all information deemed relevant by the Council has been filed.

Thank you in advance for your cooperation.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.

Date: **August 25, 2020**

Mount Analysis Report

Tower Owner: City of Middletown
Carrier: T-Mobile Northeast LLC

Site ID: CTHA242A
Site Name: HA242/PortlandHS_SST
Site Data: 95 High Street, Portland, Middlesex County, CT 06480
Latitude *41° 34' 52.01"*, Longitude *-72° 37' 19.98"*
12 ft Sector Frame Mount

Tectonic Project Number: 10473.CTHA242A

Tectonic Engineering & Surveying Consultants P.C. is pleased to submit this **"Mount Analysis Report"** to determine the structural integrity of the above mentioned mount.

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:

Sector Frame: **Sufficient Capacity – 61%**

This analysis has been performed in accordance with the 2018 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C with a maximum topographic factor, Kzt, of 1.0 and Structure Class III were used in this analysis.

All modifications and equipment proposed in this report shall be installed in accordance with this analysis for the determined available structural capacity to be effective.

We at Tectonic appreciate the opportunity of providing our continuing professional services to you and T-Mobile. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: John-Fritz Julien / Vinod Ramesh

Respectfully submitted by:
Tectonic Engineering & Surveying Consultants P.C.

Edward N. Iamiceli, P.E.
Managing Director - Structural

Project Contact Info

1279 Route 300 | Newburgh, NY 12550
845.567.6656 Tel | 845.567.8703 Fax

tectonicengineering.com
Equal Opportunity Employer

TABLE OF CONTENTS

1) INTRODUCTION

The existing mount is a 12.0 ft sector frame mount designed by SitePro1 and is mounted on a self-support tower which has emergency equipment installed. Therefore, the sector frame mount has been analyze using structure class 3 risk category.

2) ANALYSIS CRITERIA

TIA-222 Revision: TIA-222-G
Structure Class: 3
Wind Speed: 101 mph
Exposure Category: C
Topographic Factor: 1.0
Ice Thickness: 0.75 in
Wind Speed with Ice: 50 mph
Service Wind Speed: 60 mph

Table 1 - Proposed Equipment Loading Information

Mounting Level (ft)	Carrier Designation	Number of Antennas	Antenna Manufacturer	Antenna Model	Proposed Mount Type	Note
110.0	T-Mobile	3	ericsson	AIR 6449 B41	-	1
		3	commscope	SDX1926Q-43		
		3	ericsson	RRUS 4415 B25		

Note:
1) Proposed equipment to be installed on the existing sector frame mount.

Table 2 - Existing Equipment Loading Information

Mounting Level (ft)	Carrier Designation	Number of Antennas	Antenna Manufacturer	Antenna Model	Existing Mount Type	Note
110.0	T-Mobile	3	-	Twin Style TMA	-	1
		3	rfs	APXVARR24_43-C-NA20		
		3	ericsson	AIR 32 B66Aa B2a		
		3	ericsson	RADIO 4449 B12/B71		
		3	ericsson	AIR21 B2A B4P	-	2

Notes:
1) Existing equipment.
2) Existing equipment to be removed, not considered in analysis.

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Dated
ASSEMBLY DRAWINGS (VFA12-HD)	SitePro1	06/29/18
RFDS	T-Mobile	07/06/20
FIELD NOTES	Tectonic	07/17/20

3.1) Analysis Method

A tool internally developed, using Microsoft Excel, was used to calculate wind loading on all appurtenances and mount members. This information was then used in conjunction with another program, RISA-3D, which is a commercially available analysis software package, used to check the supporting building framing and calculate member stresses for various loading cases. The selected output from the analysis is included in Appendices B and C.

3.2) Assumptions

1) The antenna mounting system was properly fabricated, installed, and maintained in good condition in accordance with its original design, TIA Standards, and/or manufacturer's specifications.
2) The configuration of antennas, mounts, and other appurtenances are as specified in Tables 1 and 2.
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) The mount members are based on similarly manufactured mounts (SitePro1 P/N: VFA12-HD) and site visit photos.
5) 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. Tectonic should be notified to determine the effect on the structural integrity of the mount.

4) ANALYSIS RESULTS

Table 4 - Mount Component Stresses vs. Capacity (Sector Mount)

Notes	Component	Mount Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	110.0	27	Pass
	Sector Horizontal		33	Pass
	Mount Pipe		61	Pass
	Sector Brace		20	Pass
	Stiffarm Pipe		10	Pass

Structure Rating (max from all components) =	61%

Note:
1) See additional documentation in "Appendix C - Analysis Output" for calculations supporting the % capacity consumed.

4.1) Results / Conclusions

The sector frame mount have sufficient capacity to carry the proposed T-Mobile load configurations. No modifications is required at this time.

This structural analysis only includes evaluation of the antenna sector mounts and not the self-support tower. The self-support tower is to be analyzed under a separate structural analysis by Tectonic Engineering & Surveying Consultants, P.C.

Contractor shall field verify existing conditions and recommendations as noted on the construction drawings and notify the design engineer of any discrepancies prior to construction. Any further changes to the antenna and/or appurtenance configuration should be reviewed with respect to their effect on structural loads prior to implementation.

APPENDIX A

SOFTWARE INPUT CALCULATIONS

Tectonic	Job No.	10473.CTHA242A		
	Sheet No.	1	of	3
	Calculated By	JJ	Date :	8/25/2020
	Checked By	VR	Date :	8/25/2020

WIND AND ICE LOADS PER TIA-222-G

W.O.	10473.CTHA242A
Project Name	HA242/PortlandHS_SST
Location	95 High Street, Portland, CT 06480
County	Middlesex

Tower Type	SST	Self-Supporting (lattice)
Structure Class	3	High hazard or Essential facility
Exposure Category	C	Open terrain
Topo Category	1	Flat or rolling terrain
Height of crest	0	ft

Basic Wind Speed (3-sec gust):		
Without ice	101	mph*
With ice	50	mph
Service	60	mph
Ice thickness	0.75	in

Importance Factor	
Wind only	1.15
Wind with ice	1.00
Ice thickness	1.25
Supporting Data:	
K_e	1.00
K_t	N/A
f	N/A
z_g	900
α	9.5
$K_{z,min}$	0.85
K_d	0.95
G_h	1.00

Height	z (ft)	110
	Kh	N/A
	Kzt	1.00
	Kz	1.29
	Kiz	1.13
Wind Pressure, qz (psf)	No Ice	36.84
	With Ice	7.85
	Service	13.00
(tiz)	Ice Thk	2.11
Appurtenances (qzGh)	No Ice	36.84
	With Ice	7.85
	Service	13.00

*Ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second wind gust speed of 101 mph per Section 1609.3 and Appendix N, as required for use in the TIA-222-G Standard.

Tectonic

Job No.	10473.CTHA242A		
Sheet No.	2	of	3
Calculated By	JJ	Date :	08/25/20
Checked By	VR	Date :	08/25/20

Appurtenance Information

Effective Projected Area for Appurtenance $(EPA)_A=Max((EPA)_N,(EPA)_T)$

$(EPA)_T=\sum(C_aA_A)_T$ | $(EPA)_N=\sum(C_aA_A)_N$

Reduction Factor = 1

Wind Only Load Combinations

Antenna Configuration	(E) or (P)	Qty	z (ft)	Length or Diameter (ft)	Width (in)	Depth (in)	Flat or Cylindrical?	Antenna $(Ca)_T$	Antenna $(Ca)_N$	Side Face $(Aa)_T$ (ft^2)	Wind ward Side Face (CaAa)T (ft^2)	Face Normal $(A_a)_N$ (ft^2)	Windward face Normal $(C_aA_a)_N$ (ft^2)	Normal Antenna Wind Load Each (lb)	Transverse Antenna Wind Load Each (lb)	Antenna Weight (lb)	Total Weight (lb)
AIR 6449 B41	**P**	**3**	110	2.76	20.50	8.30	Flat	1.27	1.20	1.91	7.25	4.71	16.96	208	89	103.0	309.0
RRUS 4415 B25	**P**	**3**	110	1.24	13.20	5.40	Flat	1.21	1.20	0.56	2.03	1.37	4.92	60	25	46.3	138.9
SDX1926Q-43	**P**	**3**	110	0.35	6.93	2.91	Flat	1.20	1.20	0.08	0.30	0.20	0.72	9	4	6.2	18.5
TMA	E	3	110	1.32	14.00	3.10	Flat	1.32	1.20	0.34	1.34	1.54	5.53	68	16	33.0	99.0
RRU 4449 B71+B12	E	3	110	1.25	13.20	10.40	Flat	1.20	1.20	1.08	3.90	1.38	4.95	61	48	75.0	225.0
APXVAARR24_43-U-NA20	E	3	110	7.99	24.00	8.70	Flat	1.53	1.27	5.79	26.67	15.98	60.73	746	327	153.3	459.9
AIR-32 B2A/B66A	E	3	110	4.72	12.90	8.70	Flat	1.38	1.28	3.42	14.14	5.07	19.53	240	174	132.2	396.6
										$\sum(CaA_A)_T$	55.63	$\sum(CaA_A)_N$	113.34				1647

Note: Appurtenances listed above are to be installed along three (3) sector mounts.

Wind with Ice Load Combinations **Ice Thk=** 2.11 in

Antenna Configuration	(E), (R) or (P)	Qty	z (ft)	Length or Diameter (ft)	Width (in)	Depth (in)	Flat or Cylindrical?	Antenna $(Ca)_T$	Antenna $(Ca)_N$	Side Face $(A_a)_T$ (ft^2)	Windward Side Face (CaAa)T (ft^2)	Face Normal $(A_a)_N$ (ft^2)	Windward Face Normal $(C_aA_a)_N$ (ft^2)	Normal Antenna Wind Load Each (lb)	Transverse Antenna Wind Load Each (lb)	Ice Area for Weight (ft^2)	Ice Weight Alone (lbs)
AIR 6449 B41	P	3.00	110.00	3.11	24.73	12.53	Cylindrical	1.22	1.20	3.25	11.90	6.41	23.08	60	31	13.2	130.7
RRUS 4415 B25	P	3.00	110.00	1.59	17.43	9.63	Cylindrical	1.20	1.20	1.28	4.61	2.32	8.34	22	12	3.8	38.0
SDX1926Q-43	P	3.00	110.00	0.70	11.16	7.14	Cylindrical	1.20	1.20	0.42	1.50	0.65	2.34	6	4	0.6	5.6
TMA	E	3.00	110.00	1.67	18.23	7.33	Cylindrical	1.21	1.20	1.02	3.70	2.54	9.13	24	10	3.8	37.0
RRU 4449 B71+B12	E	3.00	110.00	1.60	17.43	14.63	Cylindrical	1.20	1.20	1.95	7.03	2.33	8.38	22	18	4.9	48.5
APXVAARR24_43-U-NA20	E	3.00	110.00	8.34	28.23	12.93	Cylindrical	1.42	1.25	8.99	38.43	19.63	73.41	192	101	43.6	429.9
AIR-32 B2A/B66A	E	3.00	110.00	5.07	17.13	12.93	Cylindrical	1.30	1.25	5.46	21.27	7.24	27.06	71	56	17.0	167.6
										$\sum(CaA_A)_T$	88.44	$\sum(CaA_A)_N$	151.74				857

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.

Job No. 10473.CTHA242A
Sheet No. 3 of 3
Calculated By JJ Date : 08/25/20
Checked By VR Date : 08/25/20

Existing Sector Mount

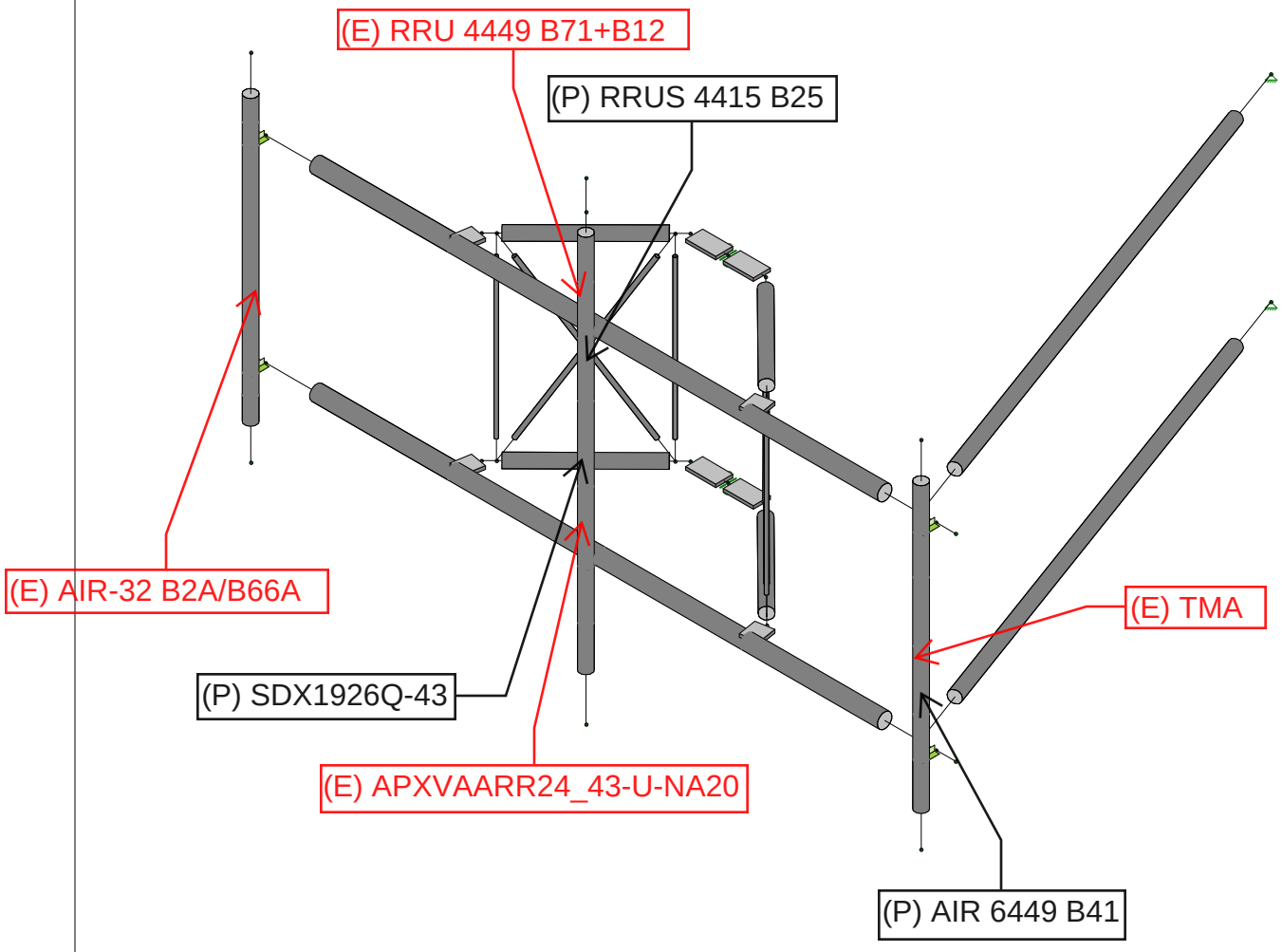
Mount Center Line=	110 ft

Reduction Factor = 1

Mount Part	Quantity	Length (ft)	Projected Width (in)	Depth (in)	Flat or Cylindrical?	Drag Factor	Projected Area (ft^2)	Wind Force (lbs/ft)	Ice Weight Area (ft^2)	Ice Weight (lbs/ft)	Projected Area with Ice (ft^2)	Wind Force Ice (lbs/ft)	Service Wind Force (lbs/ft)
Face Horizontal_2.5" STD Pipe	2	12.00	2.88	2.88	Cylindrical	1.2	6.90	10.6	18.06	7.4	17.05	5.6	3.7
Sector Horizontal_2.0" STD Pipe	4	2.50	2.38	2.38	Cylindrical	1.2	2.38	8.7	6.21	6.1	6.60	5.2	3.1
Sector Vertical_5/8" SR	4	3.33	0.63	0.63	Cylindrical	1.2	0.83	2.3	2.18	1.6	6.47	3.8	0.8
Sector Brace_3/4" SR	4	4.00	0.75	0.75	Cylindrical	1.2	1.20	2.8	3.14	1.9	7.97	3.9	1.0
Mount Pipe_2.0" STD	3	8.00	2.38	2.38	Cylindrical	1.2	5.70	8.7	14.92	6.1	15.85	5.2	3.1
Connection Plate_PL3.5x5/8	4	0.40	0.63	3.50	Flat	2	0.17	3.8	1.10	6.8	1.29	6.4	1.4
Stiffarm Pipe_2.0" STD	2	10.00	2.38	2.38	Cylindrical	1.2	4.75	8.7	12.43	6.1	13.21	5.2	3.1

APPENDIX B

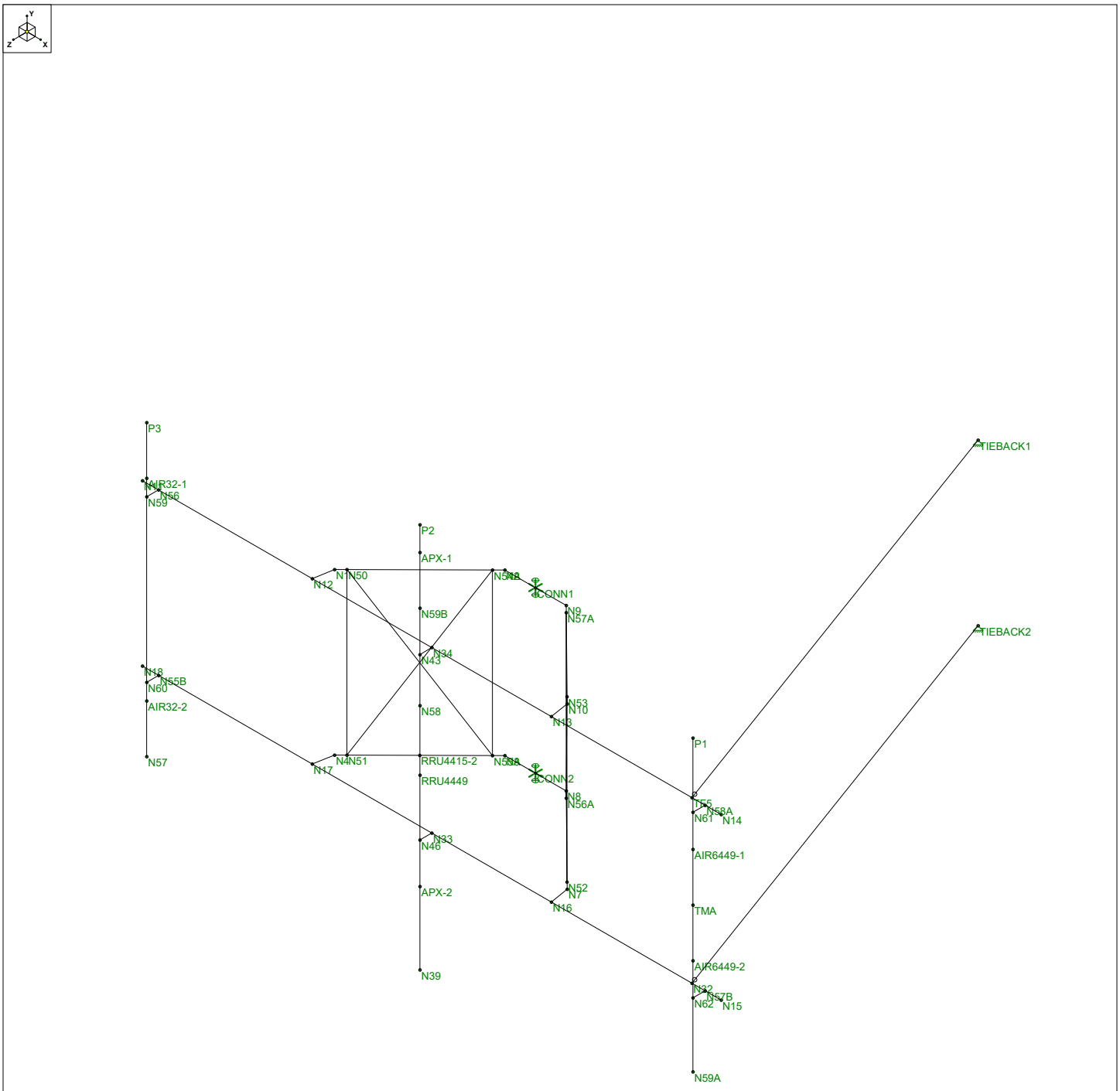
WIRE FRAME AND RENDERED MODELS



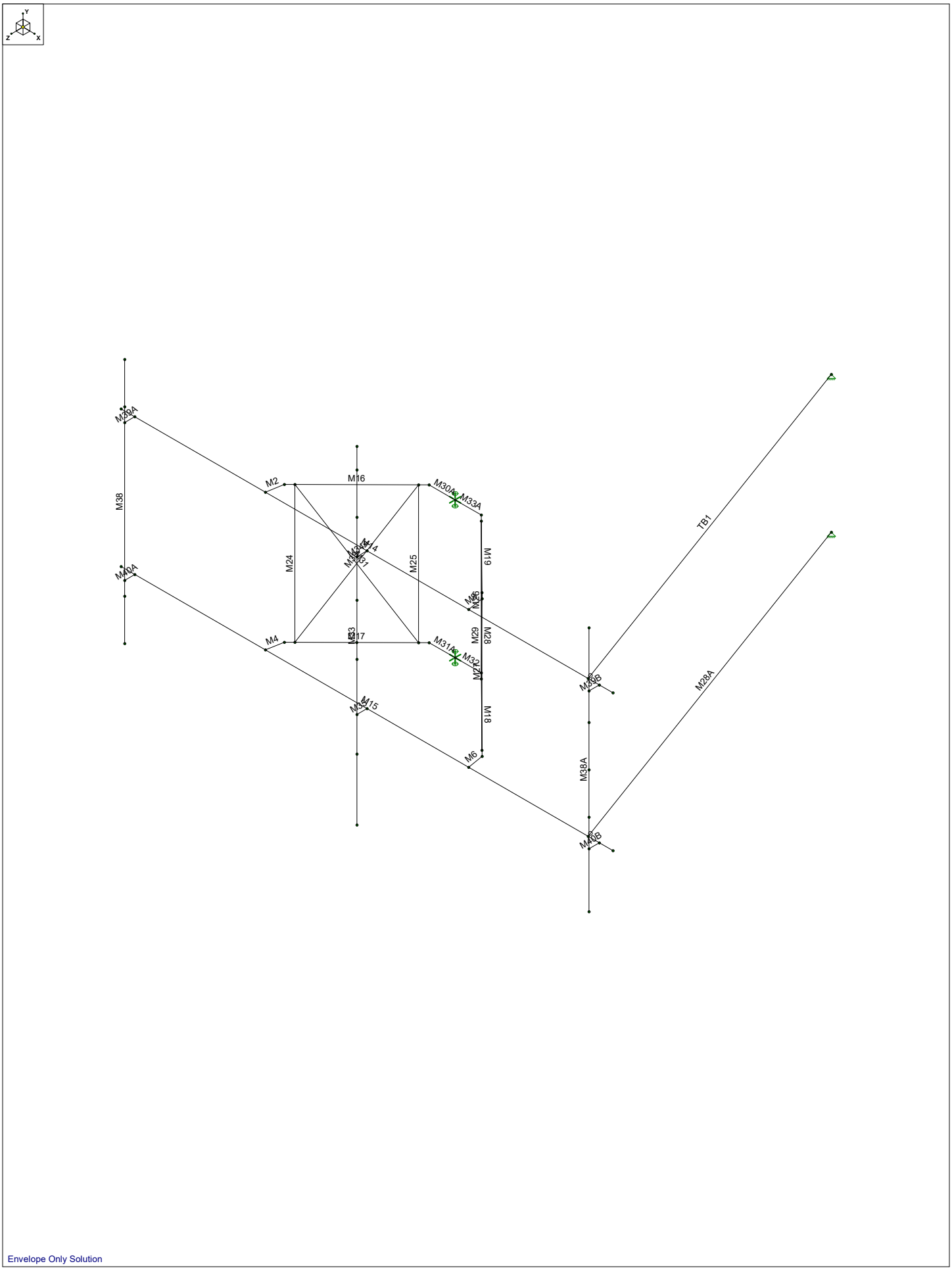
NOTES:
1)EXISTING AND PROPOSED ANTENNAS AND MOUNTING PIPES HAVE BEEN VERTICALLY OFFSET ALONG THE EXISTING MOUNT BY 1 FT.
2) LISTED APPURTENANCES ABOVE ARE TYPICAL FOR ALL SECTORS.
3) RADIOS ARE LOCATED BEHIND THE ANTENNAS.

(P) PROPOSED
(E) EXISTING

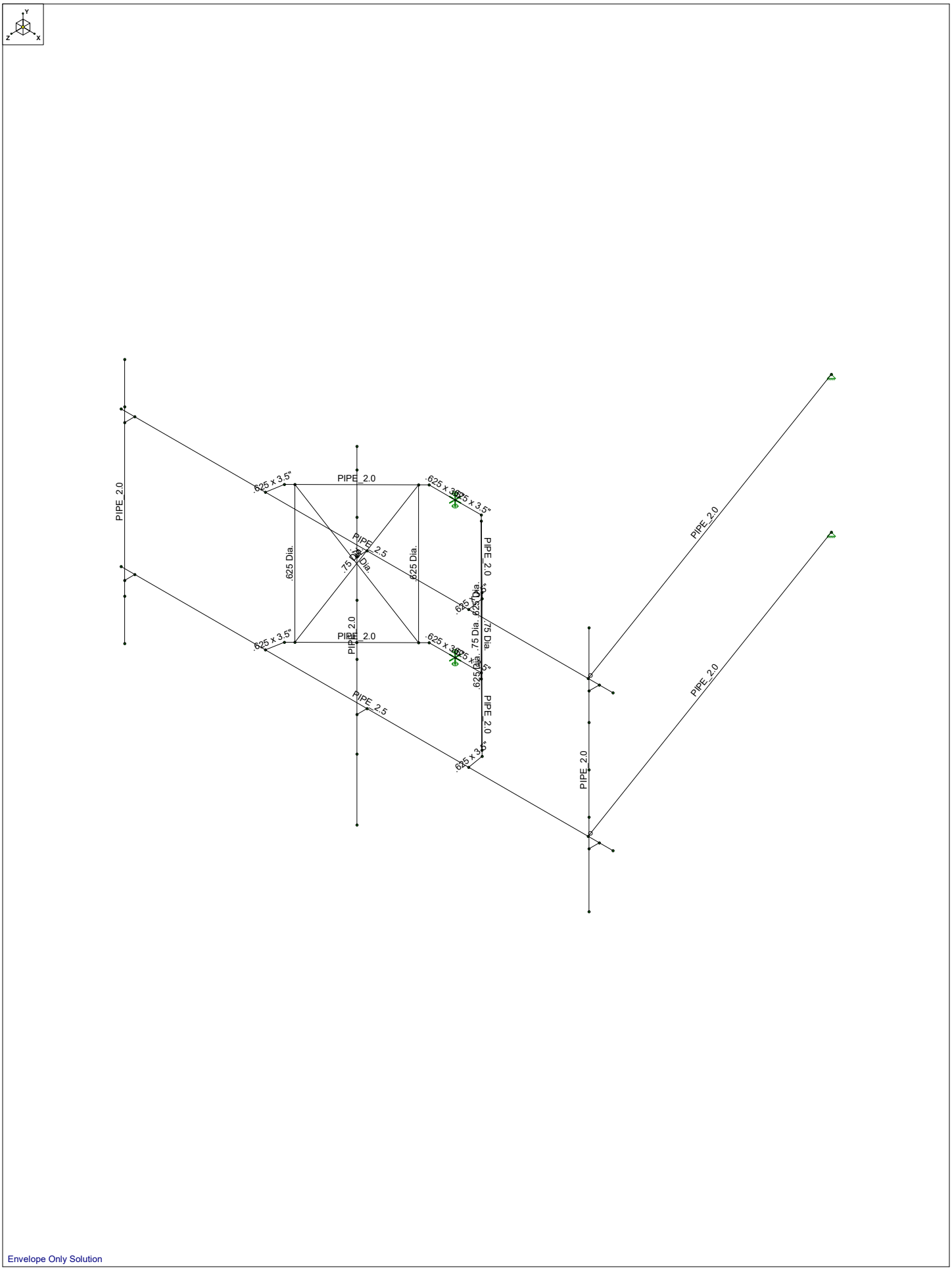
Envelope Only Solution



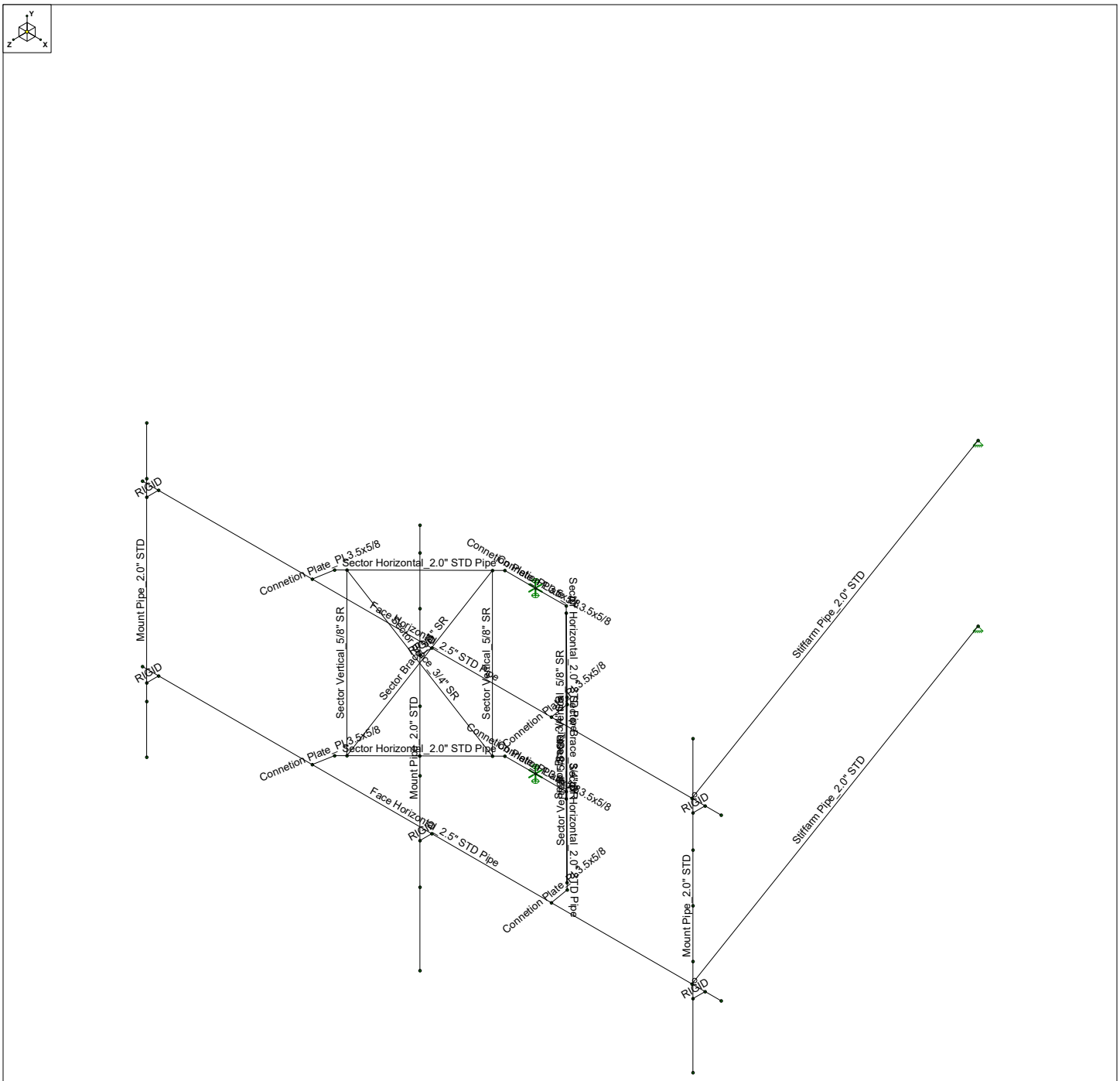
Envelope Only Solution



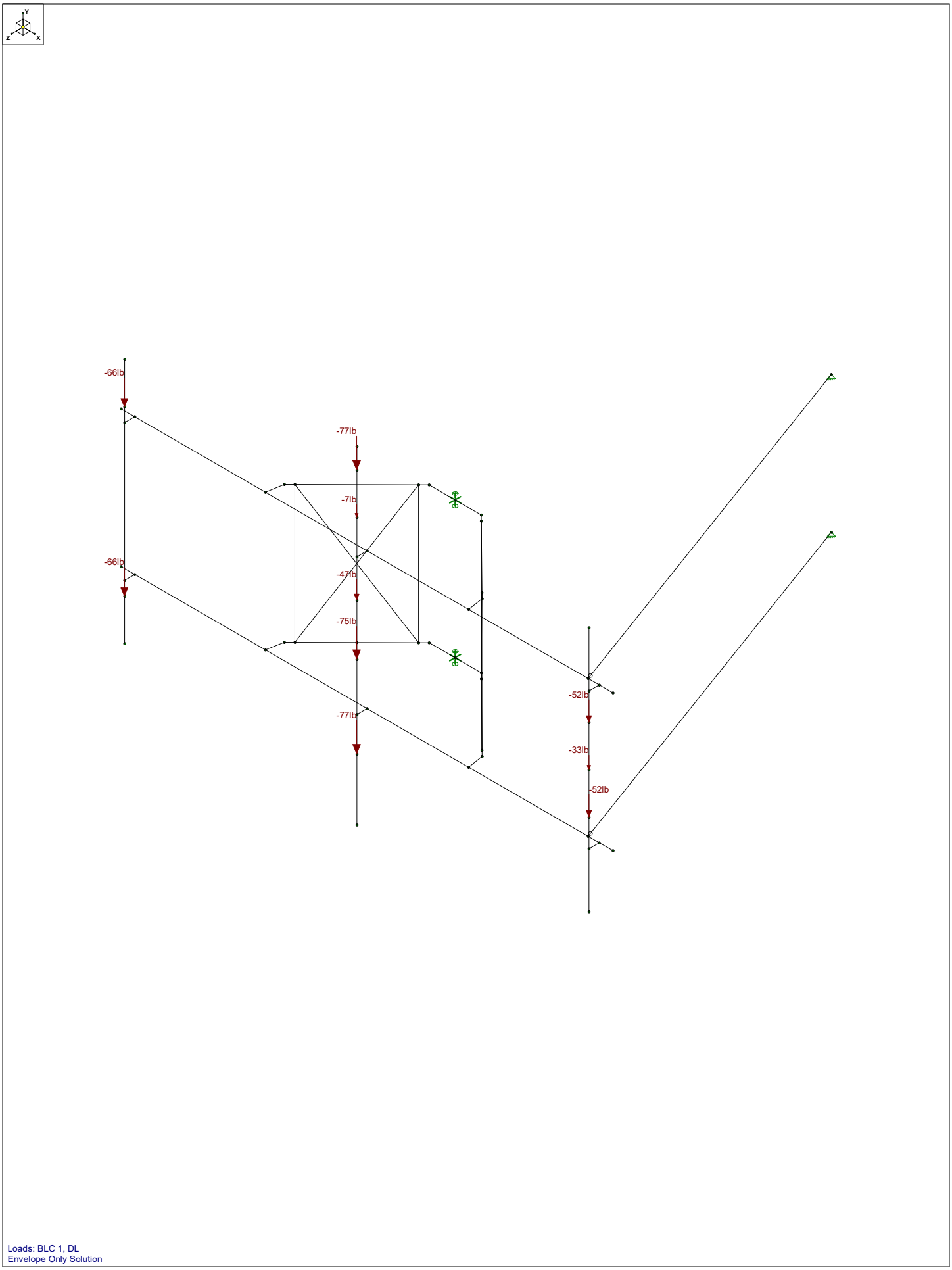
Envelope Only Solution



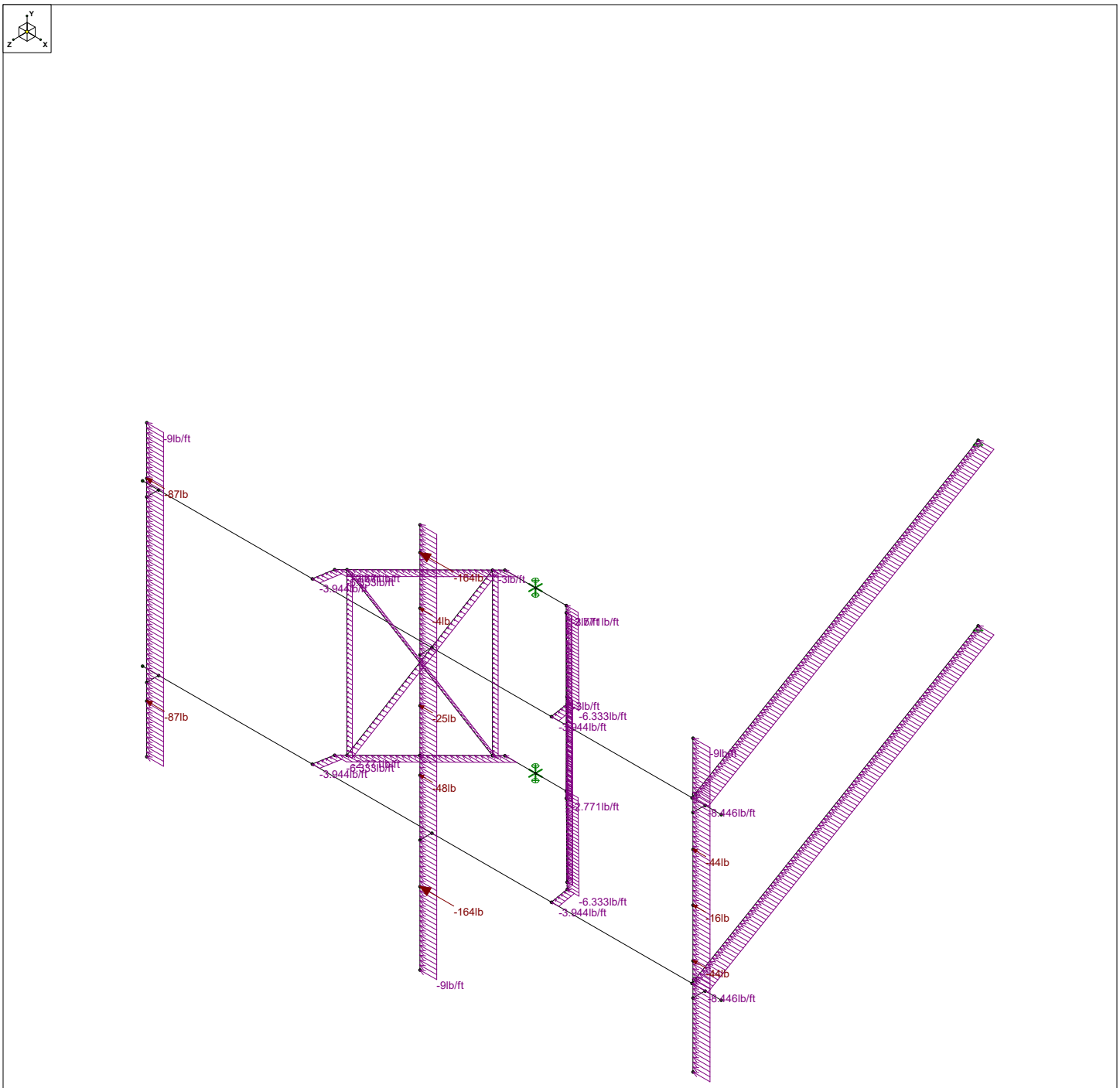
Envelope Only Solution



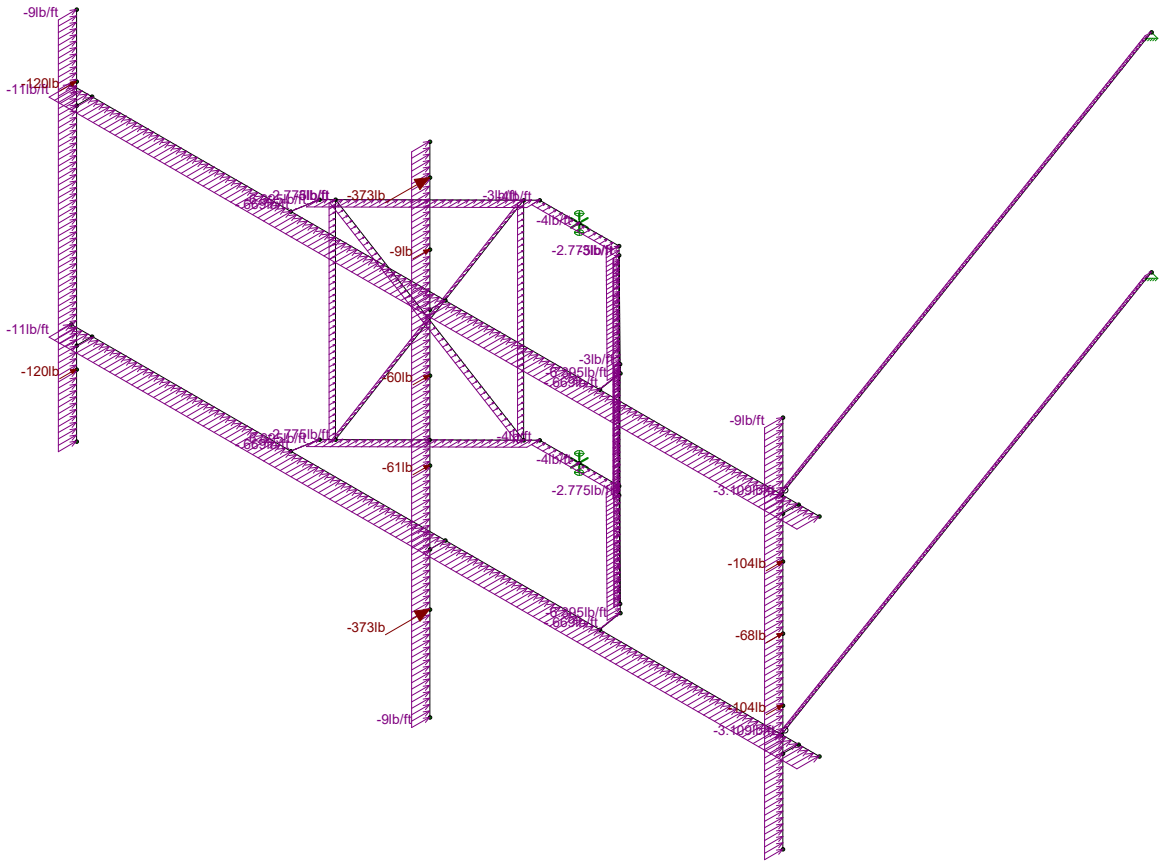
Envelope Only Solution



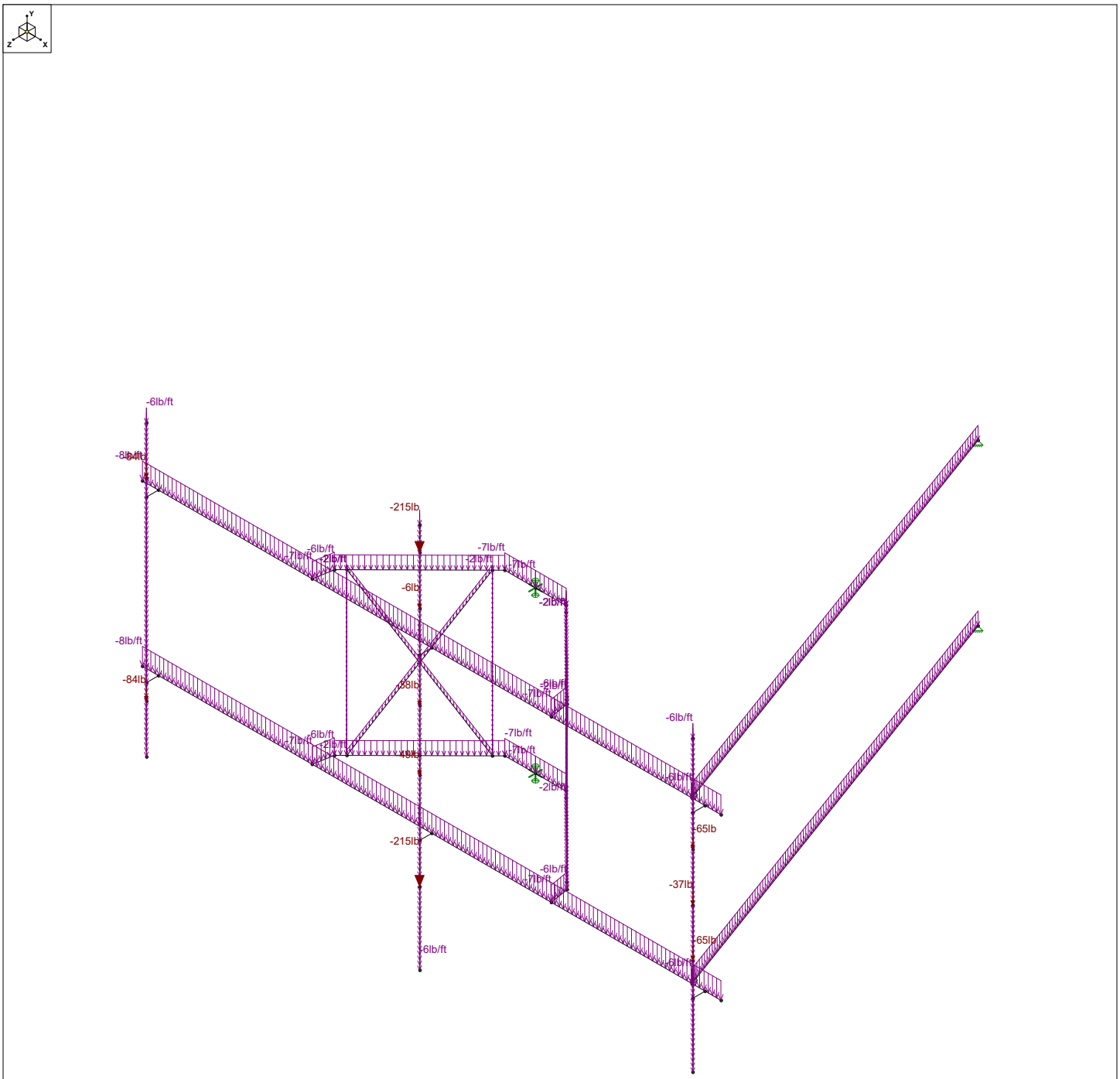
Loads: BLC 1, DL
Envelope Only Solution



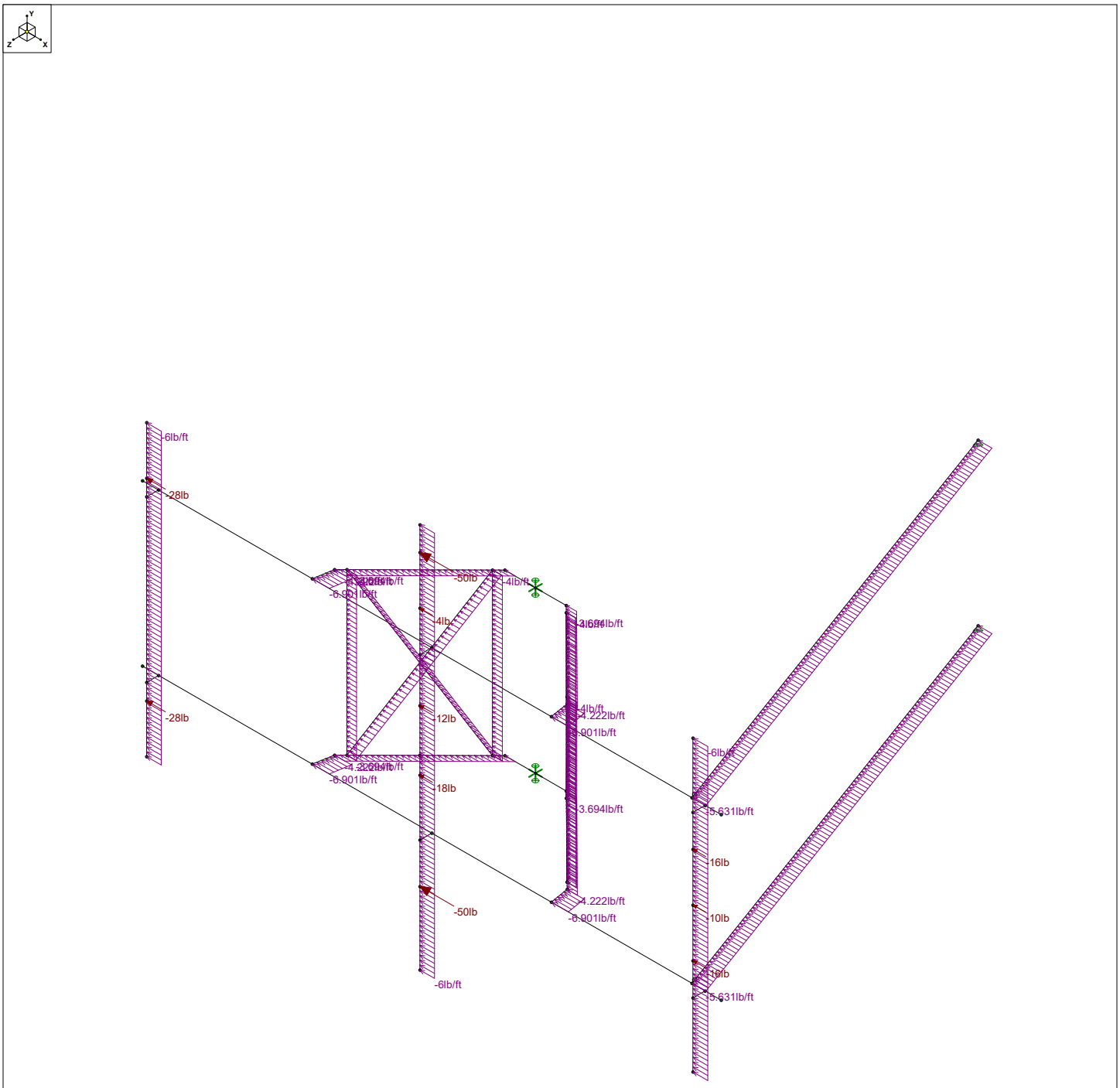
Loads: BLC 2, WLX
Envelope Only Solution



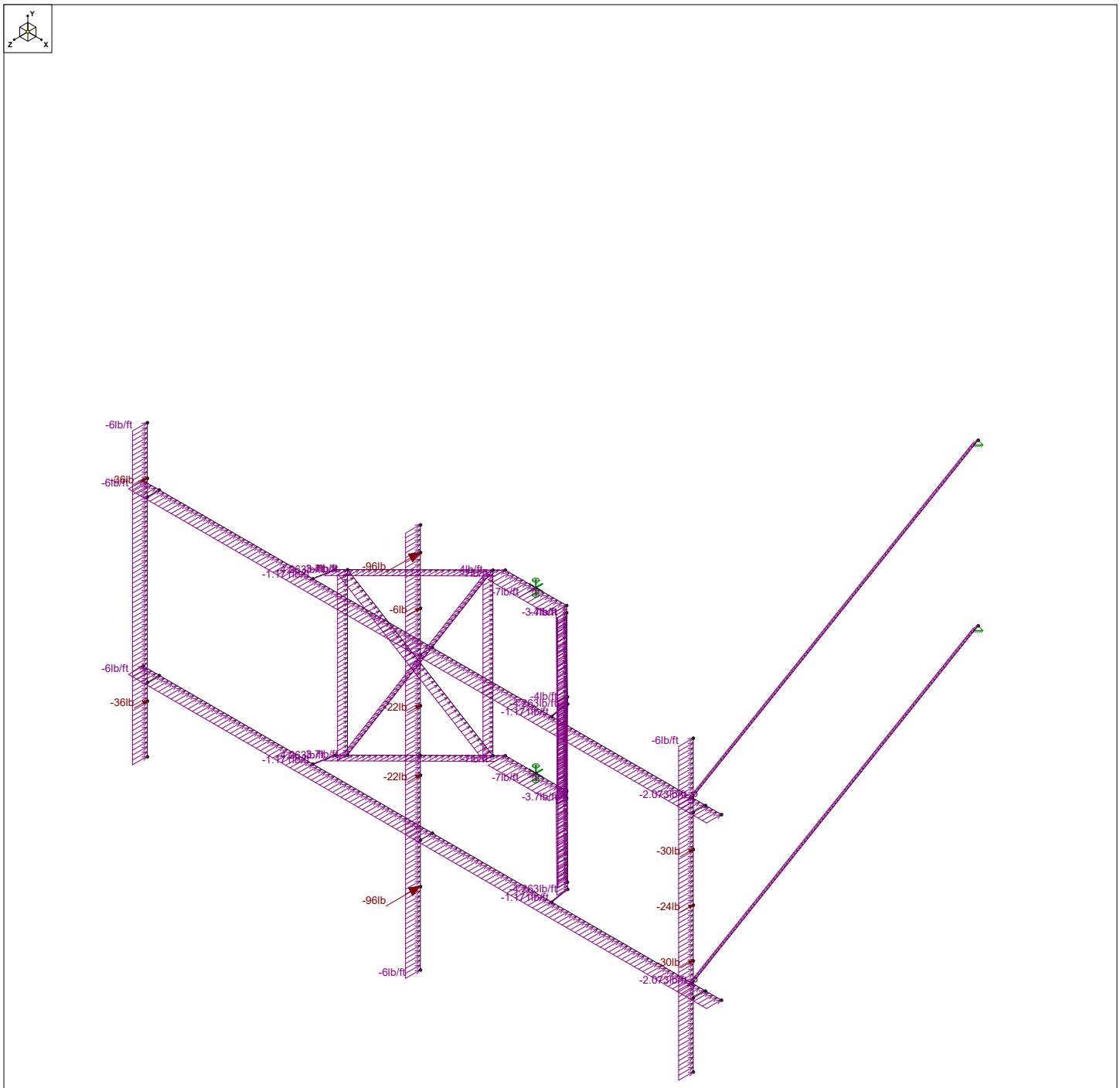
Loads: BLC 3, WLZ
Envelope Only Solution



Loads: BLC 4, DLi
Envelope Only Solution



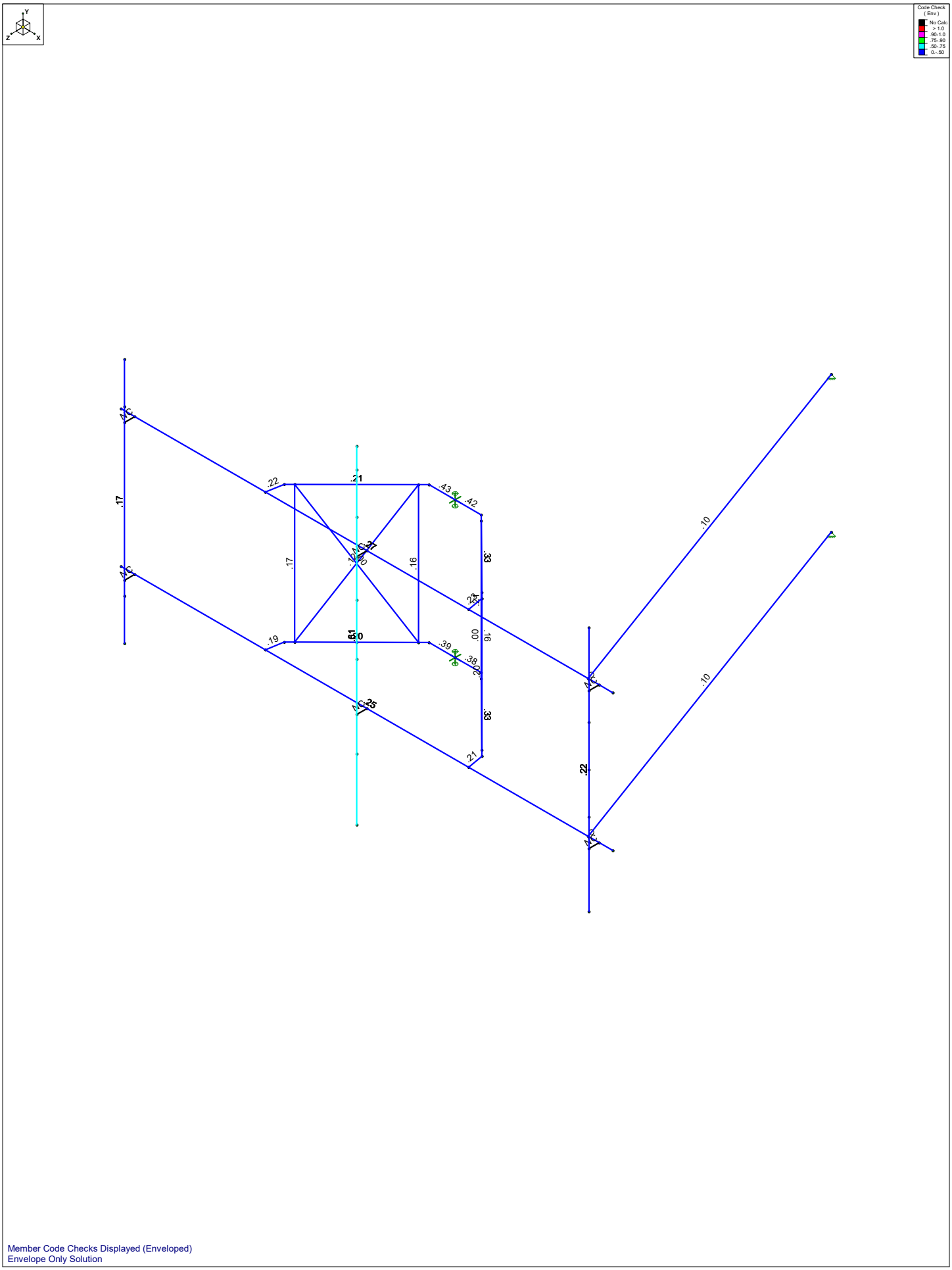
Loads: BLC 5, WLXi
Envelope Only Solution



Loads: BLC 6, WLZi
Envelope Only Solution

APPENDIX C

SOFTWARE ANALYSIS OUTPUT



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	DL	DL		-1.05		10				
2	WLX	WLX				10		27		
3	WLZ	WLZ				10		27		
4	DLi	SL				10		27		
5	WLXi	WL+X				10		27		
6	WLZi	WL+Z				10		27		

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	**LRFD**																							
2	1.4D	Yes	Y		1	1.4																		
3	1.2D+1.6(WLX+WLZ) - 0 Deg	Yes	Y		1	1.2	2	1.6																
4	1.2D+1.6(WLX+WLZ) - 30 Deg	Yes	Y		1	1.2	2	1.3...	3	.8														
5	1.2D+1.6(WLX+WLZ) - 60 Deg	Yes	Y		1	1.2	2	.8	3	1.3...														
6	1.2D+1.6(WLX+WLZ) - 90 Deg	Yes	Y		1	1.2	2		3	1.6														
7	1.2D+1.6(WLX+WLZ) - 120 Deg	Yes	Y		1	1.2	2	-.8	3	1.3...														
8	1.2D+1.6(WLX+WLZ) - 150 Deg	Yes	Y		1	1.2	2	-1....	3	.8														
9	1.2D+1.6(WLX+WLZ) - 180 Deg	Yes	Y		1	1.2	2	-1.6	3															
10	1.2D+1.6(WLX+WLZ) - 210 Deg	Yes	Y		1	1.2	2	-1....	3	-.8														
11	1.2D+1.6(WLX+WLZ) - 240 Deg	Yes	Y		1	1.2	2	-.8	3	-1....														
12	1.2D+1.6(WLX+WLZ) - 270 Deg	Yes	Y		1	1.2	2		3	-1.6														
13	1.2D+1.6(WLX+WLZ) - 300 Deg	Yes	Y		1	1.2	2	.8	3	-1....														
14	1.2D+1.6(WLX+WLZ) - 330 Deg	Yes	Y		1	1.2	2	1.3...	3	-.8														
15	**Wind Load with Ice**																							
16	1.2D+1.0Di+1.0(WLXi+WLZi) - 0...	Yes	Y		1	1.2	4	1	5	1	6													
17	1.2D+1.0Di+1.0(WLXi+WLZi) - 3...	Yes	Y		1	1.2	4	1	5	.87	6	.5												
18	1.2D+1.0Di+1.0(WLXi+WLZi) - 6...	Yes	Y		1	1.2	4	1	5	.5	6	.87												
19	1.2D+1.0Di+1.0(WLXi+WLZi) - 9...	Yes	Y		1	1.2	4	1	5		6	1												
20	1.2D+1.0Di+1.0(WLXi+WLZi) - 1...	Yes	Y		1	1.2	4	1	5	-.5	6	.87												
21	1.2D+1.0Di+1.0(WLXi+WLZi) - 1...	Yes	Y		1	1.2	4	1	5	-.87	6	.5												
22	1.2D+1.0Di+1.0(WLXi+WLZi) - 1...	Yes	Y		1	1.2	4	1	5	-1	6													
23	1.2D+1.0Di+1.0(WLXi+WLZi) - 2...	Yes	Y		1	1.2	4	1	5	-.87	6	-.5												
24	1.2D+1.0Di+1.0(WLXi+WLZi) - 2...	Yes	Y		1	1.2	4	1	5	-.5	6	-.87												
25	1.2D+1.0Di+1.0(WLXi+WLZi) - 2...	Yes	Y		1	1.2	4	1	5		6	-1												
26	1.2D+1.0Di+1.0(WLXi+WLZi) - 3...	Yes	Y		1	1.2	4	1	5	.5	6	-.87												
27	1.2D+1.0Di+1.0(WLXi+WLZi) - 3...	Yes	Y		1	1.2	4	1	5	.87	6	-.5												

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Face Horizontal_2.5"...	PIPE_2.5	None	None	A53 Gr. B	Typical	1.61	1.45	1.45	2.89
2	Mount Pipe_2.0" STD	PIPE_2.0	None	None	A53 Gr. B	Typical	1.02	.627	.627	1.25
3	Sector Brace_3/4" SR	.75 Dia.	None	None	A36 Gr.36	Typical	.442	.016	.016	.031

Hot Rolled Steel Section Sets (Continued)

	Label	Shape	Type	Design List	Material	Design...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
4	Sector Vertical_5/8" ...	.625 Dia.	None	None	A36 Gr.36	Typical	.307	.007	.007	.015
5	Connetion Plate_PL3...	.625 x 3.5"	None	None	A36 Gr.36	Typical	2.188	.071	2.233	.253
6	Sector Horizontal_2....	PIPE_2.0	None	None	A53 Gr. B	Typical	1.02	.627	.627	1.25
7	Stiffarm Pipe_2.0" S...	PIPE_2.0	None	None	A53 Gr. B	Typical	1.02	.627	.627	1.25

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	TIEBACK1	max	64.686	7	52.069	27	310.375	8	0	27	0	27	0	27
2		min	-72.205	13	21.684	8	-330.116	14	0	2	0	2	0	2
3	TIEBACK2	max	65.708	7	51.995	27	315.535	8	0	27	0	27	0	27
4		min	-57.481	13	21.677	8	-292.445	14	0	2	0	2	0	2
5	CONN2	max	966.15	3	1173.395	25	1964.552	6	0	27	898.284	4	0	27
6		min	-812.679	9	499.998	7	-569.677	12	0	2	-899.353	10	0	2
7	CONN1	max	979.242	3	1329.542	19	947.146	6	0	27	892.119	4	0	27
8		min	-1134.351	9	566.45	13	-2341.384	12	0	2	-878.836	10	0	2
9	Totals:	max	1896.881	3	2570.552	19	3291.817	6						
10		min	-1896.881	9	1133.146	12	-3291.818	12						

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc...	...	...	phi*P...	phi*P...	phi*M...	phi*M...	Cb	Eqn
1	M33	PIPE_2.0	.611	5.684	12	.067	5.6...		12	14918...	32130	1871....	1871....	2.45	H1-1b
2	M30A	.625 x 3.5"	.429	.636	24	.054	.636	y	12	64500...	70875	922.8...	5167....	1.57	H1-1b
3	M33A	.625 x 3.5"	.416	0	27	.053	0	y	25	64500...	70875	922.8...	5167....	1.571	H1-1b
4	M31A	.625 x 3.5"	.394	.636	18	.052	.636	y	20	64500...	70875	922.8...	5167....	1.566	H1-1b
5	M32	.625 x 3.5"	.379	0	21	.053	0	y	20	64500...	70875	922.8...	5167....	1.579	H1-1b
6	M19	PIPE_2.0	.333	2.5	10	.147	2.5		21	31128...	32130	1871....	1871....	2.051	H1-1b
7	M18	PIPE_2.0	.325	2.5	4	.131	2.5		27	31128...	32130	1871....	1871....	2.134	H1-1b
8	M14	PIPE_2.5	.268	8.526	10	.124	6		6	30825...	50715	3596....	3596....	1.478	H1-1b
9	M15	PIPE_2.5	.252	8.526	4	.084	6		12	30825...	50715	3596....	3596....	1.409	H1-1b
10	M8	.625 x 3.5"	.231	0	5	.050	.398	y	11	69777...	70875	922.8...	5167....	1.342	H1-1b
11	M2	.625 x 3.5"	.218	0	6	.039	0	y	12	69777...	70875	922.8...	5167....	2.173	H1-1b
12	M38A	PIPE_2.0	.216	4.578	16	.034	1.4...		12	20868...	32130	1871....	1871....	1.555	H1-1b
13	M16	PIPE_2.0	.215	2.5	10	.121	2.5		17	31128...	32130	1871....	1871....	2.099	H1-1b
14	M26	.625 Dia.	.212	0	21	.004	3.3...		27	4378....	9940....	103.5...	103.5...	2.377	H1-1b
15	M6	.625 x 3.5"	.211	0	11	.046	.398	y	4	69777...	70875	922.8...	5167....	1.283	H1-1b
16	M27	.625 Dia.	.200	3.333	20	.005	0		23	4378....	9940....	103.5...	103.5...	1	H1-1...
17	M17	PIPE_2.0	.200	2.5	4	.106	2.5		23	31128...	32130	1871....	1871....	2.006	H1-1b
18	M4	.625 x 3.5"	.190	0	12	.031	.398	y	7	69777...	70875	922.8...	5167....	1.702	H1-1b
19	M24	.625 Dia.	.169	3.333	18	.003	3.3...		7	4378....	9940....	103.5...	103.5...	2.401	H1-1...
20	M38	PIPE_2.0	.167	4.578	22	.030	1.4...		27	20868...	32130	1871....	1871....	1.555	H1-1b
21	M25	.625 Dia.	.159	0	16	.005	3.3...		23	4378....	9940....	103.5...	103.5...	1	H1-1b
22	M28	.75 Dia.	.157	0	21	.011	3.9...		4	3679....	14313...	178.9...	178.9...	2.306	H1-1b
23	M30	.75 Dia.	.121	0	21	.012	0		9	3679....	14313...	178.9...	178.9...	2.488	H1-1b
24	M28A	PIPE_2.0	.099	5.005	9	.007	10....		9	14893...	32130	1871....	1871....	1.137	H1-1b
25	TB1	PIPE_2.0	.099	5.005	9	.007	10....		9	14893...	32130	1871....	1871....	1.137	H1-1b
26	M29	.75 Dia.	.000	0	27	.000	0		27	3679....	14313...	178.9...	178.9...	1	H1-1a
27	M31	.75 Dia.	.000	0	27	.000	0		27	3679....	14313...	178.9...	178.9...	1	H1-1a

THE MAXIMUM MEMBER STRESS IS AT 61% OF ITS CAPACITY AND IS ADEQUATE TO SUPPORT THE PROPOSED UPGRADE.

SERVICE DEFLECTION = 0.16" x [(60MPH)^2/(101MPH)^2] = 0.06" < 1.6"
HENCE, OK.

BASED ON THE CURRENT REACTIONS AND STRESS RATIO'S IN THE FRAME MEMBERS, WE EXPECT THE CONNECTIONS TO BE ADEQUATE TO SUPPORT THE PROPOSED UPGRADE.

CONNECTICUT DESIGN CRITERIA - STATE

Revison:

CT is NOT a Home Rule State; Tab added only for Design Criteria

(APPENDIX N) MUNICIPALITY - SPECIFIC STRUCTURAL DESIGN PARAMETERS

Municipality	Ground Snow Load	*Wind Design Parameters*							
		MCE Spectral Accelerations (%g)		Ultimate Design Wind Speeds, V_{ult} (mph)			Nominal Design Wind Speeds, V_{asd} (mph)		
		S_s	S_1	Risk Cat.I	Risk Cat.II	Risk Cat III-IV	Risk Cat. I	Risk Cat. II	Risk Cat. III-IV
Andover	30	0.176	0.063	120	130	140	93	101	108
Ansonia	30	0.195	0.064	115	125	135	89	97	105
Ashford	35	0.173	0.063	120	130	140	93	101	108
Avon	35	0.181	0.064	110	120	130	85	93	101
Barkhamsted	40	0.177	0.065	110	120	125	85	93	97
Beacon Falls	30	0.192	0.064	115	125	135	89	97	105
Berlin	30	0.183	0.063	115	125	135	89	97	105
Bethany	30	0.189	0.063	115	125	135	89	97	105
Bethel	30	0.215	0.066	110	120	125	85	93	97
Bethlehem	35	0.190	0.065	110	120	125	85	93	97
Bloomfield	35	0.180	0.064	115	125	130	89	97	101
Bolton	30	0.177	0.063	115	125	135	89	97	105
Bozrah	30	0.170	0.061	120	135	145	93	105	112
Branford	30	0.180	0.061	120	130	140	93	101	108
Bridgeport	30	0.209	0.064	115	125	135	89	97	105
Bridgewater	35	0.201	0.066	110	120	125	85	93	97
Bristol	35	0.185	0.064	110	120	130	85	93	101
Brookfield	35	0.208	0.066	110	120	125	85	93	97
Brooklyn	35	0.171	0.062	120	130	140	93	101	108
Burlington	35	0.182	0.064	110	120	130	85	93	101
Canaan	40	0.173	0.065	105	115	120	81	89	93
Canterbury	35	0.171	0.061	120	130	140	93	101	108
Canton	35	0.180	0.064	110	120	130	85	93	101
Chaplin	35	0.173	0.062	120	130	140	93	101	108
Cheshire	30	0.186	0.063	115	125	135	89	97	105
Chester	30	0.172	0.060	120	130	140	93	101	108
Clinton	30	0.169	0.059	120	135	140	93	105	108
Colchester	30	0.174	0.061	120	130	140	93	101	108
Colebrook	40	0.174	0.065	105	115	125	81	89	97
Columbia	30	0.175	0.062	120	130	140	93	101	108
Cornwall	40	0.180	0.065	105	115	120	81	89	93
Coventry	30	0.176	0.063	120	130	140	93	101	108
Cromwell	30	0.181	0.063	115	125	135	89	97	105
Danbury	30	0.217	0.067	110	120	125	85	93	97
Darien	30	0.242	0.068	110	120	130	85	93	101
Deep River	30	0.170	0.060	120	130	140	93	101	108
Derby	30	0.195	0.064	115	125	135	89	97	105
Durham	30	0.179	0.062	115	130	140	89	101	108
Eastford	40	0.172	0.063	120	130	140	93	101	108
East Granby	35	0.177	0.065	110	120	130	85	93	101
East Haddam	30	0.172	0.061	120	130	140	93	101	108
East Hampton	30	0.177	0.062	120	130	140	93	101	108

East Hartford	30	0.180	0.064	115	125	135	89	97	105
East Haven	30	0.182	0.062	120	130	140	93	101	108
East Lyme	30	0.164	0.059	125	135	145	97	105	112
Easton	30	0.215	0.066	110	120	130	85	93	101
East Windsor	35	0.177	0.064	115	125	135	89	97	105
Ellington	35	0.176	0.064	115	125	135	89	97	105
Enfield	35	0.176	0.065	110	125	130	85	97	101
Essex	30	0.168	0.059	120	135	145	93	105	112
Fairfield	30	0.215	0.065	115	125	135	89	97	105
Farmington	35	0.183	0.064	115	125	135	89	97	105
Franklin	30	0.171	0.061	120	130	140	93	101	108
Glastonbury	30	0.180	0.063	115	125	135	89	97	105
Goshen	40	0.181	0.065	105	115	125	81	89	97
Granby	35	0.176	0.065	110	120	130	85	93	101
Greenwich	30	0.259	0.070	110	120	130	85	93	101
Griswold	30	0.168	0.060	125	135	145	97	105	112
Groton	30	0.160	0.058	125	135	145	97	105	112
Guilford	30	0.176	0.061	120	130	140	93	101	108
Haddam	30	0.175	0.061	120	130	140	93	101	108
Hamden	30	0.185	0.063	115	125	135	89	97	105
Hampton	35	0.172	0.062	120	130	140	93	101	108
Hartford	30	0.181	0.064	115	125	135	89	97	105
Hartland	40	0.175	0.065	110	120	125	85	93	97
Harwinton	35	0.183	0.065	110	120	130	85	93	101
Hebron	30	0.177	0.063	120	130	140	93	101	108
Kent	40	0.188	0.065	105	115	120	81	89	93
Killingly	40	0.171	0.062	120	130	140	93	101	108
Killingworth	30	0.173	0.061	120	130	140	93	101	108
Lebanon	30	0.173	0.062	120	130	140	93	101	108
Ledyard	30	0.163	0.059	125	135	145	97	105	112
Lisbon	30	0.169	0.061	125	135	145	97	105	112
Litchfield	40	0.184	0.065	110	120	125	85	93	97
Lyme	30	0.164	0.059	125	135	145	97	105	112
Madison	30	0.173	0.060	120	130	140	93	101	108
Manchester	30	0.178	0.064	115	125	135	89	97	105
Mansfield	35	0.173	0.062	120	130	140	93	101	108
Marlborough	30	0.177	0.062	120	130	140	93	101	108
Meriden	30	0.183	0.063	115	125	135	89	97	105
Middlebury	35	0.191	0.064	110	120	130	85	93	101
Middlefield	30	0.181	0.063	115	125	135	89	97	105
Middletown	30	0.180	0.063	115	130	135	89	101	105
Milford	30	0.194	0.063	115	125	135	89	97	105
Monroe	30	0.205	0.065	110	120	130	85	93	101
Montville	30	0.165	0.059	125	135	145	97	105	112
Morris	35	0.187	0.065	110	120	125	85	93	97
Naugatuck	30	0.190	0.064	110	125	135	85	97	105
New Britain	30	0.183	0.064	115	125	135	89	97	105
New Canaan	30	0.240	0.068	110	120	130	85	93	101
New Fairfield	35	0.212	0.067	105	115	125	81	89	97
Portland	30	0.180	0.063	115	130	135	89	101	105
Preston	30	0.167	0.060	125	135	145	97	105	112
Prospect	30	0.188	0.064	115	125	135	89	97	105
Putnam	40	0.172	0.063	120	130	140	93	101	108

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:	Mon Jul 27 2020

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.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.

Date: **October 2, 2020**

Structural Modification Analysis Report

Tower Owner: City of Middletown
Carrier: T-Mobile Northeast LLC

Site ID: CTHA242A
Site Name: HA242/PortlandHS_SST
Site Data: 95 High Street, Portland, Middlesex County, CT 06480
Latitude *41° 34' 52.01"*, Longitude *-72° 37' 19.98"*
120 ft Self-Support Tower

Tectonic Project Number: 10473.CTHA242A

Tectonic Engineering & Surveying Consultants P.C. is pleased to submit this **"Structural Modification 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 upon proposed modifications. Based on our analysis we have determined the tower stress level for the structure and foundation upon installation of proposed modifications to be:

Structure: **Sufficient Capacity – 99.8%**
Foundation: **Sufficient Capacity – 97.5%**

This analysis has been performed in accordance with the 2018 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C with a maximum topographic factor, Kzt, of 1.0 and Structure Class III were used in this analysis.

All modifications and equipment proposed in this report shall be installed in accordance with this analysis for the determined available structural capacity to be effective.

We at Tectonic appreciate the opportunity of providing our continuing professional services to you and T-Mobile. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural modification analysis prepared by: John-Fritz Julien / Ian Marinaccio

Respectfully submitted by:
Tectonic Engineering & Surveying Consultants P.C.

Edward N. Iamiceli, P.E.
Managing Director - Structural

Project Contact Info

1279 Route 300 | Newburgh, NY 12550
845.567.6656 Tel | 845.567.8703 Fax

tectonicengineering.com
Equal Opportunity Employer

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 120 ft Self Support tower designed by PiRod, Inc. The tower is located in Portland Connecticut and is currently being used by T-Mobile and City of Middletown.

2) ANALYSIS CRITERIA

TIA-222 Revision: TIA-222-G
Risk Category: III
Wind Speed: 101 mph
Exposure Category: C
Topographic Factor: 1.0
Ice Thickness: 0.75 in
Wind Speed with Ice: 50 mph
Service Wind Speed: 60 mph

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Carrier Designation	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
110.0	T-Mobile	3	commscope	SDX1926Q-43	1	6x12 Hybrid	-
		3	ericsson	AIR 6449 B41			
		3	ericsson	RRUS 4415 B25			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Carrier Designation	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
119.0	Unknown	1	rfs celwave	PD220-9	1 1	1/2 7/8	1
		1	-	TMA			
118.0		2	rfs celwave	PD220-2	2	1/2	1
		2	tower mounts	Side Arm Mount			
110.0	T-Mobile	3	-	Twin Style TMA	6 3	1-5/8 6x12 Hybrid	1
		3	ericsson	AIR 32 B66Aa B2a			
		3	ericsson	RADIO 4449 B12/B71			
		3	rfs	APXVARR24_43-C-NA20			
		3	tower mounts	12' Sector Mount			
		3	ericsson	AIR 21 B2A/B4P	-	-	2
108.0	Unknown	1	telewave	ANT50D	1	7/8	1
95.0		1	-	Twin Style TMA	1 1	EW90 7/8	1
		1	andrew	Andrew 6' Dish			
		1	tower mounts	Dish Mount			
91.0		1	telewave	ANT50D	1	7/8	1
90.0		1	andrew	Andrew 4' Dish	1	EW90	1
		1	tower mounts	Dish Mount			
87.0		1	miscl	10' Omni	1	1/2	1
		1	tower mounts	Side Arm Mount			

Mounting Level (ft)	Carrier Designation	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
80.0	Unknown	1	rfs celwave	PD220-2	2	1/2	1
		1	rfs celwave	PD220-9			
		2	tower mounts	Side Arm Mount			

Notes:
1) Existing equipment
2) Existing equipment to be removed, not considered in analysis

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Dated
GEOTECHNICAL REPORT	Clarence Welti Assoc., Inc.	12/20/04
ORIGINAL TOWER AND FOUNDATION DRAWINGS	PiRod	12/28/04
TOWER REINFORCEMENT DRAWINGS & SPECIFICATIONS	KM Consulting Engineers, Inc.	09/29/17
STRUCTURAL MODIFICATION ANALYSIS REPORT	KM Consulting Engineers, Inc.	01/05/18
STRUCTURAL ANALYSIS REPORT	B+T Group	07/19/19
RFDS	T-Mobile	07/06/20
SITE VISIT	Tectonic	07/17/20
STRUCTURAL ANALYSIS REPORT	Tectonic	08/25/20
GEOTECHNICAL REVIEW	Tectonic	09/30/20

3.1) Analysis Method

tnxTower (version 8.0.5.0), 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.

tnxTower was used to determine the loads on the modified structure. Additional calculations were performed to determine the stresses in the reinforced leg sections. These calculations are presented in Appendix C.

3.2) Assumptions

1) Tower and structures were built and maintained in accordance with the manufacturer's specifications.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2.
3) The weight and wind area of certain appurtenances have been estimated.

This analysis is solely for the supporting tower structure and it may be affected if any assumptions are not valid or have been made in error. Tectonic should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	120 - 110	Leg	1 3/4	2	-4.31	77.19	5.6	Pass
T2	110 - 90	Leg	1 3/4	35	-43.95	77.19	56.9	Pass
T3	90 - 70	Leg	2	91	-110.44	132.51	83.3	Pass
T4	70 - 50	Leg	*2-1/4 SR w/ Half 2.5 X-Strong	172	-178.57	194.35	91.9	Pass
T5	50 - 40	Leg	Pirod 105244 + (2) 1-1/4" Tie-Rods	229	-178.99	252.06	71.0	Pass
T6	40 - 20	Leg	Pirod 105216 + (2) 1-1/4" Tie-Rods	238	-200.61	252.06	79.6	Pass
T7	20 - 0	Leg	PiRod 105217 + (2) 1-1/2" Tie-Rods	253	-220.32	373.21	59.0 63.0 (b)	Pass
T1	120 - 110	Diagonal	3/4	15	-0.67	4.87	13.8	Pass
T2	110 - 90	Diagonal	*3/4 SR w/ 3/4 Clip	44	-4.59	7.53	60.9	Pass
T3	90 - 70	Diagonal	7/8	100	-7.20	8.88	81.1	Pass
T4	70 - 50	Diagonal	*7/8 SR w/ 7/8 SR Clipped	188	-6.07	11.24	53.9	Pass
T5	50 - 40	Diagonal	L2 1/2x2 1/2x3/16	232	-8.18	13.38	61.2 82.4 (b)	Pass
T6	40 - 20	Diagonal	L2 1/2x2 1/2x3/16	244	-5.39	10.79	49.9 60.1 (b)	Pass
T7	20 - 0	Diagonal	*L2.5x2.5x3/16 + PL2.5x1/4	256	-7.73	32.37	23.9 24.3 (b)	Pass
T3	90 - 70	Secondary Horizontal	1 1/4	115	-1.91	19.47	9.8	Pass
T1	120 - 110	Top Girt	3/4	6	-0.04	2.62	1.6	Pass
T2	110 - 90	Top Girt	*3/4 SR w/ 3/4 Clip	39	-0.45	2.67	16.9	Pass
T3	90 - 70	Top Girt	7/8	96	-0.23	4.91	4.7	Pass
T4	70 - 50	Top Girt	*7/8 SR w/ 7/8 SR Clipped	177	-0.11	4.98	2.3	Pass
T1	120 - 110	Bottom Girt	3/4	8	-0.20	2.62	7.7	Pass
T2	110 - 90	Bottom Girt	*3/4 SR w/ 3/4 Clip	42	-0.30	2.67	11.3	Pass
T3	90 - 70	Bottom Girt	*7/8 SR w/ 7/8 SR Clipped	98	-0.33	4.82	6.8	Pass
T4	70 - 50	Bottom Girt	*7/8 SR w/ 7/8 SR Clipped	179	-1.38	3.99	34.6	Pass
							Summary	
						Leg (T4)	91.9	Pass
						Diagonal (T5)	82.4	Pass
						Secondary Horizontal (T3)	9.8	Pass
						Top Girt (T2)	16.9	Pass
						Bottom Girt (T4)	34.6	Pass
						Bolt Checks	82.4	Pass
						Rating =	91.9	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Flange Bypass	70	88	Pass
1	Anchor Rods	0	74.3	Pass
1	Base Foundation	0	72.6	Pass
1	Base Foundation Soil Interaction	0	97.5	Pass

Structure Rating (max from all components) =	99.8%

Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity consumed.

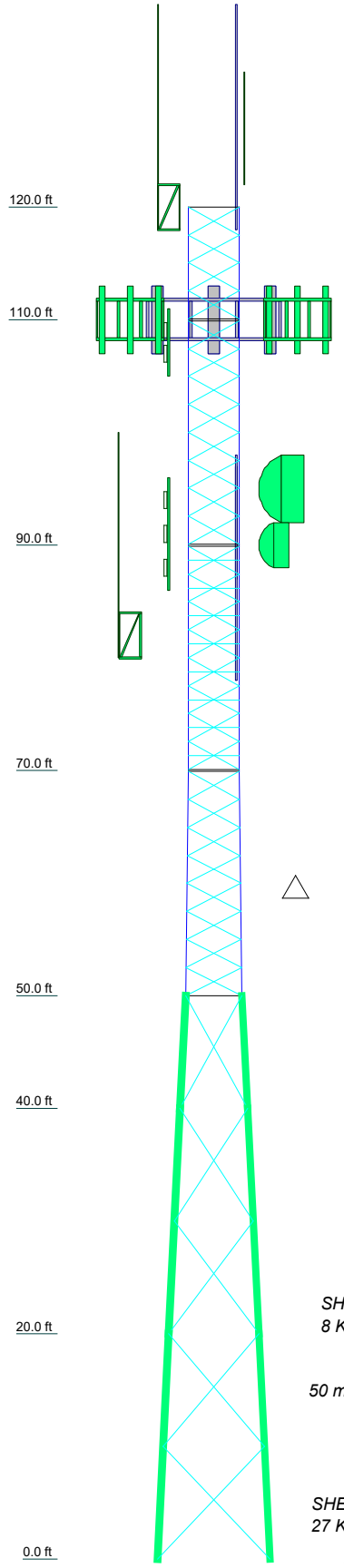
4.1) Results / Conclusions

The tower and its foundation have sufficient capacity to carry the proposed load configuration once the proposed modifications are installed as detailed in the drawings.

APPENDIX A

TNXTOWER OUTPUT

Section		T1	T2	T3	T4	T5	T6	T7
Legs		SR 1 3/4		SR 2	*2-1/4 SR w/ Half 2.5 X-Strong	A	Pirod 105216 + (2) 1-1/4" Tie-Rods	PiRod 105217 + (2) 1-1/2" Tie-Rods
Leg Grade		A572-50						
Diagonals	SR 3/4	*3/4 SR w/ 3/4 Clip		SR 7/8	*7/8 SR w/ 7/8 SR Clipped		L2 1/2x2 1/2x3/16	*L2.5x2.5x3/16 + PL2.5x1/4
Diagonal Grade		A36						
Top Girts	SR 3/4	*3/4 SR w/ 3/4 Clip		SR 7/8	*7/8 SR w/ 7/8 SR Clipped		N.A.	
Bottom Girts	SR 3/4	*3/4 SR w/ 3/4 Clip		*7/8 SR w/ 7/8 SR Clipped			N.A.	
Sec. Horizontals	N.A.			SR 1 1/4			N.A.	
Face Width (ft)	4.5					5	6	8
# Panels @ (ft)	20 @ 2.47917				8 @ 2.48958		5 @ 10	
Weight (K)	0.5	0.9		1.7	1.7	1.3	2.5	3.7



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PD220-9	119	RRUS 4415 B25	110
TMA	119	SDX1926Q-43	110
PD220-2	118	SDX1926Q-43	110
2' Side Arm Mount	118	SDX1926Q-43	110
PD220-2	118	12' Sector Mount	110
2' Side Arm Mount	118	ANT50D	108
AIR 32 B66Aa B2a	110	Dish Mount Pipe	95
AIR 32 B66Aa B2a	110	Dish Mount	95
AIR 32 B66Aa B2a	110	Twin Style TMA	95
APXVARR24_43-C-NA20 w/ Mount Pipe	110	Andrew 6' Dish	95
		ANT50D	91
APXVARR24_43-C-NA20 w/ Mount Pipe	110	Dish Mount Pipe	90
		Dish Mount	90
APXVARR24_43-C-NA20 w/ Mount Pipe	110	Andrew 4' Dish	90
RADIO 4449 B12/B71	110	10' horizontal x 2" Pipe Mount	87
RADIO 4449 B12/B71	110	72" Side Arm Mount	87
RADIO 4449 B12/B71	110	10' x 3" Dia Omni	87
Twin Style TMA	110	72" Side Arm Mount	80
Twin Style TMA	110	PD220-9	80
Twin Style TMA	110	72" Side Arm Mount	80
AIR 6449 B41	110	PD220-2	80
AIR 6449 B41	110	10' horizontal x 2" Pipe Mount	80
AIR 6449 B41	110	10' horizontal x 2" Pipe Mount	80
RRUS 4415 B25	110	(2) Jump Plate	70
RRUS 4415 B25	110	(2) Jump Plate	70
		(2) Jump Plate	70

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	Pirod 105244 + (2) 1-1/4" Tie-Rods		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 101 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class III.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 99.8%

ALL RE
ARE FA

MAX. CORNER REACTIONS AT BASE:

DOWN: 230 K
SHEAR: 20 K

UPLIFT: -214 K
SHEAR: 19 K

AXIAL
81 K
SHEAR
8 K
MOMENT
570 kip-ft

TORQUE 2 kip-ft
50 mph WIND - 0.75 in ICE

AXIAL
27 K
SHEAR
27 K
MOMENT
1918 kip-ft

TORQUE 20 kip-ft
REACTIONS - 101 mph WIND

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.

Tectonic
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-6656
FAX: (845) 567-8703

Job: ***10473.CTHA242A - Modification Analysis***			
Project: ***120' Self-Support Tower***			
Client: T-Mobile	Drawn by: Ian Marinaccio	App'd:	
Code: TIA-222-G	Date: 10/02/20	Scale: NTS	
Path: G:\Newburgh\Projects\10473-NSS\10473.CTHA242A\Structural\Tower Analysis\Reinf - Rev 0\10473.CTHA242A - TowerModificationSheet		Dwg No. E-1	

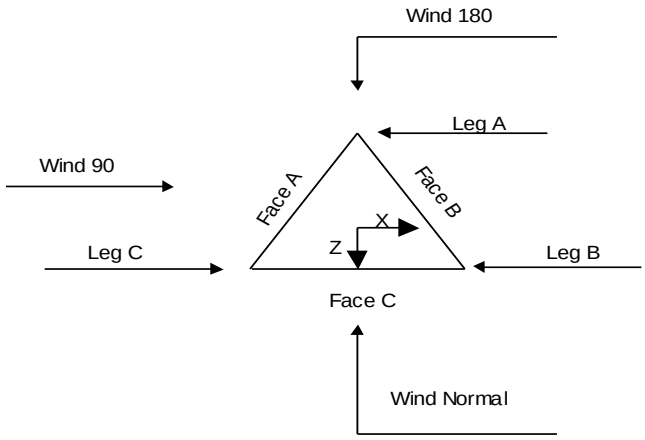
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 120.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 4.50 ft at the top and 10.00 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

1) Tower is located in Middlesex County, Connecticut.
2) Basic wind speed of 101 mph.
3) Structure Class III.
4) Exposure Category C.
5) Topographic Category 1.
6) Crest Height 0.00 ft.
7) Nominal ice thickness of 0.75 in.
8) Ice thickness is considered to increase with height.
9) Ice density of 56 pcf.
10) A wind speed of 50 mph is used in combination with ice.
11) Temperature drop of 50 °F.
12) Deflections calculated using a wind speed of 60 mph.
13) TOWER RATING: 99.8%
14) A non-linear (P-delta) analysis was used.
15) Pressures are calculated at each section.
16) Stress ratio used in tower member design is 1.
17) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Distribute Leg Loads As Uniform		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Horizontals		Assume Legs Pinned	√	Calculate Redundant Bracing Forces
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Use Moment Magnification	√	Use Clear Spans For Wind Area		SR Leg Bolts Resist Compression
√	Use Code Stress Ratios	√	Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		Offset Girt At Foundation
	Escalate Ice	√	Bypass Mast Stability Checks	√	Consider Feed Line Torque
	Always Use Max Kz		Use Azimuth Dish Coefficients	√	Include Angle Block Shear Check
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Use TIA-222-G Bracing Resist. Exemption
√	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-G Tension Splice Exemption
√	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination		Poles
√	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component		Include Shear-Torsion Interaction
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Always Use Sub-Critical Flow
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Use Top Mounted Sockets
	SR Members Are Concentric		Ignore KL/ry For 60 Deg. Angle Legs		Pole Without Linear Attachments
					Pole With Shroud Or No Appurtenances
					Outside and Inside Corner Radii Are Known



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	120.00-110.00			4.50	1	10.00
T2	110.00-90.00			4.50	1	20.00
T3	90.00-70.00			4.50	1	20.00
T4	70.00-50.00			4.50	1	20.00
T5	50.00-40.00			5.00	1	10.00
T6	40.00-20.00			6.00	1	20.00
T7	20.00-0.00			8.00	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	120.00-110.00	2.48	X Brace	No	No	0.00	1.00
T2	110.00-90.00	2.48	X Brace	No	No	1.00	1.00
T3	90.00-70.00	2.48	X Brace	No	Yes	1.00	1.00
T4	70.00-50.00	2.49	X Brace	No	No	1.00	0.00
T5	50.00-40.00	10.00	X Brace	No	No	0.00	0.00
T6	40.00-20.00	10.00	X Brace	No	No	0.00	0.00
T7	20.00-0.00	10.00	X Brace	No	No	0.00	0.00

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade

Tower Elevation ft	*Leg Type*	*Leg Size*	*Leg Grade*	*Diagonal Type*	*Diagonal Size*	*Diagonal Grade*
T1 120.00-110.00	Solid Round	1 3/4	A572-50 (50 ksi)	Solid Round	3/4	A36 (36 ksi)
T2 110.00-90.00	Solid Round	1 3/4	A572-50 (50 ksi)	Arbitrary Shape	*3/4 SR w/ 3/4 Clip	A36 (36 ksi)
T3 90.00-70.00	Solid Round	2	A572-50 (50 ksi)	Solid Round	7/8	A36 (36 ksi)
T4 70.00-50.00	Arbitrary Shape	*2-1/4 SR w/ Half 2.5 X-Strong	A572-50 (50 ksi)	Arbitrary Shape	*7/8 SR w/ 7/8 SR Clipped	A36 (36 ksi)
T5 50.00-40.00	Truss Leg	Pirod 105244 + (2) 1-1/4" Tie-Rods	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 40.00-20.00	Truss Leg	Pirod 105216 + (2) 1-1/4" Tie-Rods	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 20.00-0.00	Truss Leg	PiRod 105217 + (2) 1-1/2" Tie-Rods	A572-50 (50 ksi)	Arbitrary Shape	*L2.5x2.5x3/16 + PL2.5x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Top Girt Type*	*Top Girt Size*	*Top Girt Grade*	*Bottom Girt Type*	*Bottom Girt Size*	*Bottom Girt Grade*
T1 120.00-110.00	Solid Round	3/4	A36 (36 ksi)	Solid Round	3/4	A36 (36 ksi)
T2 110.00-90.00	Arbitrary Shape	*3/4 SR w/ 3/4 Clip	A36 (36 ksi)	Arbitrary Shape	*3/4 SR w/ 3/4 Clip	A36 (36 ksi)
T3 90.00-70.00	Solid Round	7/8	A36 (36 ksi)	Arbitrary Shape	*7/8 SR w/ 7/8 SR Clipped	A36 (36 ksi)
T4 70.00-50.00	Arbitrary Shape	*7/8 SR w/ 7/8 SR Clipped	A36 (36 ksi)	Arbitrary Shape	*7/8 SR w/ 7/8 SR Clipped	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Secondary Horizontal Type*	*Secondary Horizontal Size*	*Secondary Horizontal Grade*	*Inner Bracing Type*	*Inner Bracing Size*	*Inner Bracing Grade*
T3 90.00-70.00	Solid Round	1 1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Gusset Area (per face) ft²*	*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*
T1 120.00-110.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T2 110.00-90.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T3 90.00-70.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T4 70.00-50.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T5 50.00-40.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt

Tower Elevation *ft*	*Gusset Area (per face)* *ft²*	*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*
T6 40.00-20.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T7 20.00-0.00	0.00	0.00	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*K Factors[1]* *Legs*	*X Brace Diags* *X* *Y*	*K Brace Diags* *X* *Y*	*Single Diags* *X* *Y*	*Girts* *X* *Y*	*Horiz.* *X* *Y*	*Sec. Horiz.* *X* *Y*	*Inner Brace* *X* *Y*
T1 120.00-110.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T2 110.00-90.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T3 90.00-70.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T4 70.00-50.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T5 50.00-40.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T6 40.00-20.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T7 20.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

[1]Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry *(cont'd)*

	Truss-Leg K Factors					
	Truss-Legs Used As Leg Members			*Truss-Legs Used As Inner Members*		
Tower Elevation *ft*	*Leg Panels*	*X Brace Diagonals*	*Z Brace Diagonals*	*Leg Panels*	*X Brace Diagonals*	*Z Brace Diagonals*
T5 50.00-40.00	1	0.5	0.7	1	0.5	0.85
T6 40.00-20.00	1	0.5	0.7	1	0.5	0.85
T7 20.00-0.00	1	0.5	0.7	1	0.5	0.85

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Leg*		*Diagonal*		*Top Girt*		*Bottom Girt*		*Mid Girt*		*Long Horizontal*		*Short Horizontal*	
	Net Width Deduct in	*U*	*Net Width Deduct* in	*U*	*Net Width Deduct* in	*U*	*Net Width Deduct* in	*U*	*Net Width Deduct* in	*U*	*Net Width Deduct* in	*U*	*Net Width Deduct* in	*U*
T1 120.00-110.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	1	0.00	0.75	0.00	0.75

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T2 110.00-90.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	1	0.00	0.75	0.00	0.75
T3 90.00-70.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T4 70.00-50.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T5 50.00-40.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T6 40.00-20.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75
T7 20.00-0.00	0.00	1	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75	0.00	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 120.00-110.00	Sleeve DS	0.63 A325N	0	0.00 A325N	0	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0
T2 110.00-90.00	Sleeve DS	0.63 A325N	4	0.00 A325N	0	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0
T3 90.00-70.00	Sleeve DS	0.63 A325N	5	0.00 A325N	0	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0
T4 70.00-50.00	Sleeve DS	0.75 A325N	0	0.00 A325N	0	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0
T5 50.00-40.00	Flange	1.00 A325N	6	1.00 A325N	1	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0
T6 40.00-20.00	Flange	1.00 A325N	6	1.00 A325N	1	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0
T7 20.00-0.00	Flange	1.00 A325N	6	1.00 A325N	1	0.00 A325N	0	0.00 A325N	0	0.63 A325N	0	0.75 A325N	0	0.50 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
Reinforcement Area													
Reinf Area (2) 1-1/4" TR	A	No	No	Ar (CaAa)	50.00 - 20.00	0.00	-0.48	1	1	0.00	1.25		0.00
Reinf Area (2) 1-1/4" TR	B	No	No	Ar (CaAa)	50.00 - 20.00	0.00	-0.48	1	1	0.00	1.25		0.00
Reinf Area (2) 1-1/4" TR	C	No	No	Ar (CaAa)	50.00 - 20.00	0.00	-0.48	1	1	0.00	1.25		0.00
Reinf Area (2) 1-1/4" TR	A	No	No	Ar (CaAa)	50.00 - 20.00	0.00	0.48	1	1	0.00	1.25		0.00
Reinf Area (2) 1-1/4" TR	B	No	No	Ar (CaAa)	50.00 - 20.00	0.00	0.48	1	1	0.00	1.25		0.00
Reinf Area (2) 1-1/4" TR	C	No	No	Ar (CaAa)	50.00 - 20.00	0.00	0.48	1	1	0.00	1.25		0.00
***													
AVA7-50(1-5/8")	B	No	No	Ar (CaAa)	110.00 - 8.00	0.00	0.45	6	6	0.50	2.01		0.00

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
HCS 6X12 4AWG(1-5/8)	C	No	No	Ar (CaAa)	110.00 - 8.00	0.00	-0.48	3	3	0.50	1.66		0.00
FXL-540(1/2")	A	No	No	Ar (CaAa)	80.00 - 8.00	0.00	0.46	6	6	0.50	0.61		0.00
FXL-540(1/2")	A	No	No	Ar (CaAa)	87.00 - 80.00	0.00	0.5	4	4	0.50	0.61		0.00
FXL-540(1/2")	A	No	No	Ar (CaAa)	118.00 - 87.00	0.00	0.5	3	3	0.50	0.61		0.00
FXL-540(1/2")	A	No	No	Ar (CaAa)	119.00 - 118.00	0.00	0.5	1	1	0.50	0.61		0.00
AVA5-50(7/8")	B	No	No	Ar (CaAa)	91.00 - 8.00	0.00	-0.45	4	4	0.50	1.10		0.00
AVA5-50(7/8")	B	No	No	Ar (CaAa)	95.00 - 91.00	0.00	-0.45	3	3	0.50	1.10		0.00
AVA5-50(7/8")	A	No	No	Ar (CaAa)	108.00 - 95.00	0.00	0.5	2	2	0.50	1.10		0.00
AVA5-50(7/8")	A	No	No	Ar (CaAa)	119.00 - 108.00	0.00	0.5	1	1	0.50	1.10		0.00
EW90(ELLIPTICAL)	B	No	No	Ar (CaAa)	90.00 - 8.00	0.00	-0.48	2	2	0.50	1.28		0.00
EW90(ELLIPTICAL)**	A	No	No	Ar (CaAa)	95.00 - 90.00	0.00	0.5	1	1	1.28	1.28		0.00
Safety Line 3/8	C	No	No	Ar (CaAa)	120.00 - 8.00	0.00	0.5	1	1	0.38	0.38		0.00
Feedline Ladder (Af)	B	No	No	Af (CaAa)	120.00 - 8.00	-2.00	0.5	1	1	3.00	3.00		0.01
Feedline Ladder (Af)***	A	No	No	Af (CaAa)	120.00 - 8.00	-2.00	0.5	1	1	3.00	3.00		0.01
HCS 6X12 4AWG(1-5/8) **Reinforcement Area**	B	No	No	Ar (CaAa)	110.00 - 8.00	-2.00	0.5	1	1	1.66	1.66		0.00
Reinf Area (2) 1-1/2" TR	A	No	No	Ar (CaAa)	20.00 - 0.00	0.00	-0.48	1	1	0.00	1.50		0.01
Reinf Area (2) 1-1/2" TR	B	No	No	Ar (CaAa)	20.00 - 0.00	0.00	-0.48	1	1	0.00	1.50		0.01
Reinf Area (2) 1-1/2" TR	C	No	No	Ar (CaAa)	20.00 - 0.00	0.00	-0.48	1	1	0.00	1.50		0.01
Reinf Area (2) 1-1/2" TR	A	No	No	Ar (CaAa)	20.00 - 0.00	0.00	0.48	1	1	0.00	1.50		0.01
Reinf Area (2) 1-1/2" TR	B	No	No	Ar (CaAa)	20.00 - 0.00	0.00	0.48	1	1	0.00	1.50		0.01
Reinf Area (2) 1-1/2" TR**	C	No	No	Ar (CaAa)	20.00 - 0.00	0.00	0.48	1	1	0.00	1.50		0.01

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 klf
**								

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 K
T1	120.00-110.00	A	0.000	0.000	7.511	0.000	0.09
		B	0.000	0.000	5.000	0.000	0.08
		C	0.000	0.000	0.375	0.000	0.00
T2	110.00-90.00	A	0.000	0.000	17.386	0.000	0.19
		B	0.000	0.000	39.203	0.000	0.30
		C	0.000	0.000	10.710	0.000	0.15
T3	90.00-70.00	A	0.000	0.000	15.917	0.000	0.18
		B	0.000	0.000	51.376	0.000	0.34
		C	0.000	0.000	10.710	0.000	0.15
T4	70.00-50.00	A	0.000	0.000	17.320	0.000	0.18
		B	0.000	0.000	51.376	0.000	0.34
		C	0.000	0.000	10.710	0.000	0.15
T5	50.00-40.00	A	0.000	0.000	11.160	0.000	0.18
		B	0.000	0.000	28.188	0.000	0.25
		C	0.000	0.000	7.855	0.000	0.16
T6	40.00-20.00	A	0.000	0.000	22.320	0.000	0.35
		B	0.000	0.000	56.376	0.000	0.50
		C	0.000	0.000	15.710	0.000	0.32
T7	20.00-0.00	A	0.000	0.000	16.392	0.000	0.35
		B	0.000	0.000	36.826	0.000	0.44
		C	0.000	0.000	12.426	0.000	0.33

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	120.00-110.00	A	2.124	0.000	0.000	22.941	0.000	0.43
		B		0.000	0.000	9.249	0.000	0.25
		C		0.000	0.000	4.624	0.000	0.07
T2	110.00-90.00	A	2.095	0.000	0.000	56.882	0.000	0.93
		B		0.000	0.000	85.878	0.000	1.59
		C		0.000	0.000	38.459	0.000	0.63
T3	90.00-70.00	A	2.049	0.000	0.000	43.592	0.000	0.78
		B		0.000	0.000	129.356	0.000	2.07
		C		0.000	0.000	37.959	0.000	0.62
T4	70.00-50.00	A	1.991	0.000	0.000	45.792	0.000	0.80
		B		0.000	0.000	127.727	0.000	2.01
		C		0.000	0.000	37.331	0.000	0.60
T5	50.00-40.00	A	1.934	0.000	0.000	32.833	0.000	0.62
		B		0.000	0.000	73.309	0.000	1.21
		C		0.000	0.000	28.596	0.000	0.52
T6	40.00-20.00	A	1.857	0.000	0.000	64.236	0.000	1.19
		B		0.000	0.000	143.853	0.000	2.33
		C		0.000	0.000	55.748	0.000	1.01
T7	20.00-0.00	A	1.664	0.000	0.000	44.715	0.000	0.90
		B		0.000	0.000	90.472	0.000	1.51
		C		0.000	0.000	39.596	0.000	0.80

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	120.00-110.00	3.46	-4.48	0.85	-2.93
T2	110.00-90.00	10.77	0.80	5.92	-0.69
T3	90.00-70.00	8.82	-2.16	3.40	-1.62
T4	70.00-50.00	8.21	-2.36	4.86	-2.44
T5	50.00-40.00	6.42	-1.97	3.24	-1.69
T6	40.00-20.00	7.83	-2.45	5.02	-2.62
T7	20.00-0.00	5.98	-1.95	4.83	-2.58

Shielding Factor Ka

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	*K_a No Ice*	*K_a Ice*
T1	13	FXL-540(1/2")	110.00 - 118.00	0.6000	0.3962
T1	14	FXL-540(1/2")	118.00 - 119.00	0.6000	0.3962
T1	18	AVA5-50(7/8")	110.00 - 119.00	0.6000	0.3962
T1	22	Safety Line 3/8	110.00 - 120.00	0.6000	0.3962
T1	23	Feedline Ladder (Af)	110.00 - 120.00	0.6000	0.3962
T1	24	Feedline Ladder (Af)	110.00 - 120.00	0.6000	0.3962
T2	9	AVA7-50(1-5/8")	90.00 - 110.00	0.6000	0.4382
T2	10	HCS 6X12 4AWG(1-5/8)	90.00 - 110.00	0.6000	0.4382
T2	13	FXL-540(1/2")	90.00 - 110.00	0.6000	0.4382
T2	15	AVA5-50(7/8")	90.00 - 91.00	0.6000	0.4382
T2	16	AVA5-50(7/8")	91.00 - 95.00	0.6000	0.4382
T2	17	AVA5-50(7/8")	95.00 - 108.00	0.6000	0.4382
T2	18	AVA5-50(7/8")	108.00 - 110.00	0.6000	0.4382
T2	20	EW90(ELLIPTICAL)	90.00 - 95.00	0.6000	0.4382
T2	22	Safety Line 3/8	90.00 - 110.00	0.6000	0.4382
T2	23	Feedline Ladder (Af)	90.00 - 110.00	0.6000	0.4382
T2	24	Feedline Ladder (Af)	90.00 - 110.00	0.6000	0.4382
T2	26	HCS 6X12 4AWG(1-5/8)	90.00 - 110.00	0.6000	0.4382
T3	9	AVA7-50(1-5/8")	70.00 - 90.00	0.6000	0.2764
T3	10	HCS 6X12 4AWG(1-5/8)	70.00 - 90.00	0.6000	0.2764
T3	11	FXL-540(1/2")	70.00 - 80.00	0.6000	0.2764
T3	12	FXL-540(1/2")	80.00 - 87.00	0.6000	0.2764
T3	13	FXL-540(1/2")	87.00 - 90.00	0.6000	0.2764
T3	15	AVA5-50(7/8")	70.00 - 90.00	0.6000	0.2764
T3	19	EW90(ELLIPTICAL)	70.00 - 90.00	0.6000	0.2764
T3	22	Safety Line 3/8	70.00 - 90.00	0.6000	0.2764
T3	23	Feedline Ladder (Af)	70.00 - 90.00	0.6000	0.2764
T3	24	Feedline Ladder (Af)	70.00 - 90.00	0.6000	0.2764
T3	26	HCS 6X12 4AWG(1-5/8)	70.00 - 90.00	0.6000	0.2764
T4	9	AVA7-50(1-5/8")	50.00 - 70.00	0.6000	0.3736
T4	10	HCS 6X12 4AWG(1-5/8)	50.00 - 70.00	0.6000	0.3736

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	*K_a No Ice*	*K_a Ice*
T4	11	FXL-540(1/2")	50.00 - 70.00	0.6000	0.3736
T4	15	AVA5-50(7/8")	50.00 - 70.00	0.6000	0.3736
T4	19	EW90(ELLIPTICAL)	50.00 - 70.00	0.6000	0.3736
T4	22	Safety Line 3/8	50.00 - 70.00	0.6000	0.3736
T4	23	Feedline Ladder (Af)	50.00 - 70.00	0.6000	0.3736
T4	24	Feedline Ladder (Af)	50.00 - 70.00	0.6000	0.3736
T4	26	HCS 6X12 4AWG(1-5/8)	50.00 - 70.00	0.6000	0.3736
T5	2	Reinf Area (2) 1-1/4" TR	40.00 - 50.00	0.6000	0.3068
T5	3	Reinf Area (2) 1-1/4" TR	40.00 - 50.00	0.6000	0.3068
T5	4	Reinf Area (2) 1-1/4" TR	40.00 - 50.00	0.6000	0.3068
T5	5	Reinf Area (2) 1-1/4" TR	40.00 - 50.00	0.6000	0.3068
T5	6	Reinf Area (2) 1-1/4" TR	40.00 - 50.00	0.6000	0.3068
T5	7	Reinf Area (2) 1-1/4" TR	40.00 - 50.00	0.6000	0.3068
T5	9	AVA7-50(1-5/8")	40.00 - 50.00	0.6000	0.3068
T5	10	HCS 6X12 4AWG(1-5/8)	40.00 - 50.00	0.6000	0.3068
T5	11	FXL-540(1/2")	40.00 - 50.00	0.6000	0.3068
T5	15	AVA5-50(7/8")	40.00 - 50.00	0.6000	0.3068
T5	19	EW90(ELLIPTICAL)	40.00 - 50.00	0.6000	0.3068
T5	22	Safety Line 3/8	40.00 - 50.00	0.6000	0.3068
T5	23	Feedline Ladder (Af)	40.00 - 50.00	0.6000	0.3068
T5	24	Feedline Ladder (Af)	40.00 - 50.00	0.6000	0.3068
T5	26	HCS 6X12 4AWG(1-5/8)	40.00 - 50.00	0.6000	0.3068
T6	2	Reinf Area (2) 1-1/4" TR	20.00 - 40.00	0.6000	0.4097
T6	3	Reinf Area (2) 1-1/4" TR	20.00 - 40.00	0.6000	0.4097
T6	4	Reinf Area (2) 1-1/4" TR	20.00 - 40.00	0.6000	0.4097
T6	5	Reinf Area (2) 1-1/4" TR	20.00 - 40.00	0.6000	0.4097
T6	6	Reinf Area (2) 1-1/4" TR	20.00 - 40.00	0.6000	0.4097
T6	7	Reinf Area (2) 1-1/4" TR	20.00 - 40.00	0.6000	0.4097
T6	9	AVA7-50(1-5/8")	20.00 - 40.00	0.6000	0.4097
T6	10	HCS 6X12 4AWG(1-5/8)	20.00 - 40.00	0.6000	0.4097
T6	11	FXL-540(1/2")	20.00 - 40.00	0.6000	0.4097
T6	15	AVA5-50(7/8")	20.00 - 40.00	0.6000	0.4097
T6	19	EW90(ELLIPTICAL)	20.00 - 40.00	0.6000	0.4097
T6	22	Safety Line 3/8	20.00 - 40.00	0.6000	0.4097
T6	23	Feedline Ladder (Af)	20.00 -	0.6000	0.4097

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			40.00		
T6	24	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.4097
T6	26	HCS 6X12 4AWG(1-5/8)	20.00 - 40.00	0.6000	0.4097
T7	9	AVA7-50(1-5/8")	8.00 - 20.00	0.6000	0.5391
T7	10	HCS 6X12 4AWG(1-5/8)	8.00 - 20.00	0.6000	0.5391
T7	11	FXL-540(1/2")	8.00 - 20.00	0.6000	0.5391
T7	15	AVA5-50(7/8")	8.00 - 20.00	0.6000	0.5391
T7	19	EW90(ELLIPTICAL)	8.00 - 20.00	0.6000	0.5391
T7	22	Safety Line 3/8	8.00 - 20.00	0.6000	0.5391
T7	23	Feedline Ladder (Af)	8.00 - 20.00	0.6000	0.5391
T7	24	Feedline Ladder (Af)	8.00 - 20.00	0.6000	0.5391
T7	26	HCS 6X12 4AWG(1-5/8)	8.00 - 20.00	0.6000	0.5391
T7	28	Reinf Area (2) 1-1/2" TR	0.00 - 20.00	0.6000	0.5391
T7	29	Reinf Area (2) 1-1/2" TR	0.00 - 20.00	0.6000	0.5391
T7	30	Reinf Area (2) 1-1/2" TR	0.00 - 20.00	0.6000	0.5391
T7	31	Reinf Area (2) 1-1/2" TR	0.00 - 20.00	0.6000	0.5391
T7	32	Reinf Area (2) 1-1/2" TR	0.00 - 20.00	0.6000	0.5391
T7	33	Reinf Area (2) 1-1/2" TR	0.00 - 20.00	0.6000	0.5391

Discrete Tower Loads

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 K
***									
PD220-9	B	From Leg	0.50 0.00 8.00	0.00	119.00	No Ice 1/2" Ice 1" Ice	5.17 7.08 9.01	5.17 7.08 9.01	0.02 0.06 0.11
TMA	B	From Leg	0.50 0.00 0.00	0.00	119.00	No Ice 1/2" Ice 1" Ice	1.05 1.18 1.32	0.55 0.65 0.75	0.02 0.03 0.04
PD220-2	A	From Leg	2.00 0.00 10.00	0.00	118.00	No Ice 1/2" Ice 1" Ice	5.28 7.23 9.20	5.28 7.23 9.20	0.03 0.06 0.11
2' Side Arm Mount	A	None		0.00	118.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
PD220-2	C	From Leg	2.00 0.00 10.00	0.00	118.00	No Ice 1/2" Ice 1" Ice	5.28 7.23 9.20	5.28 7.23 9.20	0.03 0.06 0.11
2' Side Arm Mount	C	None		0.00	118.00	No Ice 1/2" Ice 1" Ice	0.31 0.50 0.73	0.88 1.26 1.67	0.02 0.03 0.05
**									
AIR 32 B66Aa B2a	A	From Leg	4.00 0.00 0.00	0.00	110.00	No Ice 1/2" Ice 1" Ice	6.51 6.89 7.27	4.71 5.07 5.43	0.13 0.18 0.23
AIR 32 B66Aa B2a	B	From Leg	4.00 0.00	0.00	110.00	No Ice 1/2"	6.51 6.89	4.71 5.07	0.13 0.18

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* *K*
			0.00			Ice	7.27	5.43	0.23
						1" Ice			
AIR 32 B66Aa B2a	C	From Leg	4.00	0.00	110.00	No Ice	6.51	4.71	0.13
			0.00			1/2"	6.89	5.07	0.18
			0.00			Ice	7.27	5.43	0.23
						1" Ice			
APXVARR24_43-C-NA20 w/ Mount Pipe	A	From Leg	4.00	0.00	110.00	No Ice	17.15	10.64	0.14
			0.00			1/2"	17.77	12.07	0.26
			0.00			Ice	18.40	13.35	0.39
						1" Ice			
APXVARR24_43-C-NA20 w/ Mount Pipe	B	From Leg	4.00	0.00	110.00	No Ice	17.15	10.64	0.14
			0.00			1/2"	17.77	12.07	0.26
			0.00			Ice	18.40	13.35	0.39
						1" Ice			
APXVARR24_43-C-NA20 w/ Mount Pipe	C	From Leg	4.00	0.00	110.00	No Ice	17.15	10.64	0.14
			0.00			1/2"	17.77	12.07	0.26
			0.00			Ice	18.40	13.35	0.39
						1" Ice			
RADIO 4449 B12/B71	A	From Leg	4.00	0.00	110.00	No Ice	1.65	1.16	0.07
			0.00			1/2"	1.81	1.30	0.09
			0.00			Ice	1.98	1.45	0.11
						1" Ice			
RADIO 4449 B12/B71	B	From Leg	4.00	0.00	110.00	No Ice	1.65	1.16	0.07
			0.00			1/2"	1.81	1.30	0.09
			0.00			Ice	1.98	1.45	0.11
						1" Ice			
RADIO 4449 B12/B71	C	From Leg	4.00	0.00	110.00	No Ice	1.65	1.16	0.07
			0.00			1/2"	1.81	1.30	0.09
			0.00			Ice	1.98	1.45	0.11
						1" Ice			
Twin Style TMA	A	From Leg	4.00	0.00	110.00	No Ice	1.05	0.55	0.02
			0.00			1/2"	1.18	0.65	0.03
			0.00			Ice	1.32	0.75	0.04
						1" Ice			
Twin Style TMA	B	From Leg	4.00	0.00	110.00	No Ice	1.05	0.55	0.02
			0.00			1/2"	1.18	0.65	0.03
			0.00			Ice	1.32	0.75	0.04
						1" Ice			
Twin Style TMA	C	From Leg	4.00	0.00	110.00	No Ice	1.05	0.55	0.02
			0.00			1/2"	1.18	0.65	0.03
			0.00			Ice	1.32	0.75	0.04
						1" Ice			
AIR 6449 B41	A	From Leg	4.00	0.00	110.00	No Ice	5.65	2.42	0.10
			0.00			1/2"	5.96	2.64	0.14
			0.00			Ice	6.26	2.87	0.18
						1" Ice			
AIR 6449 B41	B	From Leg	4.00	0.00	110.00	No Ice	5.65	2.42	0.10
			0.00			1/2"	5.96	2.64	0.14
			0.00			Ice	6.26	2.87	0.18
						1" Ice			
AIR 6449 B41	C	From Leg	4.00	0.00	110.00	No Ice	5.65	2.42	0.10
			0.00			1/2"	5.96	2.64	0.14
			0.00			Ice	6.26	2.87	0.18
						1" Ice			
RRUS 4415 B25	A	From Leg	4.00	0.00	110.00	No Ice	1.64	0.68	0.04
			0.00			1/2"	1.80	0.79	0.06
			0.00			Ice	1.97	0.91	0.07
						1" Ice			
RRUS 4415 B25	B	From Leg	4.00	0.00	110.00	No Ice	1.64	0.68	0.04
			0.00			1/2"	1.80	0.79	0.06
			0.00			Ice	1.97	0.91	0.07
						1" Ice			
RRUS 4415 B25	C	From Leg	4.00	0.00	110.00	No Ice	1.64	0.68	0.04
			0.00			1/2"	1.80	0.79	0.06
			0.00			Ice	1.97	0.91	0.07

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* *K*
						1" Ice			
SDX1926Q-43	A	From Leg	4.00	0.00	110.00	No Ice	0.24	0.10	0.01
			0.00			1/2"	0.31	0.14	0.01
			0.00			Ice	0.38	0.19	0.01
						1" Ice			
SDX1926Q-43	B	From Leg	4.00	0.00	110.00	No Ice	0.24	0.10	0.01
			0.00			1/2"	0.31	0.14	0.01
			0.00			Ice	0.38	0.19	0.01
						1" Ice			
SDX1926Q-43	C	From Leg	4.00	0.00	110.00	No Ice	0.24	0.10	0.01
			0.00			1/2"	0.31	0.14	0.01
			0.00			Ice	0.38	0.19	0.01
						1" Ice			
12' Sector Mount	C	None		0.00	110.00	No Ice	29.82	29.82	1.67
						1/2"	42.21	42.21	2.27
						Ice	54.43	54.43	3.05
						1" Ice			
**									
Twin Style TMA	B	From Leg	0.50	0.00	95.00	No Ice	1.05	0.55	0.02
			0.00			1/2"	1.18	0.65	0.03
			0.00			Ice	1.32	0.75	0.04
						1" Ice			
Dish Mount Pipe	B	From Face	2.00	0.00	95.00	No Ice	0.90	0.90	0.02
			0.00			1/2"	1.52	1.52	0.02
			0.00			Ice	2.00	2.00	0.04
						1" Ice			
Dish Mount	B	None		0.00	95.00	No Ice	1.78	2.97	0.11
						1/2"	2.24	3.57	0.13
						Ice	2.75	4.19	0.16
						1" Ice			
Dish Mount Pipe	B	From Face	2.00	0.00	90.00	No Ice	0.90	0.90	0.02
			0.00			1/2"	1.52	1.52	0.02
			0.00			Ice	2.00	2.00	0.04
						1" Ice			
Dish Mount	B	None		0.00	90.00	No Ice	1.78	2.97	0.11
						1/2"	2.24	3.57	0.13
						Ice	2.75	4.19	0.16
						1" Ice			
**									
72'' Side Arm Mount	A	None		0.00	87.00	No Ice	0.41	3.06	0.05
						1/2"	0.81	5.10	0.08
						Ice	1.23	7.20	0.12
						1" Ice			
10' horizontal x 2'' Pipe Mount	A	From Face	4.00	0.00	87.00	No Ice	0.83	0.83	0.10
			0.00			1/2"	1.76	1.76	0.48
			0.00			Ice	2.37	2.37	0.88
						1" Ice			
10' x 3'' Dia Omni	A	From Leg	6.00	45.00	87.00	No Ice	3.00	3.00	0.02
			0.00			1/2"	4.03	4.03	0.04
			5.00			Ice	5.03	5.03	0.07
						1" Ice			
*									
10' horizontal x 2'' Pipe Mount	C	From Face	4.00	0.00	80.00	No Ice	0.83	0.83	0.10
			0.00			1/2"	1.76	1.76	0.48
			0.00			Ice	2.37	2.37	0.88
						1" Ice			
72'' Side Arm Mount	C	None		0.00	80.00	No Ice	0.41	3.06	0.05
						1/2"	0.81	5.10	0.08
						Ice	1.23	7.20	0.12
						1" Ice			
PD220-2	C	From Leg	6.00	0.00	80.00	No Ice	5.28	5.28	0.03
			0.00			1/2"	7.23	7.23	0.06
			10.00			Ice	9.20	9.20	0.11
						1" Ice			
10' horizontal x 2'' Pipe	A	From Face	4.00	0.00	80.00	No Ice	0.83	0.83	0.10

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 K
Mount			0.00 0.00			1/2" Ice 1" Ice	1.76 2.37	1.76 2.37	0.48 0.88
72'' Side Arm Mount	A	None		0.00	80.00	No Ice 1/2" Ice 1" Ice	0.41 0.81 1.23	3.06 5.10 7.20	0.05 0.08 0.12
PD220-9	A	From Leg	0.50 0.00 8.00	0.00	80.00	No Ice 1/2" Ice 1" Ice	5.17 7.08 9.01	5.17 7.08 9.01	0.02 0.06 0.11
***									
ANT50D	C	From Leg	2.00 0.00 0.00	0.00	108.00	No Ice 1/2" Ice 1" Ice	3.30 4.43 5.58	3.30 4.43 5.58	0.04 0.06 0.09
ANT50D	C	From Leg	2.00 0.00 0.00	0.00	91.00	No Ice 1/2" Ice 1" Ice	3.30 4.43 5.58	3.30 4.43 5.58	0.04 0.06 0.09
**									
(2) Jump Plate	A	From Leg	0.00 0.00 0.00	0.00	70.00	No Ice 1/2" Ice 1" Ice	3.09 3.36 3.64	0.44 0.84 1.17	0.02 0.03 0.05
(2) Jump Plate	B	From Leg	0.00 0.00 0.00	0.00	70.00	No Ice 1/2" Ice 1" Ice	3.09 3.36 3.64	0.44 0.84 1.17	0.02 0.03 0.05
(2) Jump Plate	C	From Leg	0.00 0.00 0.00	0.00	70.00	No Ice 1/2" Ice 1" Ice	3.09 3.36 3.64	0.44 0.84 1.17	0.02 0.03 0.05
**									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
***											
Andrew 6' Dish	B	Paraboloid w/Shroud (HP)	From Leg	2.00 0.00 0.00	Worst		95.00	6.00	No Ice 1/2" Ice 1" Ice	28.30 30.00 31.70	0.74 1.00 1.26
Andrew 4' Dish	B	Paraboloid w/Shroud (HP)	From Leg	2.00 0.00 0.00	Worst		90.00	4.00	No Ice 1/2" Ice 1" Ice	12.57 13.10 13.63	0.11 0.18 0.25
**											

Truss-Leg Properties

Section Designation	*Area*	*Area Ice*	*Self Weight*	*Ice Weight*	*Equiv. Diameter*	*Equiv. Diameter Ice*	*Leg Area*
	in^2	*in^2*	*K*	*K*	*in*	*in*	*in^2*
Pirod 105244 + (2) 1-1/4" Tie-Rods	1119.36	3295.46	0.74	0.74	7.77	22.89	6.13
Pirod 105216 + (2) 1-1/4" Tie-Rods	2190.76	6707.42	0.68	1.33	7.61	23.29	6.13
PiRod 105217 + (2) 1-1/2" Tie-Rods	2362.94	6629.58	0.87	1.14	8.20	23.02	8.83

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	1.2D+1.6W (pattern 1) 0 deg - No Ice
4	1.2D+1.6W (pattern 2) 0 deg - No Ice
5	0.9 Dead+1.6 Wind 0 deg - No Ice
6	1.2 Dead+1.6 Wind 30 deg - No Ice
7	1.2D+1.6W (pattern 1) 30 deg - No Ice
8	1.2D+1.6W (pattern 2) 30 deg - No Ice
9	0.9 Dead+1.6 Wind 30 deg - No Ice
10	1.2 Dead+1.6 Wind 60 deg - No Ice
11	1.2D+1.6W (pattern 1) 60 deg - No Ice
12	1.2D+1.6W (pattern 2) 60 deg - No Ice
13	0.9 Dead+1.6 Wind 60 deg - No Ice
14	1.2 Dead+1.6 Wind 90 deg - No Ice
15	1.2D+1.6W (pattern 1) 90 deg - No Ice
16	1.2D+1.6W (pattern 2) 90 deg - No Ice
17	0.9 Dead+1.6 Wind 90 deg - No Ice
18	1.2 Dead+1.6 Wind 120 deg - No Ice
19	1.2D+1.6W (pattern 1) 120 deg - No Ice
20	1.2D+1.6W (pattern 2) 120 deg - No Ice
21	0.9 Dead+1.6 Wind 120 deg - No Ice
22	1.2 Dead+1.6 Wind 150 deg - No Ice
23	1.2D+1.6W (pattern 1) 150 deg - No Ice
24	1.2D+1.6W (pattern 2) 150 deg - No Ice
25	0.9 Dead+1.6 Wind 150 deg - No Ice
26	1.2 Dead+1.6 Wind 180 deg - No Ice
27	1.2D+1.6W (pattern 1) 180 deg - No Ice
28	1.2D+1.6W (pattern 2) 180 deg - No Ice
29	0.9 Dead+1.6 Wind 180 deg - No Ice
30	1.2 Dead+1.6 Wind 210 deg - No Ice
31	1.2D+1.6W (pattern 1) 210 deg - No Ice
32	1.2D+1.6W (pattern 2) 210 deg - No Ice
33	0.9 Dead+1.6 Wind 210 deg - No Ice
34	1.2 Dead+1.6 Wind 240 deg - No Ice
35	1.2D+1.6W (pattern 1) 240 deg - No Ice
36	1.2D+1.6W (pattern 2) 240 deg - No Ice
37	0.9 Dead+1.6 Wind 240 deg - No Ice
38	1.2 Dead+1.6 Wind 270 deg - No Ice
39	1.2D+1.6W (pattern 1) 270 deg - No Ice
40	1.2D+1.6W (pattern 2) 270 deg - No Ice
41	0.9 Dead+1.6 Wind 270 deg - No Ice
42	1.2 Dead+1.6 Wind 300 deg - No Ice
43	1.2D+1.6W (pattern 1) 300 deg - No Ice
44	1.2D+1.6W (pattern 2) 300 deg - No Ice
45	0.9 Dead+1.6 Wind 300 deg - No Ice
46	1.2 Dead+1.6 Wind 330 deg - No Ice
47	1.2D+1.6W (pattern 1) 330 deg - No Ice
48	1.2D+1.6W (pattern 2) 330 deg - No Ice
49	0.9 Dead+1.6 Wind 330 deg - No Ice
50	1.2 Dead+1.0 Ice+1.0 Temp
51	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
52	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
53	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp

Comb. No.	Description
54	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
55	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
56	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
57	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
58	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
59	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
60	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
61	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
62	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
63	Dead+Wind 0 deg - Service
64	Dead+Wind 30 deg - Service
65	Dead+Wind 60 deg - Service
66	Dead+Wind 90 deg - Service
67	Dead+Wind 120 deg - Service
68	Dead+Wind 150 deg - Service
69	Dead+Wind 180 deg - Service
70	Dead+Wind 210 deg - Service
71	Dead+Wind 240 deg - Service
72	Dead+Wind 270 deg - Service
73	Dead+Wind 300 deg - Service
74	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	120 - 110	Leg	Max Tension	13	4.35	0.13	-0.08
			Max. Compression	18	-4.93	0.05	0.03
			Max. Mx	38	3.14	-0.13	-0.04
			Max. My	26	4.20	0.00	0.15
			Max. Vy	18	0.91	0.05	0.03
			Max. Vx	2	-1.06	-0.00	-0.06
		Diagonal	Max Tension	6	0.68	0.00	0.00
			Max. Compression	34	-0.67	0.00	0.00
			Max. Mx	55	0.01	-0.01	0.00
			Max. My	53	-0.04	-0.01	-0.00
			Max. Vy	52	0.01	-0.01	0.00
			Max. Vx	53	-0.00	0.00	0.00
		Top Girt	Max Tension	29	0.03	0.00	0.00
			Max. Compression	55	-0.04	0.00	0.00
			Max. Mx	50	-0.03	0.02	0.00
			Max. My	6	-0.01	0.00	-0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
		Bottom Girt	Max Tension	34	0.21	0.00	0.00
			Max. Compression	10	-0.20	0.00	0.00
			Max. Mx	50	0.02	0.02	0.00
			Max. My	6	0.01	0.00	-0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
T2	110 - 90	Leg	Max Tension	13	42.38	-0.21	0.09
			Max. Compression	18	-47.25	-0.21	-0.10
			Max. Mx	34	-45.70	0.22	-0.09
			Max. My	2	-45.25	0.01	0.23
			Max. Vy	34	-4.83	0.22	-0.09
			Max. Vx	2	-4.89	0.01	0.23
		Diagonal	Max Tension	10	4.56	0.00	0.00
			Max. Compression	10	-4.59	0.00	0.00
			Max. Mx	55	0.97	-0.01	-0.00
			Max. My	26	-4.10	-0.00	-0.00
			Max. Vy	55	0.01	-0.01	-0.00
			Max. Vx	26	-0.00	-0.00	-0.00
		Top Girt	Max Tension	34	0.46	0.00	0.00
			Max. Compression	42	-0.45	0.00	0.00
			Max. Mx	50	0.02	0.01	0.00
			Max. My	6	0.01	0.00	-0.00

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
			Max. Vy	50	0.01	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
		Bottom Girt	Max Tension	10	0.32	0.00	0.00
			Max. Compression	21	-0.30	0.00	0.00
			Max. Mx	50	0.03	0.01	0.00
			Max. My	6	0.02	0.00	-0.00
			Max. Vy	50	0.01	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
T3	90 - 70	Leg	Max Tension	13	110.30	0.42	-0.18
			Max. Compression	34	-116.01	0.17	-0.06
			Max. Mx	34	-49.55	0.65	-0.21
			Max. My	2	-45.27	0.12	0.66
			Max. Vy	34	-7.44	0.17	-0.06
			Max. Vx	2	-7.58	0.04	0.17
		Diagonal	Max Tension	10	7.06	-0.00	0.00
			Max. Compression	34	-7.20	0.00	0.00
			Max. Mx	59	1.38	-0.01	0.00
			Max. My	30	-3.73	0.00	-0.00
			Max. Vy	59	0.01	-0.01	0.00
			Max. Vx	30	0.00	0.00	-0.00
		Secondary Horizontal	Max Tension	34	1.91	-0.01	-0.00
			Max. Compression	34	-1.91	0.00	0.00
			Max. Mx	58	-0.23	-0.01	0.00
			Max. My	10	-0.56	-0.01	-0.01
			Max. Vy	58	0.02	-0.01	0.00
			Max. Vx	26	0.00	0.00	0.00
		Top Girt	Max Tension	34	0.22	0.00	0.00
			Max. Compression	42	-0.23	0.00	0.00
			Max. Mx	50	-0.00	0.03	0.00
			Max. My	6	0.00	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
		Bottom Girt	Max Tension	10	0.29	0.00	0.00
			Max. Compression	37	-0.33	0.00	0.00
			Max. Mx	50	0.01	0.02	0.00
			Max. My	6	0.01	0.00	-0.00
			Max. Vy	50	0.02	0.00	0.00
			Max. Vx	6	-0.00	0.00	0.00
T4	70 - 50	Leg	Max Tension	13	171.46	0.14	0.00
			Max. Compression	34	-178.57	1.38	0.03
			Max. Mx	34	-178.57	1.38	0.03
			Max. My	6	-7.14	0.05	-0.61
			Max. Vy	34	-6.28	0.70	0.15
			Max. Vx	30	-4.03	0.00	0.45
		Diagonal	Max Tension	10	6.07	0.00	0.00
			Max. Compression	34	-6.18	0.00	0.00
			Max. Mx	34	2.69	-0.01	-0.00
			Max. My	26	-5.67	0.00	-0.01
			Max. Vy	55	0.01	-0.01	-0.00
			Max. Vx	26	0.00	0.00	0.00
		Top Girt	Max Tension	28	0.11	0.00	0.00
			Max. Compression	20	-0.11	0.00	0.00
			Max. Mx	50	0.05	0.02	0.00
			Max. My	58	0.06	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	58	-0.00	0.00	0.00
		Bottom Girt	Max Tension	10	1.48	0.00	0.00
			Max. Compression	37	-1.38	0.00	0.00
			Max. Mx	50	0.11	0.02	0.00
			Max. My	52	0.09	0.00	-0.00
			Max. Vy	50	-0.02	0.00	0.00
			Max. Vx	52	0.00	0.00	0.00
T5	50 - 40	Leg	Max Tension	13	172.16	-1.34	-0.03
			Max. Compression	34	-178.99	8.41	0.15
			Max. Mx	10	171.58	-8.82	-0.34
			Max. My	6	-7.28	-0.16	-14.15
			Max. Vy	10	0.88	-8.82	-0.34
			Max. Vx	6	1.54	-0.16	-14.15

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Diagonal	Max Tension	33	7.53	0.09	0.03
			Max. Compression	30	-8.18	0.00	0.00
			Max. Mx	10	0.40	0.11	-0.00
			Max. My	30	-8.16	-0.08	0.06
			Max. Vy	53	0.03	0.06	-0.00
			Max. Vx	30	-0.01	0.00	0.00
T6	40 - 20	Leg	Max Tension	13	190.74	-7.66	-0.09
			Max. Compression	34	-200.61	8.89	0.57
			Max. Mx	34	-200.61	8.89	0.57
			Max. My	6	-7.82	-0.16	-14.15
			Max. Vy	61	0.30	-3.79	-0.06
			Max. Vx	6	-0.77	-0.16	-14.15
		Diagonal	Max Tension	3	5.50	0.00	0.00
			Max. Compression	29	-5.73	0.00	0.00
			Max. Mx	34	1.47	0.11	0.02
			Max. My	31	-4.90	0.00	0.03
			Max. Vy	53	0.04	0.07	0.01
			Max. Vx	31	-0.01	0.00	0.00
T7	20 - 0	Leg	Max Tension	13	206.17	-6.87	-0.02
			Max. Compression	34	-220.31	-0.00	-0.00
			Max. Mx	34	-212.36	8.89	0.57
			Max. My	14	-7.49	-0.38	12.07
			Max. Vy	10	-0.82	-6.98	-0.03
			Max. Vx	6	-1.34	-0.33	-11.98
		Diagonal	Max Tension	33	7.23	0.00	0.00
			Max. Compression	30	-7.73	0.00	0.00
			Max. Mx	34	1.18	-0.12	-0.02
			Max. My	9	-3.47	0.04	0.03
			Max. Vy	54	-0.04	-0.06	-0.01
			Max. Vx	9	-0.01	0.04	0.03

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	34	229.71	17.75	-9.41
	Max. H_x	34	229.71	17.75	-9.41
	Max. H_z	13	-213.80	-16.50	8.71
	Min. Vert	13	-213.80	-16.50	8.71
	Min. H_x	13	-213.80	-16.50	8.71
	Min. H_z	34	229.71	17.75	-9.41
Leg B	Max. Vert	18	221.97	-16.43	-9.89
	Max. H_x	45	-202.50	15.09	9.12
	Max. H_z	45	-202.50	15.09	9.12
	Min. Vert	45	-202.50	15.09	9.12
	Min. H_x	18	221.97	-16.43	-9.89
	Min. H_z	18	221.97	-16.43	-9.89
Leg A	Max. Vert	2	221.09	0.97	19.20
	Max. H_x	10	118.72	2.03	10.30
	Max. H_z	2	221.09	0.97	19.20
	Min. Vert	29	-204.27	-0.94	-17.72
	Min. H_x	34	-101.84	-1.93	-8.94
	Min. H_z	29	-204.27	-0.94	-17.72

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	22.60	0.00	0.00	2.33	-8.48	0.00

Load Combination	*Vertical*	*Shear$_x$*	*Shear$_z$*	*Overturning Moment, M$_x$*	*Overturning Moment, M$_z$*	*Torque*
	K	*K*	*K*	*kip-ft*	*kip-ft*	*kip-ft*
1.2 Dead+1.6 Wind 0 deg - No Ice	27.12	-0.02	-25.59	-1836.43	-8.16	16.60
1.2D+1.6W (pattern 1) 0 deg - No Ice	27.12	-0.02	-23.50	-1602.67	-8.63	16.78
1.2D+1.6W (pattern 2) 0 deg - No Ice	27.12	-0.02	-17.73	-1372.22	-8.52	13.86
0.9 Dead+1.6 Wind 0 deg - No Ice	20.34	-0.02	-25.59	-1833.04	-5.58	16.56
1.2 Dead+1.6 Wind 30 deg - No Ice	27.12	13.30	-23.04	-1652.29	-965.86	20.05
1.2D+1.6W (pattern 1) 30 deg - No Ice	27.12	12.26	-21.24	-1450.71	-849.44	20.11
1.2D+1.6W (pattern 2) 30 deg - No Ice	27.12	9.17	-15.88	-1224.53	-718.87	16.74
0.9 Dead+1.6 Wind 30 deg - No Ice	20.34	13.30	-23.04	-1649.33	-961.15	20.00
1.2 Dead+1.6 Wind 60 deg - No Ice	27.12	22.98	-13.24	-949.85	-1664.48	12.45
1.2D+1.6W (pattern 1) 60 deg - No Ice	27.12	21.17	-12.20	-833.39	-1461.79	12.40
1.2D+1.6W (pattern 2) 60 deg - No Ice	27.12	15.85	-9.13	-704.12	-1238.14	9.50
0.9 Dead+1.6 Wind 60 deg - No Ice	20.34	22.98	-13.24	-948.44	-1658.23	12.41
1.2 Dead+1.6 Wind 90 deg - No Ice	27.12	26.56	0.02	4.88	-1917.84	1.99
1.2D+1.6W (pattern 1) 90 deg - No Ice	27.12	24.46	0.02	4.41	-1683.15	1.84
1.2D+1.6W (pattern 2) 90 deg - No Ice	27.12	18.32	0.02	4.54	-1427.22	0.19
0.9 Dead+1.6 Wind 90 deg - No Ice	20.34	26.56	0.02	4.18	-1911.04	1.97
1.2 Dead+1.6 Wind 120 deg - No Ice	27.12	22.08	12.75	919.69	-1598.28	-6.11
1.2D+1.6W (pattern 1) 120 deg - No Ice	27.12	20.26	11.70	802.21	-1394.79	-6.34
1.2D+1.6W (pattern 2) 120 deg - No Ice	27.12	15.31	8.84	689.29	-1199.22	-6.31
0.9 Dead+1.6 Wind 120 deg - No Ice	20.34	22.08	12.75	916.94	-1592.17	-6.11
1.2 Dead+1.6 Wind 150 deg - No Ice	27.12	12.14	20.99	1534.56	-896.96	-10.86
1.2D+1.6W (pattern 1) 150 deg - No Ice	27.12	11.09	19.17	1331.54	-779.19	-11.11
1.2D+1.6W (pattern 2) 150 deg - No Ice	27.12	8.48	14.66	1157.55	-678.89	-9.41
0.9 Dead+1.6 Wind 150 deg - No Ice	20.34	12.14	20.99	1530.40	-892.39	-10.83
1.2 Dead+1.6 Wind 180 deg - No Ice	27.12	0.02	25.20	1832.54	-12.33	-16.60
1.2D+1.6W (pattern 1) 180 deg - No Ice	27.12	0.02	23.11	1598.77	-11.84	-16.78
1.2D+1.6W (pattern 2) 180 deg - No Ice	27.12	0.02	17.50	1372.15	-11.97	-13.86
0.9 Dead+1.6 Wind 180 deg - No Ice	20.34	0.02	25.20	1827.72	-9.75	-16.56
1.2 Dead+1.6 Wind 210 deg - No Ice	27.12	-13.30	23.04	1657.98	945.30	-20.05
1.2D+1.6W (pattern 1) 210 deg - No Ice	27.12	-12.26	21.24	1456.37	828.93	-20.11
1.2D+1.6W (pattern 2) 210 deg - No Ice	27.12	-9.17	15.88	1230.20	698.35	-16.74
0.9 Dead+1.6 Wind 210 deg - No Ice	20.34	-13.30	23.04	1653.59	945.77	-20.00
1.2 Dead+1.6 Wind 240 deg - No Ice	27.12	-23.31	13.44	960.28	1652.24	-12.45
1.2D+1.6W (pattern 1) 240 deg - No Ice	27.12	-21.50	12.40	843.80	1449.57	-12.40
1.2D+1.6W (pattern 2) 240	27.12	-16.05	9.25	712.63	1222.61	-9.51

Load Combination	*Vertical*	*Shear$_x$*	*Shear$_z$*	*Overturning Moment, M$_x$*	*Overturning Moment, M$_z$*	*Torque*
	K	*K*	*K*	*kip-ft*	*kip-ft*	*kip-ft*
deg - No Ice						
0.9 Dead+1.6 Wind 240 deg - No Ice	20.34	-23.31	13.44	957.44	1651.16	-12.42
1.2 Dead+1.6 Wind 270 deg - No Ice	27.12	-26.56	-0.02	0.70	1897.39	-1.99
1.2D+1.6W (pattern 1) 270 deg - No Ice	27.12	-24.46	-0.02	1.18	1662.69	-1.84
1.2D+1.6W (pattern 2) 270 deg - No Ice	27.12	-18.32	-0.02	1.07	1406.76	-0.20
0.9 Dead+1.6 Wind 270 deg - No Ice	20.34	-26.56	-0.02	-0.00	1895.75	-1.97
1.2 Dead+1.6 Wind 300 deg - No Ice	27.12	-21.74	-12.55	-909.30	1569.57	6.11
1.2D+1.6W (pattern 1) 300 deg - No Ice	27.12	-19.92	-11.50	-791.81	1366.07	6.34
1.2D+1.6W (pattern 2) 300 deg - No Ice	27.12	-15.11	-8.72	-680.81	1173.80	6.31
0.9 Dead+1.6 Wind 300 deg - No Ice	20.34	-21.74	-12.55	-907.97	1568.62	6.11
1.2 Dead+1.6 Wind 330 deg - No Ice	27.12	-12.14	-20.99	-1528.91	876.53	10.86
1.2D+1.6W (pattern 1) 330 deg - No Ice	27.12	-11.09	-19.17	-1325.89	758.76	11.11
1.2D+1.6W (pattern 2) 330 deg - No Ice	27.12	-8.48	-14.66	-1151.91	658.45	9.41
0.9 Dead+1.6 Wind 330 deg - No Ice	20.34	-12.14	-20.99	-1526.18	877.12	10.83
1.2 Dead+1.0 Ice+1.0 Temp	80.51	0.00	0.00	0.23	-15.13	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	80.51	-0.00	-7.36	-542.95	-14.87	2.25
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	80.51	3.74	-6.48	-477.43	-291.02	2.38
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	80.51	6.55	-3.78	-277.67	-497.34	1.39
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	80.51	7.50	0.00	0.64	-567.88	-0.19
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	80.51	6.39	3.69	272.41	-486.59	-1.23
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	80.51	3.63	6.28	466.35	-284.75	-1.72
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	80.51	0.00	7.31	542.51	-15.58	-2.25
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	80.51	-3.74	6.48	477.97	260.58	-2.38
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	80.51	-6.59	3.80	278.70	467.74	-1.39
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	80.51	-7.50	-0.00	-0.08	537.44	0.19
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	80.51	-6.35	-3.66	-271.39	455.30	1.23
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	80.51	-3.63	-6.28	-465.84	254.28	1.72
Dead+Wind 0 deg - Service	22.60	-0.00	-4.91	-349.94	-8.12	3.18
Dead+Wind 30 deg - Service	22.60	2.55	-4.42	-314.67	-191.54	3.83
Dead+Wind 60 deg - Service	22.60	4.41	-2.54	-180.12	-325.35	2.38
Dead+Wind 90 deg - Service	22.60	5.09	0.00	2.74	-373.88	0.39
Dead+Wind 120 deg - Service	22.60	4.23	2.44	177.95	-312.69	-1.17
Dead+Wind 150 deg - Service	22.60	2.33	4.03	295.70	-178.35	-2.09
Dead+Wind 180 deg - Service	22.60	0.00	4.83	352.78	-8.91	-3.18
Dead+Wind 210 deg - Service	22.60	-2.55	4.42	319.35	174.51	-3.83
Dead+Wind 240 deg - Service	22.60	-4.47	2.58	185.74	309.92	-2.38
Dead+Wind 270 deg - Service	22.60	-5.09	-0.00	1.94	356.85	-0.39
Dead+Wind 300 deg -	22.60	-4.17	-2.41	-172.35	294.06	1.17

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Service Dead+Wind 330 deg - Service	22.60	-2.33	-4.03	-291.02	161.32	2.09

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-22.60	0.00	0.00	22.60	0.00	0.000%
2	-0.02	-27.12	-25.59	0.02	27.12	25.59	0.000%
3	-0.02	-27.12	-23.50	0.02	27.12	23.50	0.000%
4	-0.02	-27.12	-17.73	0.02	27.12	17.73	0.000%
5	-0.02	-20.34	-25.59	0.02	20.34	25.59	0.000%
6	13.30	-27.12	-23.04	-13.30	27.12	23.04	0.000%
7	12.26	-27.12	-21.24	-12.26	27.12	21.24	0.000%
8	9.17	-27.12	-15.88	-9.17	27.12	15.88	0.000%
9	13.30	-20.34	-23.04	-13.30	20.34	23.04	0.000%
10	22.98	-27.12	-13.24	-22.98	27.12	13.24	0.000%
11	21.17	-27.12	-12.20	-21.17	27.12	12.20	0.000%
12	15.85	-27.12	-9.13	-15.85	27.12	9.13	0.000%
13	22.98	-20.34	-13.24	-22.98	20.34	13.24	0.000%
14	26.56	-27.12	0.02	-26.56	27.12	-0.02	0.000%
15	24.46	-27.12	0.02	-24.46	27.12	-0.02	0.000%
16	18.32	-27.12	0.02	-18.32	27.12	-0.02	0.000%
17	26.56	-20.34	0.02	-26.56	20.34	-0.02	0.000%
18	22.08	-27.12	12.75	-22.08	27.12	-12.75	0.000%
19	20.26	-27.12	11.70	-20.26	27.12	-11.70	0.000%
20	15.31	-27.12	8.84	-15.31	27.12	-8.84	0.000%
21	22.08	-20.34	12.75	-22.08	20.34	-12.75	0.000%
22	12.14	-27.12	20.99	-12.14	27.12	-20.99	0.000%
23	11.09	-27.12	19.17	-11.09	27.12	-19.17	0.000%
24	8.48	-27.12	14.66	-8.48	27.12	-14.66	0.000%
25	12.14	-20.34	20.99	-12.14	20.34	-20.99	0.000%
26	0.02	-27.12	25.20	-0.02	27.12	-25.20	0.000%
27	0.02	-27.12	23.11	-0.02	27.12	-23.11	0.000%
28	0.02	-27.12	17.50	-0.02	27.12	-17.50	0.000%
29	0.02	-20.34	25.20	-0.02	20.34	-25.20	0.000%
30	-13.30	-27.12	23.04	13.30	27.12	-23.04	0.000%
31	-12.26	-27.12	21.24	12.26	27.12	-21.24	0.000%
32	-9.17	-27.12	15.88	9.17	27.12	-15.88	0.000%
33	-13.30	-20.34	23.04	13.30	20.34	-23.04	0.000%
34	-23.31	-27.12	13.44	23.31	27.12	-13.44	0.000%
35	-21.50	-27.12	12.40	21.50	27.12	-12.40	0.000%
36	-16.05	-27.12	9.25	16.05	27.12	-9.25	0.000%
37	-23.31	-20.34	13.44	23.31	20.34	-13.44	0.000%
38	-26.56	-27.12	-0.02	26.56	27.12	0.02	0.000%
39	-24.46	-27.12	-0.02	24.46	27.12	0.02	0.000%
40	-18.32	-27.12	-0.02	18.32	27.12	0.02	0.000%
41	-26.56	-20.34	-0.02	26.56	20.34	0.02	0.000%
42	-21.74	-27.12	-12.55	21.74	27.12	12.55	0.000%
43	-19.92	-27.12	-11.50	19.92	27.12	11.50	0.000%
44	-15.11	-27.12	-8.72	15.11	27.12	8.72	0.000%
45	-21.74	-20.34	-12.55	21.74	20.34	12.55	0.000%
46	-12.14	-27.12	-20.99	12.14	27.12	20.99	0.000%
47	-11.09	-27.12	-19.17	11.09	27.12	19.17	0.000%
48	-8.48	-27.12	-14.66	8.48	27.12	14.66	0.000%
49	-12.14	-20.34	-20.99	12.14	20.34	20.99	0.000%
50	0.00	-80.51	0.00	0.00	80.51	0.00	0.000%
51	-0.00	-80.51	-7.36	0.00	80.51	7.36	0.000%
52	3.74	-80.51	-6.48	-3.74	80.51	6.48	0.000%
53	6.55	-80.51	-3.78	-6.55	80.51	3.78	0.000%
54	7.50	-80.51	0.00	-7.50	80.51	-0.00	0.000%
55	6.39	-80.51	3.69	-6.39	80.51	-3.69	0.000%
56	3.63	-80.51	6.28	-3.63	80.51	-6.28	0.000%
57	0.00	-80.51	7.31	-0.00	80.51	-7.31	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
58	-3.74	-80.51	6.48	3.74	80.51	-6.48	0.000%
59	-6.59	-80.51	3.80	6.59	80.51	-3.80	0.000%
60	-7.50	-80.51	-0.00	7.50	80.51	0.00	0.000%
61	-6.35	-80.51	-3.66	6.35	80.51	3.66	0.000%
62	-3.63	-80.51	-6.28	3.63	80.51	6.28	0.000%
63	-0.00	-22.60	-4.91	0.00	22.60	4.91	0.000%
64	2.55	-22.60	-4.42	-2.55	22.60	4.42	0.000%
65	4.41	-22.60	-2.54	-4.41	22.60	2.54	0.000%
66	5.09	-22.60	0.00	-5.09	22.60	-0.00	0.000%
67	4.23	-22.60	2.44	-4.23	22.60	-2.44	0.000%
68	2.33	-22.60	4.03	-2.33	22.60	-4.03	0.000%
69	0.00	-22.60	4.83	-0.00	22.60	-4.83	0.000%
70	-2.55	-22.60	4.42	2.55	22.60	-4.42	0.000%
71	-4.47	-22.60	2.58	4.47	22.60	-2.58	0.000%
72	-5.09	-22.60	-0.00	5.09	22.60	0.00	0.000%
73	-4.17	-22.60	-2.41	4.17	22.60	2.41	0.000%
74	-2.33	-22.60	-4.03	2.33	22.60	4.03	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000474
3	Yes	4	0.00000001	0.00000497
4	Yes	4	0.00000001	0.00000398
5	Yes	4	0.00000001	0.00000300
6	Yes	4	0.00000001	0.00001001
7	Yes	4	0.00000001	0.00000844
8	Yes	4	0.00000001	0.00000660
9	Yes	4	0.00000001	0.00000804
10	Yes	4	0.00000001	0.00000583
11	Yes	4	0.00000001	0.00000585
12	Yes	4	0.00000001	0.00000507
13	Yes	4	0.00000001	0.00000277
14	Yes	4	0.00000001	0.00000572
15	Yes	4	0.00000001	0.00000489
16	Yes	4	0.00000001	0.00000435
17	Yes	4	0.00000001	0.00000446
18	Yes	4	0.00000001	0.00000249
19	Yes	4	0.00000001	0.00000317
20	Yes	4	0.00000001	0.00000291
21	Yes	4	0.00000001	0.00000084
22	Yes	4	0.00000001	0.00000556
23	Yes	4	0.00000001	0.00000486
24	Yes	4	0.00000001	0.00000449
25	Yes	4	0.00000001	0.00000376
26	Yes	4	0.00000001	0.00000611
27	Yes	4	0.00000001	0.00000612
28	Yes	4	0.00000001	0.00000527
29	Yes	4	0.00000001	0.00000300
30	Yes	4	0.00000001	0.00001016
31	Yes	4	0.00000001	0.00000854
32	Yes	4	0.00000001	0.00000667
33	Yes	4	0.00000001	0.00000816
34	Yes	4	0.00000001	0.00000438
35	Yes	4	0.00000001	0.00000456
36	Yes	4	0.00000001	0.00000369
37	Yes	4	0.00000001	0.00000280
38	Yes	4	0.00000001	0.00000560
39	Yes	4	0.00000001	0.00000484
40	Yes	4	0.00000001	0.00000435
41	Yes	4	0.00000001	0.00000431
42	Yes	4	0.00000001	0.00000508
43	Yes	4	0.00000001	0.00000513

44	Yes	4	0.00000001	0.00000468
45	Yes	4	0.00000001	0.00000205
46	Yes	4	0.00000001	0.00000536
47	Yes	4	0.00000001	0.00000478
48	Yes	4	0.00000001	0.00000442
49	Yes	4	0.00000001	0.00000351
50	Yes	4	0.00000001	0.00000001
51	Yes	4	0.00000001	0.00010881
52	Yes	4	0.00000001	0.00011231
53	Yes	4	0.00000001	0.00011490
54	Yes	4	0.00000001	0.00011214
55	Yes	4	0.00000001	0.00010963
56	Yes	4	0.00000001	0.00011155
57	Yes	4	0.00000001	0.00011366
58	Yes	4	0.00000001	0.00011175
59	Yes	4	0.00000001	0.00010903
60	Yes	4	0.00000001	0.00011067
61	Yes	4	0.00000001	0.00011280
62	Yes	4	0.00000001	0.00011056
63	Yes	4	0.00000001	0.00000001
64	Yes	4	0.00000001	0.00000001
65	Yes	4	0.00000001	0.00000001
66	Yes	4	0.00000001	0.00000001
67	Yes	4	0.00000001	0.00000001
68	Yes	4	0.00000001	0.00000001
69	Yes	4	0.00000001	0.00000001
70	Yes	4	0.00000001	0.00000001
71	Yes	4	0.00000001	0.00000001
72	Yes	4	0.00000001	0.00000001
73	Yes	4	0.00000001	0.00000001
74	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
T1	120 - 110	4.42	66	0.32	0.14
T2	110 - 90	3.75	66	0.32	0.14
T3	90 - 70	2.44	66	0.29	0.13
T4	70 - 50	1.34	66	0.21	0.09
T5	50 - 40	0.59	66	0.13	0.05
T6	40 - 20	0.35	66	0.09	0.03
T7	20 - 0	0.07	66	0.04	0.01

Critical Deflections and Radius of Curvature - Service Wind

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	°	°	*ft*
119.00	PD220-9	66	4.35	0.32	0.14	341772
118.00	PD220-2	66	4.29	0.32	0.14	341772
110.00	AIR 32 B66Aa B2a	66	3.75	0.32	0.14	324371
108.00	ANT50D	66	3.62	0.32	0.14	Inf
95.00	Andrew 6' Dish	66	2.76	0.30	0.14	28400
91.00	ANT50D	66	2.51	0.29	0.13	21969
90.00	Andrew 4' Dish	66	2.44	0.29	0.13	20990
87.00	72'' Side Arm Mount	66	2.26	0.28	0.13	19047
80.00	10' horizontal x 2'' Pipe Mount	66	1.86	0.25	0.11	16345
70.00	(2) Jump Plate	66	1.34	0.21	0.09	13725

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	120 - 110	22.43	14	1.61	0.75
T2	110 - 90	19.06	14	1.60	0.75
T3	90 - 70	12.46	10	1.45	0.69
T4	70 - 50	6.89	10	1.08	0.47
T5	50 - 40	3.01	10	0.67	0.26
T6	40 - 20	1.79	10	0.48	0.15
T7	20 - 0	0.38	14	0.18	0.03

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
119.00	PD220-9	14	22.09	1.61	0.75	72388
118.00	PD220-2	14	21.76	1.60	0.75	72388
110.00	AIR 32 B66Aa B2a	14	19.06	1.60	0.75	68833
108.00	ANT50D	14	18.39	1.59	0.75	142917
95.00	Andrew 6' Dish	10	14.06	1.51	0.72	5883
91.00	ANT50D	10	12.78	1.47	0.70	4548
90.00	Andrew 4' Dish	10	12.46	1.45	0.69	4340
87.00	72'' Side Arm Mount	10	11.54	1.41	0.66	3914
80.00	10' horizontal x 2'' Pipe Mount	10	9.49	1.28	0.59	3306
70.00	(2) Jump Plate	10	6.89	1.08	0.47	2732

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T2	110	Leg	A325N	0.63	4	1.09	24.85	0.044	1	Bolt DS
T3	90	Leg	A325N	0.63	5	8.48	24.85	0.341	1	Bolt DS
T5	50	Leg	A325N	1.00	6	28.69	53.01	0.541	1	Bolt Tension
		Diagonal	A325N	1.00	1	7.53	9.14	0.824	1	Member Block Shear
T6	40	Leg	A325N	1.00	6	30.42	53.01	0.574	1	Bolt Tension
		Diagonal	A325N	1.00	1	5.50	9.14	0.601	1	Member Block Shear
T7	20	Leg	A325N	1.00	6	33.42	53.01	0.630	1	Bolt Tension
		Diagonal	A325N	1.00	1	7.73	31.81	0.243	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	1 3/4	10.00	2.48	68.0 K=1.00	2.41	-4.31	77.19	0.056 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T2	110 - 90	1 3/4	20.00	2.48	68.0 K=1.00	2.41	-43.95	77.19	0.569 [1]
T3	90 - 70	2	20.00	1.24	29.8 K=1.00	3.14	-110.44	132.51	0.833 [1]
T4	70 - 50	*2-1/4 SR w/ Half 2.5 X-Strong	20.00	2.49	47.8 K=1.00	5.10	-178.57	194.35	0.919 [1]
T5	50 - 40	Pirod 105244 + (2) 1-1/4" Tie-Rods	10.02	10.02	35.2 K=1.00	6.13	-178.99	252.06	0.710 [1]
T6	40 - 20	Pirod 105216 + (2) 1-1/4" Tie-Rods	20.03	10.02	35.2 K=1.00	6.13	-200.61	252.06	0.796 [1]
T7	20 - 0	PiRod 105217 + (2) 1-1/2" Tie-Rods	20.03	10.02	29.3 K=1.00	8.83	-220.32	373.21	0.590 [1]

[1] P_u / ϕP_n controls

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	ϕP_n K	A in^2	V_u K	ϕV_n K	Stress Ratio
T5	50 - 40	0.5	1.47	98.5	275.93	0.20	1.54	4.87	0.317
T6	40 - 20	0.5	1.47	98.5	275.93	0.20	0.77	4.27	0.181
T7	20 - 0	0.5	1.45	97.4	397.41	0.20	1.34	4.32	0.311

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	3/4	5.14	2.49	143.2 K=0.90	0.44	-0.67	4.87	0.138 [1]
T2	110 - 90	*3/4 SR w/ 3/4 Clip	5.14	2.49	110.5 K=1.00	0.44	-4.59	7.53	0.609 [1]
T3	90 - 70	7/8	5.14	2.47	122.1 K=0.90	0.60	-7.20	8.88	0.811 [1]
T4	70 - 50	*7/8 SR w/ 7/8 SR Clipped	5.50	2.63	102.0 K=1.00	0.60	-6.07	11.24	0.539 [1]
T5	50 - 40	L2 1/2x2 1/2x3/16	11.42	5.02	121.8 K=1.00	0.90	-8.18	13.38	0.612 [1]
T6	40 - 20	L2 1/2x2 1/2x3/16	12.50	5.67	137.4 K=1.00	0.90	-5.39	10.79	0.499 [1]
T7	20 - 0	*L2.5x2.5x3/16 + PL2.5x1/4	13.80	6.54	106.7 K=1.00	1.82	-7.73	32.37	0.239 [1]

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T3	90 - 70	1 1/4	4.50	4.33	116.5 K=0.70	1.23	-1.91	19.47	0.098 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	3/4	4.50	4.35	195.1 K=0.70	0.44	-0.04	2.62	0.016 [1]
T2	110 - 90	*3/4 SR w/ 3/4 Clip	4.50	4.35	193.5 K=1.00	0.44	-0.45	2.67	0.169 [1]
T3	90 - 70	7/8	4.50	4.33	166.4 K=0.70	0.60	-0.23	4.91	0.047 [1]
T4	70 - 50	*7/8 SR w/ 7/8 SR Clipped	4.50	4.26	165.0 K=1.00	0.60	-0.11	4.98	0.023 [1]

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	3/4	4.50	4.35	195.1 K=0.70	0.44	-0.20	2.62	0.077 [1]
T2	110 - 90	*3/4 SR w/ 3/4 Clip	4.50	4.35	193.5 K=1.00	0.44	-0.30	2.67	0.113 [1]
T3	90 - 70	*7/8 SR w/ 7/8 SR Clipped	4.50	4.33	167.7 K=1.00	0.60	-0.33	4.82	0.068 [1]
T4	70 - 50	*7/8 SR w/ 7/8 SR Clipped	5.00	4.76	184.3 K=1.00	0.60	-1.38	3.99	0.346 [1]

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	1 3/4	10.00	0.08	2.3	2.41	4.35	108.24	0.040 [1]
T2	110 - 90	1 3/4	20.00	0.08	2.3	2.41	42.38	108.24	0.392 [1]
T3	90 - 70	2	20.00	0.08	2.0	3.14	110.31	141.37	0.780 [1]
T4	70 - 50	*2-1/4 SR w/ Half 2.5 X-Strong	20.00	2.49	47.8	5.10	171.46	229.63	0.747 [1]
T5	50 - 40	Pirod 105244 + (2) 1-1/4" Tie-Rods	10.02	10.02	35.2	6.13	172.16	275.93	0.624 [1]
T6	40 - 20	Pirod 105216 + (2) 1-1/4" Tie-Rods	20.03	10.02	35.2	6.13	190.74	275.93	0.691 [1]
T7	20 - 0	PiRod 105217 + (2) 1-1/2" Tie-Rods	20.03	10.02	29.3	8.83	206.17	397.41	0.519 [1]

[1] P_u / ϕP_n controls

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	ϕP_n K	A in^2	V_u K	ϕV_n K	Stress Ratio
T5	50 - 40	0.5	1.47	98.5	275.93	0.20	1.54	4.87	0.317
T6	40 - 20	0.5	1.47	98.5	275.93	0.20	0.77	4.27	0.181
T7	20 - 0	0.5	1.45	97.4	397.41	0.20	1.34	4.32	0.311

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	3/4	5.14	2.49	159.1	0.44	0.68	14.31	0.047 [1]
T2	110 - 90	*3/4 SR w/ 3/4 Clip	5.14	2.49	110.5	0.44	4.56	14.31	0.318 [1]
T3	90 - 70	7/8	5.14	2.47	135.7	0.60	7.06	19.48	0.363 [1]
T4	70 - 50	*7/8 SR w/ 7/8 SR Clipped	5.17	2.47	95.6	0.60	6.07	19.44	0.312 [1]
T5	50 - 40	L2 1/2x2 1/2x3/16	11.42	5.02	80.1	0.52	7.53	22.55	0.334 [1]
T6	40 - 20	L2 1/2x2 1/2x3/16	11.93	5.42	86.2	0.52	5.50	22.55	0.244 [1]
T7	20 - 0	*L2.5x2.5x3/16 + PL2.5x1/4	13.80	6.54	106.7	1.82	7.23	58.94	0.123 [1]

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T3	90 - 70	1 1/4	4.50	4.33	166.4	1.23	1.91	39.76	0.048 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	3/4	4.50	4.35	278.7	0.44	0.03	14.31	0.002 [1]
T2	110 - 90	*3/4 SR w/ 3/4 Clip	4.50	4.35	193.5	0.44	0.46	14.31	0.032 [1]
T3	90 - 70	7/8	4.50	4.33	237.7	0.60	0.22	19.48	0.011 [1]
T4	70 - 50	*7/8 SR w/ 7/8 SR Clipped	4.50	4.26	165.0	0.60	0.11	19.44	0.006 [1]

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	120 - 110	3/4	4.50	4.35	278.7	0.44	0.21	14.31	0.014 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T2	110 - 90	*3/4 SR w/ 3/4 Clip	4.50	4.35	193.5	0.44	0.32	14.31	0.022 [1]
T3	90 - 70	*7/8 SR w/ 7/8 SR Clipped	4.50	4.33	167.7	0.60	0.29	19.44	0.015 [1]
T4	70 - 50	*7/8 SR w/ 7/8 SR Clipped	5.00	4.76	184.3	0.60	1.48	19.44	0.076 [1]

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	120 - 110	Leg	1 3/4	2	-4.31	77.19	5.6	Pass
T2	110 - 90	Leg	1 3/4	35	-43.95	77.19	56.9	Pass
T3	90 - 70	Leg	2	91	-110.44	132.51	83.3	Pass
T4	70 - 50	Leg	*2-1/4 SR w/ Half 2.5 X-Strong	172	-178.57	194.35	91.9	Pass
T5	50 - 40	Leg	Pirod 105244 + (2) 1-1/4" Tie-Rods	229	-178.99	252.06	71.0	Pass
T6	40 - 20	Leg	Pirod 105216 + (2) 1-1/4" Tie-Rods	238	-200.61	252.06	79.6	Pass
T7	20 - 0	Leg	PiRod 105217 + (2) 1-1/2" Tie-Rods	253	-220.32	373.21	59.0 63.0 (b)	Pass
T1	120 - 110	Diagonal	3/4	15	-0.67	4.87	13.8	Pass
T2	110 - 90	Diagonal	*3/4 SR w/ 3/4 Clip	44	-4.59	7.53	60.9	Pass
T3	90 - 70	Diagonal	7/8	100	-7.20	8.88	81.1	Pass
T4	70 - 50	Diagonal	*7/8 SR w/ 7/8 SR Clipped	188	-6.07	11.24	53.9	Pass
T5	50 - 40	Diagonal	L2 1/2x2 1/2x3/16	232	-8.18	13.38	61.2 82.4 (b)	Pass
T6	40 - 20	Diagonal	L2 1/2x2 1/2x3/16	244	-5.39	10.79	49.9 60.1 (b)	Pass
T7	20 - 0	Diagonal	*L2.5x2.5x3/16 + PL2.5x1/4	256	-7.73	32.37	23.9 24.3 (b)	Pass
T3	90 - 70	Secondary Horizontal	1 1/4	115	-1.91	19.47	9.8	Pass
T1	120 - 110	Top Girt	3/4	6	-0.04	2.62	1.6	Pass
T2	110 - 90	Top Girt	*3/4 SR w/ 3/4 Clip	39	-0.45	2.67	16.9	Pass
T3	90 - 70	Top Girt	7/8	96	-0.23	4.91	4.7	Pass
T4	70 - 50	Top Girt	*7/8 SR w/ 7/8 SR Clipped	177	-0.11	4.98	2.3	Pass
T1	120 - 110	Bottom Girt	3/4	8	-0.20	2.62	7.7	Pass
T2	110 - 90	Bottom Girt	*3/4 SR w/ 3/4 Clip	42	-0.30	2.67	11.3	Pass
T3	90 - 70	Bottom Girt	*7/8 SR w/ 7/8 SR Clipped	98	-0.33	4.82	6.8	Pass
T4	70 - 50	Bottom Girt	*7/8 SR w/ 7/8 SR Clipped	179	-1.38	3.99	34.6	Pass
							Summary	
						Leg (T4)	91.9	Pass
						Diagonal (T5)	82.4	Pass
						Secondary Horizontal (T3)	9.8	Pass
						Top Girt (T2)	16.9	Pass
						Bottom Girt (T4)	34.6	Pass
						Bolt Checks	82.4	Pass
						RATING =	**91.9**	**Pass**

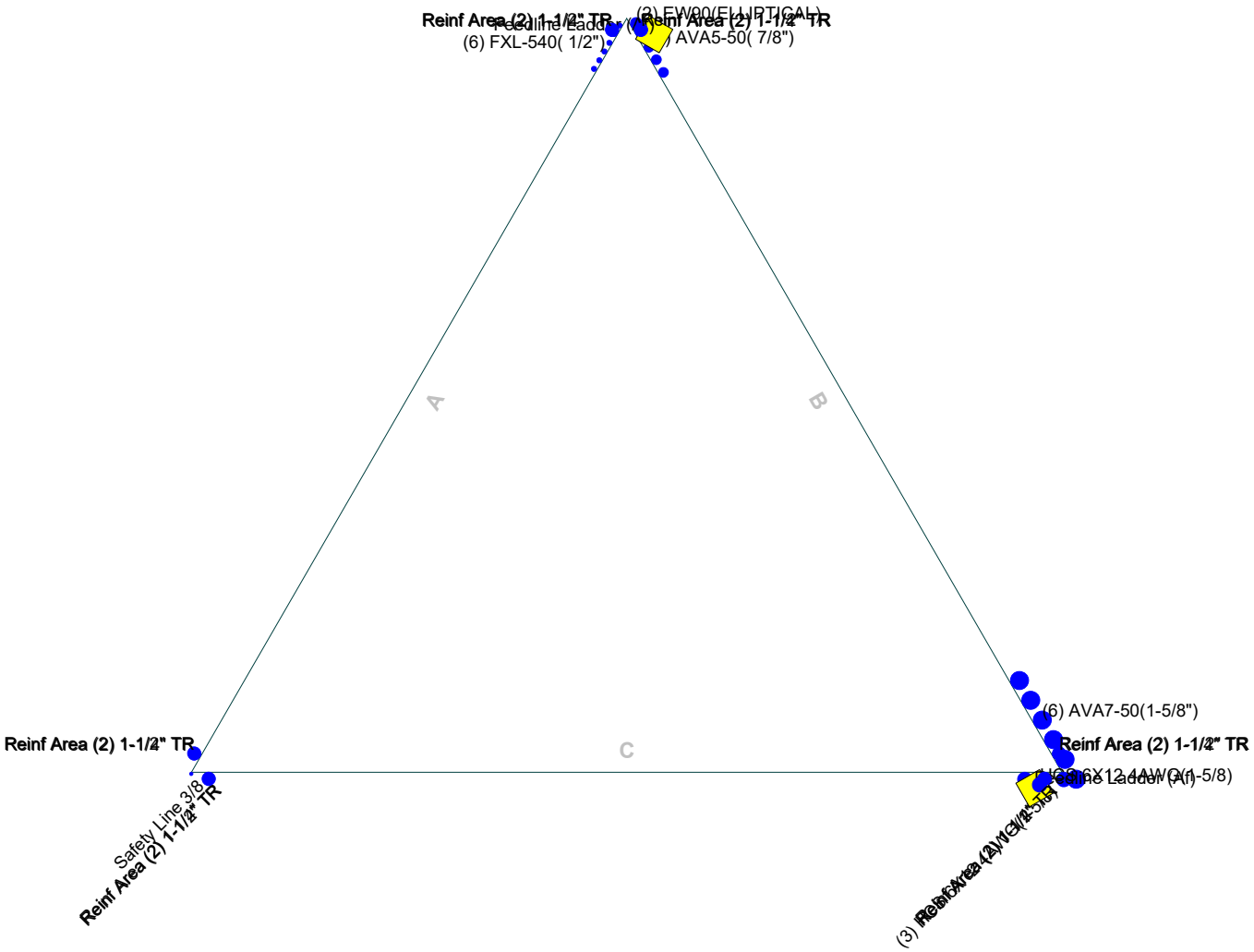
***NOTE: Above stress ratios for reinforced sections are approximate. More exact calculations are presented in Appendix C.**

APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan

Round Flat App In Face App Out Face Truss-Leg



Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.

Tectonic
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-6656
FAX: (845) 567-8703

Job:	***10473.CTHA242A - Modification Analysis***		
Project:	***120' Self-Support Tower***		
Client: T-Mobile	Drawn by: Ian Marinaccio		App'd:
Code: TIA-222-G	Date: 10/02/20		Scale: NTS
Path: G:\Newburgh\Projects\10473-NSS\10473.CTHA242A\Structural\Tower Analysis\Reinf - Rev 0\10473.CTHA242A - TowerModificationSt.eri			Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

Additional SR Diagonals with Clips

Work Order #:	10473.CTHA242A
Site name:	HA242/PortlandHS_SST
Elevation:	90 - 110 ft

TIA-222 Revision:	G

Analysis Inputs		
Compression Load, P_u:	4.59	kip
Unbraced length, L_b:	2.71	ft
Existing SR Diameter:	0.75	in
SR Yield Strength:	36	ksi
Proposed SR Diameter:	0.75	in
Clip Spacing:	11	in
Max Spacing = 12in		

Bracing Type		
Bracing Type, **k:**	K-Braced (Continuous)	

Existing Member Properties		
Area, A_e:	0.44	in^2
Moment of Inertia, I_e:	0.02	in^4
Radius of Gyration, r_e:	0.19	in

Proposed Member Properties		
Area, A_p:	0.44	in^2
Moment of Inertia, I_p:	0.02	in^4
Radius of Gyration, r_p:	0.19	in

Modified Member Properties		
Area, A_m:	0.44	in^2
Moment of Inertia, I_m:	0.03	in^4
Radius of Gyration, r_m:	0.27	in

Results	Demand	Capacity	Rating	Check
Compression (Modified Section), kip:	4.59	9.71	47.3%	**Pass**
Compression (Existing Section), kip:	4.59	6.59	69.7%	

Design Information		
Existing Slenderness Ratio Check:	OK	
Proposed Slenderness Ratio Check:	OK	
Number of Clips, ***Nc:***	4	
Clip Spacing, ***Sc:***	8.17	in
K Factor to enter into TNX:	0.495	

Complete Flange Bypass Plate Capacity Check - AISC 14th Edition						
Location:	70 ft			Code:	LRFD	
Φ_t =	0.9	LRFD		Ω_t =	1.67	ASD
$\Phi_{r/w}$ =	0.75			$\Omega_{r/w}$ =	2	
Φ_c =	0.9			Ω_c =	1.67	
Bypass Plate				**QTY =**	**2**	
Length=	38	in		A_T=	2.5	in^2
Width at Flange=	5	in		KL/r =	77.59588	
Thickness =	0.5	in		F_e =	47.53576	ksi
F_y =	50	ksi		4.71√(E/Fy) =	113.4318	
F_u =	65	ksi		F_{cr} =	32.19384	ksi
U =	1			z=	0.894447	
L_u =	14	in				
r_x =	1.443376	in		**Capacities:**		
r_y =	0.144338	in		Tension =	**112.5**	k
K=	0.8			Buckling =	**93.8**	k
E =	29000	ksi		Compression=	**64.8**	k
Connection						
Weld Material	E70XX			e_x=	4.125	inch
C1=	1			a=	0.34375	
D=	3	1/16th Weld		C=	2.901875	
l=	12	inch		ΦRn=	**78.35063**	K

Loads per TNX (max of leg section above connection)		
Compression=	113.5	kips
Tension=	113.38	kips
Plate Capacity Ratings		
Buckling=	61%	
Compression=	88%	**GOVERNS**
Tension=	50%	
Weld=	72%	

Additional SR Diagonals with Clips

Work Order #:	10473.CTHA242A
Site name:	HA242/PortlandHS_SST
Elevation:	50 - 70 ft

TIA-222 Revision:	G

Analysis Inputs		
Compression Load, P_u:	6.07	kip
Unbraced length, L_b:	2.68	ft
Existing SR Diameter:	0.875	in
SR Yield Strength:	36	ksi
Proposed SR Diameter:	0.875	in
Clip Spacing:	11	in

Max Spacing = 12in

Bracing Type		
Bracing Type, **k:**	K-Braced (Continuous)	

Existing Member Properties		
Area, A_e:	0.60	in^2
Moment of Inertia, I_e:	0.03	in^4
Radius of Gyration, r_e:	0.22	in

Proposed Member Properties		
Area, A_p:	0.60	in^2
Moment of Inertia, I_p:	0.03	in^4
Radius of Gyration, r_p:	0.22	in

Modified Member Properties		
Area, A_m:	0.60	in^2
Moment of Inertia, I_m:	0.06	in^4
Radius of Gyration, r_m:	0.31	in

Results				
	Demand	**Capacity**	**Rating**	**Check**
Compression (Modified Section), kip:	6.07	12.79	47.5%	**Pass**
Compression (Existing Section), kip:	6.07	11.16	54.4%	

Design Information		
Existing Slenderness Ratio Check:	OK	
Proposed Slenderness Ratio Check:	OK	
Number of Clips, ***Nc:***	4	
Clip Spacing, ***Sc:***	8.05	in
K Factor to enter into TNX:	0.608	

Reinforcement Capacity Check - LRFD (AISC 14th Edition)

Section:	50 - 70 ft	2-1/4" SR w/ Half 2.5" X-Strong

Solid Round

E=	29000	ksi			
F_y =	50	ksi	0.114 E/F_y =	66.12	
F_U =	65	ksi			
A_p =	3.9761	in^2	F'_y =	50	ksi
			KL/r =	53.33	
			λ_c =	0.70	
$r_x = r_y$	0.5625	in	F_{cr} =	40.61	ksi
L_p =	30	in	Section Capacity =	145.33	kips
K =	1				

Split Pipe

F_y =	50	ksi	D_{sp}/t_{sp} =	10.42	
A_{sp} =	1.1268	in^2	0.114 E/F_y =	66.12	
D_{sp} =	2.875	in	$D_{sp}/t_{sp} \le 0.114\ E/F_y$		
t_{sp} =	0.2760	in	F'_y =	50	ksi
r_x =	0.740	in	KL/r =	24.34	
r_y =	0.924	in	λ_c =	0.32	
Spacing =	18	in	F_{cr} =	47.88	ksi
K =	1	U-Bolted	Section Capacity =	48.56	kips

Composite Section

A_c =	5.1029	in^2	F'_y =	50	ksi
r_x =	0.626	in	KL/r =	47.96	
r_y =	0.660	in	λ_c =	0.63	
L_c =	30	in	F_{cr} =	42.26	ksi
K =	1		Section Capacity =	194.08	kips

Connection Option

Welded			Weld Capacity		
Length	12	in	Fw =	42	ksi
Weld Size	0.1875	in	Aw =	3.2	in^2
F_{EXX}	70	ksi	Phi * Rn =	100.2	kips

Max Load per TNX (Compression)

With wind and Reinf. =	178.57	kips	
Force in Leg =	139.14	kips	
Force in Reinf. =	39.43	kips	

Capacity

Existing Leg =	145.33	kips	95.7%
Reinforcing Half Pipe =	48.56	kips	81.2%
Composite Leg =	194.08	kips	92.0%
Leg Crushing =	178.92	kips	99.8%
Design Axial Strength =	186.51	kips	95.7%
Weld =	100.2	kips	39.3%

Truss Leg Reinforcement

Work Order # :	10473.CTHA242A
Site Name:	HA242/PortlandHS_SST
PiRod	105216
Elevation:	40 - 50 ft
TIA-222 Revision:	G

Existing Tie Rods		
Diameter, de:	1.25	in
Unbraced Length, Le:	14.1875	in
Yield Strength, Fye:	50	ksi

(2) Additional Tie Rods		
Diameter, dn:	1.25	in
Unbraced Length, Ln:	15	in
Offset, X:	0.625	in
Yield Strength, Fyn:	50	ksi

Truss Leg		
Width, w:	12	in
Unbraced Length, Lleg:	10	ft

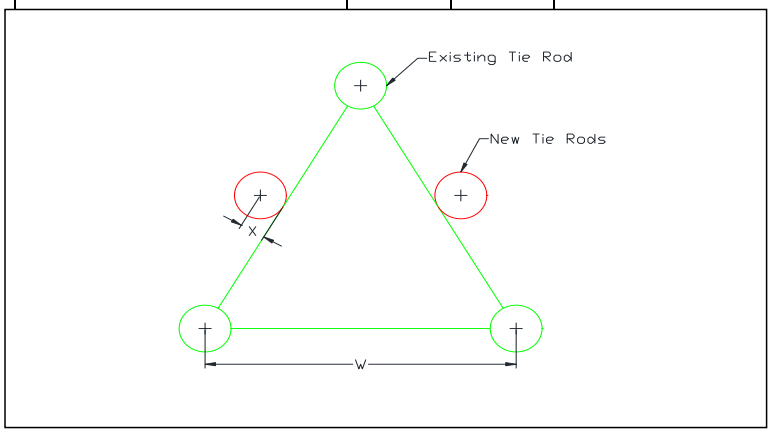
Reactions from tnx		
Compression, C:	178.99	kip
Tension, T:	172.16	kip

Output from tnx		
KL/r Modified Leg, KLtnx:	35.2	

Length Factors		
Length Factor of Existing Tie Rods, Ke:	1	
Length Factor of New Tie Rods, Kn:	1	
Length Factor of the Leg, Kleg:	1	

Results				
	Demand	Capacity	Rating	Check
Compression (Existing Tie Rods), kip:	35.80	47.50	75%	**Pass**
Compression (New Tie Rods), kip:	35.80	46.66	77%	**Pass**
Compression (Modified Tie Rods), kip:	178.99	257.98	69%	**Pass**
Tension (Existing Tie Rods), kip:	34.43	55.22	62%	**Pass**
Tension (New Tie Rods), kip:	34.43	55.22	62%	**Pass**
Tension (Modified Tie Rods), kip:	172.16	276.12	62%	**Pass**

Adjustments for tnx		
Diameter of modified truss leg, Deqv:	1.614	in



Truss Leg Reinforcement

Work Order # :	10473.CTHA242A
Site Name:	HA242/PortlandHS_SST
PiRod	105216
Elevation:	20 - 40 ft
TIA-222 Revision:	G

Existing Tie Rods		
Diameter, de:	1.25	in
Unbraced Length, Le:	14.1875	in
Yield Strength, Fye:	50	ksi

(2) Additional Tie Rods		
Diameter, dn:	1.25	in
Unbraced Length, Ln:	15	in
Offset, X:	0.625	in
Yield Strength, Fyn:	50	ksi

Truss Leg		
Width, w:	12	in
Unbraced Length, Lleg:	10	ft

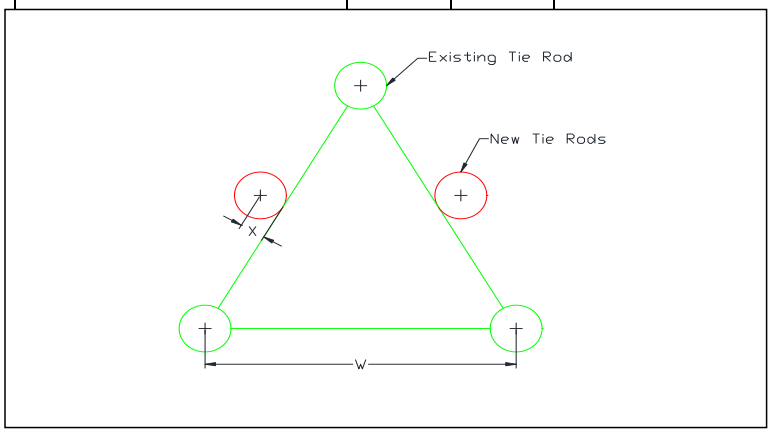
Reactions from tnx		
Compression, C:	200.61	kip
Tension, T:	190.74	kip

Output from tnx		
KL/r Modified Leg, KLtnx:	35.2	

Length Factors		
Length Factor of Existing Tie Rods, Ke:	1	
Length Factor of New Tie Rods, Kn:	1	
Length Factor of the Leg, Kleg:	1	

Results				
	Demand	Capacity	Rating	Check
Compression (Existing Tie Rods), kip:	40.12	47.50	84%	**Pass**
Compression (New Tie Rods), kip:	40.12	46.66	86%	**Pass**
Compression (Modified Tie Rods), kip:	200.61	257.98	78%	**Pass**
Tension (Existing Tie Rods), kip:	38.15	55.22	69%	**Pass**
Tension (New Tie Rods), kip:	38.15	55.22	69%	**Pass**
Tension (Modified Tie Rods), kip:	190.74	276.12	69%	**Pass**

Adjustments for tnx		
Diameter of modified truss leg, Deqv:	1.614	in



Truss Leg Reinforcement

Work Order # :	10473.CTHA242A
Site Name:	HA242/PortlandHS_SST
PiRod	105217
Elevation:	0 - 20 ft

TIA-222 Revision:	G

Existing Tie Rods		
Diameter, de:	1.5	in
Unbraced Length, Le:	14.1875	in
Yield Strength, Fye:	50	ksi

(2) New Tie Rods		
Diameter, dn:	1.5	in
Unbraced Length, Ln:	21	in
Offset, X:	0.75	in
Yield Strength, Fyn:	50	ksi

Truss Leg		
Width, w:	12	in
Unbraced Length, Lleg:	10	ft

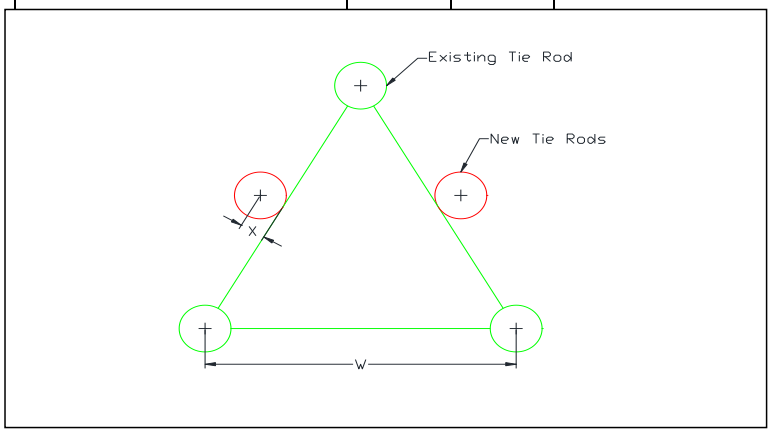
Reactions from tnx		
Compression, C:	220.32	kip
Tension, T:	206.17	kip

Output from tnx		
KL/r Modified Leg, KLtnx:	29.3	

Length Factors		
Length Factor of Existing Tie Rods, Ke:	1	
Length Factor of New Tie Rods, Kn:	1	
Length Factor of the Leg, Kleg:	1	

Results	Demand	Capacity	Rating	Check
Compression (Existing Tie Rods), kip:	44.06	71.62	62%	**Pass**
Compression (New Tie Rods), kip:	44.06	63.23	70%	**Pass**
Compression (Modified Tie Rods), kip:	220.32	371.67	59%	**Pass**
Tension (Existing Tie Rods), kip:	41.23	79.52	52%	**Pass**
Tension (New Tie Rods), kip:	41.23	79.52	52%	**Pass**
Tension (Modified Tie Rods), kip:	206.17	397.61	52%	**Pass**

Adjustments for tnx		
Diameter of modified truss leg, Deqv:	1.936	in



Project Information

Work Order #:	10473.CTHA242
Site Name	HA242/PortlandHS_SST

Tower Information

Tower Type	Self Support
TIA-222 Rev	G

☐ Load Z Normalization

Applied Loads

	Comp.	Uplift
Axial (k)	230.00	214.00
Shear (k)	20.00	19.00

Anchor Rod Data

Quantity:	6
Diameter (in):	1
Material Grade:	A687
Grout Considered:	No
l_{ar} (in):	0
Eta Factor, η:	0.5
Thread Type:	N-Included
Configuration:	Symmetrical

Fy=105 ksi Fu=150 ksi

Anchor Rod Results

Axial, Pu_c (kips)	38.33
Shear, Vu (kips)	3.33
Moment, Mu (kip-in)	-
Axial Cap., φPn_t (kips)	60.60
Shear Cap., ϕVn (kips)	-
Moment Cap., ϕMn (kip-in)	-
Stress Rating	74.3%

Pass

SST Unit Base Foundation

Work Order # : 10473.CTHA242A
Site Name: HA242/PortlandHS_SST

TIA-222 Revision: G

Top & Bot. Pad Rein. Different?:	☐
Tower Centroid Offset?:	☐
Block Foundation?:	☐

Superstructure Analysis Reactions		
Global Moment, **M**:	1918	ft-kips
Global Axial, **P**:	27	kips
Global Shear, **V**:	27	kips
Leg Compression, $\mathbf{P_{comp}}$:	230	kips
Leg Comp. Shear, $\mathbf{V_{u\_comp}}$:	20	kips
Leg Uplift, $\mathbf{P_{uplift}}$:	214	kips
Leg Uplift. Shear, $\mathbf{V_{u\_uplift}}$:	19	kips
Tower Height, **H**:	120	ft
Base Face Width, **BW**:	10	ft
BP Dist. Above Fdn, $\mathbf{bp_{dist}}$:	3	in

Foundation Analysis Checks	Capacity	Demand	Rating	Check
Lateral (Sliding) (kips)	147.51	27.00	**18.3%**	**Pass**
Bearing Pressure (ksf)	13.50	9.82	**72.8%**	**Pass**
*Overturning (kip*ft)*	2154.70	2100.25	**97.5%**	**Pass**
*Pier Flexure (Comp.) (kip*ft)*	427.58	90.00	**21.0%**	**Pass**
*Pier Flexure (Tension) (kip*ft)*	134.59	85.50	**63.5%**	**Pass**
Pier Compression (kip)	2321.21	233.98	**10.1%**	**Pass**
*Pad Flexure (kip*ft)*	1122.85	815.17	**72.6%**	**Pass**
Pad Shear - 1-way (kips)	320.26	228.99	**71.5%**	**Pass**
Pad Shear - Comp 2-way (ksi)	0.164	0.080	**48.7%**	**Pass**

Pier Properties		
Pier Shape:	Circular	
Pier Diameter, **dpier**:	2.5	ft
Ext. Above Grade, **E**:	0.50	ft
Pier Rebar Size, **Sc**:	7	
Pier Rebar Quantity, **mc**:	10	
Pier Tie/Spiral Size, **St**:	4	
Pier Tie/Spiral Quantity, **mt**:	10	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, $\mathbf{cc_{pier}}$:	3	in

Soil Rating:	**97.5%**
Structural Rating:	**72.6%**

Pad Properties		
Depth, **D**:	6.00	ft
Pad Width, **W**:	16.50	ft
Pad Thickness, **T**:	2.00	ft
Pad Rebar Size (Bottom), **Sp**:	7	
Pad Rebar Quantity (Bottom), **mp**:	22	
Pad Clear Cover, $\mathbf{cc_{pad}}$:	3	in

Material Properties		
Rebar Grade, **Fy**:	60	ksi
Concrete Compressive Strength, **F'c**:	3	ksi
Dry Concrete Density, δ**c**:	150	pcf

Soil Properties		
Total Soil Unit Weight, γ:	130	pcf
Ultimate Gross Bearing, Qult:	18.000	ksf
Cohesion, **Cu**:		ksf
Friction Angle, φ:	34	degrees
SPT Blow Count, $\mathbf{N_{blows}}$:		
Base Friction, μ:		
Neglected Depth, **N**:		ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	N/A	ft

<-- Toggle between Gross and Net

CONNECTICUT DESIGN CRITERIA - STATE

Revison:

CT is NOT a Home Rule State; Tab added only for Design Criteria

(APPENDIX N) MUNICIPALITY - SPECIFIC STRUCTURAL DESIGN PARAMETERS

				Wind Design Parameters					
Municipality	**Ground Snow Load**	**MCE Spectral Accelerations** (%g)		**Ultimate Design Wind Speeds,** V_{ult} (mph)			**Nominal Design Wind Speeds,** V_{asd} (mph)		
		S_s	S_1	Risk Cat.I	Risk Cat.II	Risk Cat III-IV	Risk Cat. I	Risk Cat. II	Risk Cat. III-IV
Andover	30	0.176	0.063	120	130	140	93	101	108
Ansonia	30	0.195	0.064	115	125	135	89	97	105
Ashford	35	0.173	0.063	120	130	140	93	101	108
Avon	35	0.181	0.064	110	120	130	85	93	101
Barkhamsted	40	0.177	0.065	110	120	125	85	93	97
Beacon Falls	30	0.192	0.064	115	125	135	89	97	105
Berlin	30	0.183	0.063	115	125	135	89	97	105
Bethany	30	0.189	0.063	115	125	135	89	97	105
Bethel	30	0.215	0.066	110	120	125	85	93	97
Bethlehem	35	0.190	0.065	110	120	125	85	93	97
Bloomfield	35	0.180	0.064	115	125	130	89	97	101
Bolton	30	0.177	0.063	115	125	135	89	97	105
Bozrah	30	0.170	0.061	120	135	145	93	105	112
Branford	30	0.180	0.061	120	130	140	93	101	108
Bridgeport	30	0.209	0.064	115	125	135	89	97	105
Bridgewater	35	0.201	0.066	110	120	125	85	93	97
Bristol	35	0.185	0.064	110	120	130	85	93	101
Brookfield	35	0.208	0.066	110	120	125	85	93	97
Brooklyn	35	0.171	0.062	120	130	140	93	101	108
Burlington	35	0.182	0.064	110	120	130	85	93	101
Canaan	40	0.173	0.065	105	115	120	81	89	93
Canterbury	35	0.171	0.061	120	130	140	93	101	108
Canton	35	0.180	0.064	110	120	130	85	93	101
Chaplin	35	0.173	0.062	120	130	140	93	101	108
Cheshire	30	0.186	0.063	115	125	135	89	97	105
Chester	30	0.172	0.060	120	130	140	93	101	108
Clinton	30	0.169	0.059	120	135	140	93	105	108
Colchester	30	0.174	0.061	120	130	140	93	101	108
Colebrook	40	0.174	0.065	105	115	125	81	89	97
Columbia	30	0.175	0.062	120	130	140	93	101	108
Cornwall	40	0.180	0.065	105	115	120	81	89	93
Coventry	30	0.176	0.063	120	130	140	93	101	108
Cromwell	30	0.181	0.063	115	125	135	89	97	105
Danbury	30	0.217	0.067	110	120	125	85	93	97
Darien	30	0.242	0.068	110	120	130	85	93	101
Deep River	30	0.170	0.060	120	130	140	93	101	108
Derby	30	0.195	0.064	115	125	135	89	97	105
Durham	30	0.179	0.062	115	130	140	89	101	108
Eastford	40	0.172	0.063	120	130	140	93	101	108
East Granby	35	0.177	0.065	110	120	130	85	93	101
East Haddam	30	0.172	0.061	120	130	140	93	101	108
East Hampton	30	0.177	0.062	120	130	140	93	101	108

East Hartford	30	0.180	0.064	115	125	135	89	97	105
East Haven	30	0.182	0.062	120	130	140	93	101	108
East Lyme	30	0.164	0.059	125	135	145	97	105	112
Easton	30	0.215	0.066	110	120	130	85	93	101
East Windsor	35	0.177	0.064	115	125	135	89	97	105
Ellington	35	0.176	0.064	115	125	135	89	97	105
Enfield	35	0.176	0.065	110	125	130	85	97	101
Essex	30	0.168	0.059	120	135	145	93	105	112
Fairfield	30	0.215	0.065	115	125	135	89	97	105
Farmington	35	0.183	0.064	115	125	135	89	97	105
Franklin	30	0.171	0.061	120	130	140	93	101	108
Glastonbury	30	0.180	0.063	115	125	135	89	97	105
Goshen	40	0.181	0.065	105	115	125	81	89	97
Granby	35	0.176	0.065	110	120	130	85	93	101
Greenwich	30	0.259	0.070	110	120	130	85	93	101
Griswold	30	0.168	0.060	125	135	145	97	105	112
Groton	30	0.160	0.058	125	135	145	97	105	112
Guilford	30	0.176	0.061	120	130	140	93	101	108
Haddam	30	0.175	0.061	120	130	140	93	101	108
Hamden	30	0.185	0.063	115	125	135	89	97	105
Hampton	35	0.172	0.062	120	130	140	93	101	108
Hartford	30	0.181	0.064	115	125	135	89	97	105
Hartland	40	0.175	0.065	110	120	125	85	93	97
Harwinton	35	0.183	0.065	110	120	130	85	93	101
Hebron	30	0.177	0.063	120	130	140	93	101	108
Kent	40	0.188	0.065	105	115	120	81	89	93
Killingly	40	0.171	0.062	120	130	140	93	101	108
Killingworth	30	0.173	0.061	120	130	140	93	101	108
Lebanon	30	0.173	0.062	120	130	140	93	101	108
Ledyard	30	0.163	0.059	125	135	145	97	105	112
Lisbon	30	0.169	0.061	125	135	145	97	105	112
Litchfield	40	0.184	0.065	110	120	125	85	93	97
Lyme	30	0.164	0.059	125	135	145	97	105	112
Madison	30	0.173	0.060	120	130	140	93	101	108
Manchester	30	0.178	0.064	115	125	135	89	97	105
Mansfield	35	0.173	0.062	120	130	140	93	101	108
Marlborough	30	0.177	0.062	120	130	140	93	101	108
Meriden	30	0.183	0.063	115	125	135	89	97	105
Middlebury	35	0.191	0.064	110	120	130	85	93	101
Middlefield	30	0.181	0.063	115	125	135	89	97	105
Middletown	30	0.180	0.063	115	130	135	89	101	105
Milford	30	0.194	0.063	115	125	135	89	97	105
Monroe	30	0.205	0.065	110	120	130	85	93	101
Montville	30	0.165	0.059	125	135	145	97	105	112
Morris	35	0.187	0.065	110	120	125	85	93	97
Naugatuck	30	0.190	0.064	110	125	135	85	97	105
New Britain	30	0.183	0.064	115	125	135	89	97	105
New Canaan	30	0.240	0.068	110	120	130	85	93	101
New Fairfield	35	0.212	0.067	105	115	125	81	89	97
Portland	30	0.180	0.063	115	130	135	89	101	105
Preston	30	0.167	0.060	125	135	145	97	105	112
Prospect	30	0.188	0.064	115	125	135	89	97	105
Putnam	40	0.172	0.063	120	130	140	93	101	108

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:	Mon Jul 27 2020

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.

APPENDIX D

MODIFICATION DRAWINGS

MODIFICATION INSPECTION (MI) CHECKLIST

CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
PRE-CONSTRUCTION	
X	MI CHECKLIST DRAWING
X	EOR APPROVED SHOP DRAWINGS
X	FABRICATION INSPECTION
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
NA	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
CONSTRUCTION	
X	GENERAL CONSTRUCTION INSPECTION
X	SPECIAL INSPECTION OF STRUCTURAL STEEL ERECTION & BOLTING
X	SPECIAL INSPECTION OF FIELD WELDING
NA	CONTINUOUS FOUNDATION INSPECTIONS
NA	CONCRETE COMPRESSIVE STRENGTH AND SLUMP TESTS
NA	GROUT COMPRESSIVE STRENGTH TESTS (ASTM C942)
NA	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION AND NDE REPORTS
NA	EARTHWORK: LIFT AND DENSITY
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
NA	NON-TENSION CONTROLLED BOLT INSPECTION (AS REQUIRED)
ADDITIONAL TESTING AND INSPECTIONS:	
POST-CONSTRUCTION	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
NA	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	

NOTE: X DENOTES A DOCUMENT REQUIRED FOR THE MI REPORT
NA DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE MI REPORT

MODIFICATION INSPECTION NOTES

GENERAL

THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, NOR DOES THE MI INSPECTOR TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.

ALL MI'S SHALL BE CONDUCTED BY AN OWNER APPROVED ENGINEERING VENDOR THAT IS APPROVED TO PERFORM ELEVATED WORK FOR THE OWNER.

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PURCHASE ORDER (PO) IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN, REFER TO THE PROJECT CONTACTS LISTED IN THE PROJECT DIRECTORY ON SHEET T-1.

MI INSPECTOR

THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS

THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GC INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO THE OWNER.

GENERAL CONTRACTOR

THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE MI INSPECTOR TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE MI INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS
- BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS

THE GC SHALL PERFORM AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST.

RECOMMENDATIONS

THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING AN MI REPORT:

- IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF FIVE (5) BUSINESS DAYS NOTICE, PREFERABLY TEN (10), TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS.
- IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE FOUNDATION INSPECTIONS TO ALLOW THE FOUNDATION AND MI INSPECTION(S) TO COMMENCE WITH ONE SITE VISIT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE.

CANCELLATION OR DELAYS IN SCHEDULED MI

IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, THE OWNER SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF THE OWNER CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

CORRECTION OF FAILING MI'S

IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI ("FAILED MI"), THE GC SHALL WORK WITH THE OWNER TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:

- CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI.
- OR, WITH THE OWNER'S APPROVAL, THE GC MAY WORK WITH THE EOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION.

MI VERIFICATION INSPECTIONS

THE OWNER RESERVES THE RIGHT TO CONDUCT AN MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTION(S) ON TOWER MODIFICATION PROJECTS.

ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS.

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT INSPECTION FIRM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "PASSING MI" OR "PASS AS NOTED MI" REPORT FOR THE ORIGINAL PROJECT.

REQUIRED PHOTOS

BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

1. PRE-CONSTRUCTION GENERAL SITE CONDITION
2. PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION:
   - RAW MATERIALS
   - PHOTOS OF ALL CRITICAL DETAILS
   - FOUNDATION MODIFICATIONS
   - WELD PREPARATION
   - BOLT INSTALLATION AND TORQUE
   - FINAL INSTALLED CONDITION
   - SURFACE COATING REPAIR
3. POST CONSTRUCTION PHOTOGRAPHS:
   - FINAL IN FIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN ONLY FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.
Tectonic Engineering & Surveying Consultants P.C.
70 Pleasant Hill Road — Phone: (845) 534-5959
P.O. Box 37 — (800) 829-6531
Mountainville, NY 10953 — www.tectonicengineering.com
Project Contact Info
1279 Route 300
Newburgh, NY 12550 — Phone: (845) 567-6656

T-Mobile
NORTHEAST, LLC.

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

APPROVALS

LANDLORD _____
RF _____
CONSTRUCTION _____
OPERATIONS _____
SITE ACQ. _____

PROJECT NUMBER	DESIGNED BY
10473.CTHA242A	EI

REV.	DATE	DESCRIPTION	DRAWN BY
A	10/2/20	FOR COMMENT	MB

ISSUED BY | DATE

0 1 2 3
ORIGINAL SIZE IN INCHES

SITE INFORMATION

HA242/PORTLANDHS_SST
CTHA242A
95 HIGH STREET
PORTLAND, CT 06480

SHEET TITLE

TOWER REINFORCEMENT MODIFICATION INSPECTION CHECKLIST & NOTES

SHEET NUMBER

SN-1

TOWER REINFORCEMENT NOTES

GENERAL

1. ALL REFERENCES TO THE OWNER IN THESE DOCUMENTS SHALL BE CONSIDERED T–MOBILE OR ITS DESIGNATED REPRESENTATIVE.
2. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR, UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST HAVE CONSIDERABLE EXPERIENCE IN THE PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTANCE OF THIS ASSIGNMENT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICIENT EXPERIENCE AND ABILITY, THAT HE IS KNOWLEDGEABLE OF THE WORK TO BE PERFORMED, THAT HE IS PROPERLY LICENSED, AND THAT HE IS PROPERLY REGISTERED TO DO THIS WORK IN THE STATE AND/OR COUNTY IN WHICH IT IS TO BE PERFORMED.
3. NOTES AND TYPICAL DETAILS ARE APPLICABLE TO ALL PARTS OF THE STRUCTURE, ALL MATERIALS LISTED HEREIN, ANY PROCEDURES TO BE USED ON THIS PROJECT, AND SHALL BE READ IN CONJUNCTION WITH THE STRUCTURAL DRAWINGS AND PROJECT SPECIFICATIONS.
4. CONTRACTOR SHALL RECEIVE CLARIFICATION IN WRITING, AND SHALL RECEIVE IN WRITING, AUTHORIZATION TO PROCEED BEFORE STARTING WORK ON ANY ITEMS NOT CLEARLY DEFINED OR IDENTIFIED BY THE CONTRACT DOCUMENTS.
5. CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK USING THE BEST CONSTRUCTION SKILLS AND ATTENTION. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER CONTRACT, UNLESS OTHERWISE NOTED.
6. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS AND APPROVALS FROM ALL AUTHORITIES HAVING JURISDICTION FOR THIS PROJECT AND SHALL NOTIFY THE APPLICABLE JURISDICTIONAL (STATE, COUNTY, OR CITY) ENGINEER 24 HOURS PRIOR TO THE BEGINNING OF CONSTRUCTION.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ABIDING BY ALL CONDITIONS AND REQUIREMENTS OF THE PERMITS.
8. ERECT GUARDS AND BARRIERS PER APPLICABLE LABOR AND CONSTRUCTION SAFETY REGULATIONS.
9. THE CONTRACTOR SHALL INSPECT THE EXISTING STRUCTURE AND FIELD VERIFY ALL EXISTING CONDITIONS, POSSIBLE INTERFERENCES, AND DIMENSIONS BEFORE PROCEEDING WITH THE WORK. REPORT ANY AND ALL DISCREPANCIES TO THE ENGINEER OF RECORD (EOR) AND FIELD PERSONNEL IMMEDIATELY. ANY AND ALL FIELD CHANGES SHALL BE APPROVED AND DOCUMENTED BY THE EOR PRIOR TO FIELD IMPLEMENTATION.
10. ALL MATERIALS AND WORKMANSHIP SHALL BE WARRANTED FOR TWO (2) YEARS FROM THE ACCEPTANCE DATE UPON COMPLETION OF CONSTRUCTION.
11. USE ONLY THE LATEST ISSUES OF ANY APPLICABLE CODES, STANDARDS, OR REGULATIONS MENTIONED IN THE FOLLOWING NOTES AND SPECIFICATIONS, UNLESS SPECIFICALLY NOTED OTHERWISE.
12. ALL WORKMANSHIP SHALL BE IN ACCORDANCE WITH ANSI, ASTM, ACI, TIA, AND AISC STANDARDS AS REFERENCED IN THE APPLICABLE CODE.
13. STRUCTURAL ELEMENTS SHOWN ON THESE DRAWINGS ARE DESIGNED IN ACCORDANCE WITH APPLICABLE BUILDING CODES/STANDARDS. ALL CONSTRUCTION, EXCEPT WHERE NOTED OTHERWISE, SHALL COMPLY WITH THOSE CODES/STANDARDS.
14. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS, AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER OF RECORD PRIOR TO FABRICATION AND INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.
15. ALL MANUFACTURER'S HARDWARE ASSEMBLY INSTRUCTIONS SHALL BE FOLLOWED EXACTLY AND SHALL SUPERSEDE ANY CONFLICTING NOTES ENCLOSED HEREIN.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK WITHIN THE WORK AREA AND ANY ADJACENT AREAS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. THE CONTRACTOR IS ALSO RESPONSIBLE FOR ENSURING THAT ALL CONSTRUCTION PROCEDURES COMPLY WITH THE REQUIREMENTS OF OSHA, THE OWNER, AND ALL OTHER APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK.
17. ACCESS TO THE PROPOSED WORK SITE MAY BE RESTRICTED. THE CONTRACTOR SHALL COORDINATE AND OBTAIN APPROVAL FOR INTENDED CONSTRUCTION ACTIVITY, INCLUDING WORK SCHEDULE AND MATERIAL ACCESS, WITH THE RESIDENT LEASING AGENT.
18. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SAFEGUARD ALL EXISTING STRUCTURES OR BURIED SERVICES AFFECTED BY THIS CONSTRUCTION. CONTRACTOR IS ALSO RESPONSIBLE FOR TEMPORARILY RELOCATING ANY LINES OR STRUTS AS NECESSARY TO COMPLETE THE REQUIRED WORK.
19. STRUCTURAL DESIGN IS FOR THE COMPLETE CONDITION ONLY. THE CONTRACTOR MUST BE COGNIZANT THAT THE REMOVAL OF ANY STRUCTURAL COMPONENT OF AN EXISTING TOWER HAS THE POTENTIAL TO CAUSE THE PARTIAL OR COMPLETE COLLAPSE OF THE STRUCTURE. ALL NECESSARY PRECAUTIONS MUST BE TAKEN TO ENSURE STRUCTURAL INTEGRITY, INCLUDING, BUT NOT LIMITED TO, ENGINEERING ASSESSMENT OF CONSTRUCTION STRESSES WITH INSTALLATION MAXIMUM WIND SPEED AND/OR TEMPORARY BRACING AND SHORING.
20. PLANS ARE NOT TO BE SCALED. DETAILS ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
21. FOR THIS ANALYSIS AND MODIFICATION, THE TOWER HAS BEEN ASSUMED TO BE IN GOOD CONDITION WITHOUT ANY DEFECTS. IF THE CONTRACTOR DISCOVERS ANY INDICATION OF AN EXISTING STRUCTURAL DEFECT, CONTACT THE ENGINEER OF RECORD IMMEDIATELY.
22. ALL WORK SHALL BE PERFORMED IN CALM WEATHER, WITH WIND GUSTS LESS THAN 10 MPH.
23. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE ENGINEER OF RECORD.
24. ALL TOWER REINFORCEMENT SHALL BE COMPLETED PRIOR TO INSTALLATION OF PROPOSED ANTENNAS, MOUNTS, AND CABLES.
25. PROTECT EXISTING ANTENNAS, MOUNTS, CABLES, AND EQUIPMENT FROM DAMAGE DURING INSTALLATION OF ANTENNAS AND REINFORCING.
26. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO ENSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENTS AND TO MAINTAIN TOWER ALIGNMENT AND PLUMBNESS DURING REINFORCEMENT OF MEMBERS. THIS INCLUDES, BUT IS NOT LIMITED TO, PROVIDING TEMPORARY GUYS, TIE–DOWNS, OR BRACING/SUPPORT SYSTEMS AS NECESSARY. NO STRUCTURAL MEMBERS SHALL BE REMOVED UNTIL SUCH SYSTEMS ARE ADEQUATELY INSTALLED ON THE TOWER. TOWER REINFORCEMENT WORK SHALL COMPLY WITH THE REQUIREMENTS OF ANSI/TIA–322 AND ANSI/ASSE A10.48.
27. CONTRACTOR SHALL SUBMIT A DETAILED, SITE SPECIFIC RIGGING PLAN TO THE OWNER PRIOR TO THE START OF ANY WORK.
28. REMOVE FROM THE SITE AND PROPERLY DISPOSE OF ALL TEMPORARY BRACING, REMOVED TOWER MEMBERS/BOLTS, EXCESS MATERIALS, AND DEBRIS, AS DIRECTED BY THE OWNER'S REPRESENTATIVE UPON COMPLETION OF WORK.
29. GROUNDING SYSTEM SHALL BE CHECKED AND UPGRADED AS NECESSARY, AS DIRECTED BY THE OWNER'S REPRESENTATIVE.
30. CONTRACTOR SHALL ACCURATELY FIELD VERIFY LENGTHS OF ALL MATERIAL PRIOR TO FABRICATION OR ORDERING OF ANY PRODUCTS.
31. 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 ENGINEER APPROVAL.
32. CONTRACTOR SHALL FIELD VERIFY SAFETY CLIMB LOCATION AND CONTACT THE ENGINEER OF RECORD IF THE DESIGN SHOWN IMPACTS THE SAFETY CLIMB SYSTEM. THE CLIMBING FACILITIES, SAFETY CLIMB, AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED, OR ALTERED WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE TOWER OWNER OR ENGINEER OF RECORD.

STRUCTURAL STEEL & BOLTING

1. DESIGN AND CONSTRUCTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS", LATEST EDITION.
2. HOLLOW STRUCTURAL SECTION (HSS) SPLIT PIPE SECTIONS FOR LEG REINFORCING SHALL CONFORM TO ASTM A500 "COLD–FORMED WELDED AND SEAMLESS CARBON STEEL STRUCTURAL TUBING IN ROUNDS AND SHAPES" (Fy = 50 ksi). IF THE MEMBER SIZES INDICATED ARE NOT AVAILABLE IN THIS GRADE, BENT PLATE LEG REINFORCING CONFORMING TO A572 "HIGH–STRENGTH LOW–ALLOY COLUMBIUM–VANADIUM STRUCTURAL STEEL", GRADE 50, MAY BE SUBSTITUTED. BENT PLATE SHALL BE FORMED TO A RADIUS MATCHING THE EXISTING TOWER LEG. SUBSTITUTION WITH ASTM A53 PIPE IS **NOT** ACCEPTABLE.
3. ALL OTHER HOLLOW STRUCTURAL SECTIONS (HSS) SHALL CONFORM TO ASTM A500, GRADE B (Fy = 42 ksi). SUBSTITUTION WITH ASTM A53 PIPE IS **NOT** ACCEPTABLE.
4. FLANGE SPLICE BYPASS PLATES SHALL CONFORM TO ASTM A572 "HIGH–STRENGTH LOW–ALLOY COLUMBIUM–VANADIUM STRUCTURAL STEEL", GRADE 50, UNLESS OTHERWISE INDICATED. ALL OTHER MISCELLANEOUS STEEL, INCLUDING CHANNELS, ANGLES, PLATES, BARS, AND SOLID RODS SHALL CONFORM TO ASTM A36 "CARBON STRUCTURAL STEEL" (Fy = 36 ksi), UNLESS OTHERWISE INDICATED.
5. ALL STEEL MATERIALS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT–DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS", UNLESS OTHERWISE NOTED.
6. STRUCTURAL CONNECTION BOLTS SHALL BE HIGH STRENGTH BOLTS CONFORMING TO ASTM A325 "STRUCTURAL BOLTS, STEEL, HEAT TREATED, 120/105 ksi MINIMUM TENSILE STRENGTH" OR ASTM A490 "STRUCTURAL BOLTS, ALLOY STEEL, HEAT TREATED, 150 KSI MINIMUM TENSILE STRENGTH", AS INDICATED ON THE TOWER MODIFICATION SCHEDULE AND TOWER REINFORCEMENT ELEVATION, **CONNECTION TYPE X**, UNLESS OTHERWISE NOTED. **BOLT THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE.** FULLY THREADED BOLTS (A325T) SHALL NOT BE USED. EXISTING BOLTS THAT HAVE BEEN REMOVED SHALL NOT BE REUSED.
7. U–BOLTS SHALL CONFORM TO ASTM A36 OR A307 "CARBON STEEL BOLTS, STUDS, AND THREADED ROD 60000 PSI TENSILE STRENGTH". ALL U–BOLTS SHALL BE 1/2" DIAMETER IN 9/16" DIAMETER HOLES, UNLESS OTHERWISE NOTED. INSTALL DOUBLE NUTS ON ALL CONNECTIONS.
8. MATCHING NUTS SHALL BE HEAVY HEX TYPE, CONFORMING TO ASTM A563, "CARBON AND ALLOY STEEL NUTS". WASHERS, WHERE REQUIRED, SHALL CONFORM TO ASTM F436 "HARDENED STEEL WASHERS". INSTALL NUT–LOCKING DEVICES OR MECHANISMS SUCH AS, BUT NOT LIMITED TO, LOCK NUTS, LOCK WASHERS, OR PALNUTS, CONFORMING TO SECTION 4.9.2 OF ANSI/TIA–222 ON ALL NEW/REPLACED BOLTS TO PREVENT LOOSENING.
9. ALL A325 BOLTS, U–BOLTS, AND MISCELLANEOUS HARDWARE SHALL BE HOT–DIP GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT–DIP) ON IRON AND STEEL HARDWARE", UNLESS OTHERWISE NOTED.
10. ALL ASTM A490 BOLTS SHALL BE COATED WITH ZINC/ALUMINUM CORROSION PROTECTIVE COATINGS PER ASTM F1136 "ZINC/ALUMINUM CORROSION PROTECTIVE COATINGS FOR FASTENERS", GRADE 3, USING GEOMET, MAGNI, OR OTHER ENGINEER APPROVED CORROSION PROTECTIVE COATING.
11. DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780 "REPAIR OF DAMAGED AND UNCOATED AREAS OF HOT–DIP GALVANIZED COATINGS", USING Z.R.C. COLD GALVANIZING COMPOUND AS MANUFACTURED BY ZRC WORLDWIDE, OR ENGINEER APPROVED EQUAL WITH A MINIMUM METALLIC ZINC CONTENT OF 95% BY WEIGHT IN DRY FILM. DRY FINISHED COATING THICKNESS SHALL BE 3 MILS MINIMUM.
12. ALL BOLT HOLES SHALL BE STANDARD HOLES AS DEFINED BY AISC, DRILLED OR PUNCHED 1/16" LARGER IN DIAMETER THAN THE CONNECTING BOLT, UNLESS OTHERWISE NOTED. OVERSIZED OR SLOTTED HOLES, OR ANY BURNING OF HOLES, IS NOT PERMITTED.
13. ALL CONNECTIONS TO BE SNUG TIGHT TYPE IN ACCORDANCE WITH THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS".
14. ALL CONNECTIONS THAT ARE NOT FULLY DETAILED ON THESE DRAWINGS SHALL BE DETAILED BY THE STEEL FABRICATOR. STEEL FABRICATOR SHALL MAINTAIN EDGE DISTANCES AND SPACING OF BOLT HOLES IN ACCORDANCE WITH THE TIA REQUIREMENTS AND EXISTING FIELD CONDITIONS. IF REQUIRED, COPING OF REINFORCING ANGLES SHALL BE WITHIN THE LIMITS OF ALLOWABLE COPING AS INDICATED ON THESE DRAWINGS. **IN CASE OF DISCREPANCIES, IMMEDIATELY CONTACT THE ENGINEER OF RECORD FOR FURTHER DIRECTION.**
15. ALL NEW/REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH SUCH THAT THE END OF THE BOLT IS AT LEAST FLUSH WITH THE FACE OF THE NUT, PROVIDING A MINIMUM STICK–THROUGH OF ZERO. IT IS NOT PERMITTED FOR THE BOLT END TO BE BELOW THE FACE OF THE NUT AFTER TIGHTENING IS COMPLETED.
16. SUBMIT SHOP DETAIL DRAWINGS OF ALL STRUCTURAL AND MISCELLANEOUS STEEL TO THE ENGINEER FOR APPROVAL, AND INCORPORATE ALL COMMENTS PRIOR TO FABRICATION.
17. AFTER FINAL INSPECTION, ALL GALVANIZED STEEL SURFACES THAT HAVE BEEN DAMAGED AS THE RESULT OF THIS SCOPE OF WORK, INCLUDING AREAS AROUND GRINDING, WELDS, FIELD DRILLED HOLES, AND LEG/SHAFT INTERIORS (WHERE ACCESSIBLE), SHALL BE PREPARED BY POWER TOOL CLEANING IN ACCORDANCE WITH SSPC SP–3, AND TOUCH–UP PAINTED WITH BRUSH–APPLIED, COLD–GALVANIZING COMPOUND. PHOTO DOCUMENTATION IS REQUIRED TO BE SUBMITTED TO THE MI INSPECTOR.

WELDING

1. **FIELD WELDING OF EXISTING TOWER MEMBERS IS NOT PERMITTED, UNLESS SPECIFICALLY INDICATED OTHERWISE ON THESE DRAWINGS.**
2. CONTRACTOR SHALL COMPLY WITH AWS D1.1 "STRUCTURAL WELDING CODE – STEEL" FOR PROCEDURES, APPEARANCE AND QUALITY OF WELDS, AND FOR METHODS USED IN CORRECTING WELDING. ALL WELDERS AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES".
3. REMOVE ALL GALVANIZING IN AREAS TO BE WELDED BY GRINDING. SURFACES TO BE WELDED SHALL BE FREE FROM SCALE, SLAG, RUST, MOISTURE, GREASE OR ANY OTHER FOREIGN MATERIAL THAT WOULD PREVENT PROPER WELDING. GRIND THE SURFACE ADJACENT TO THE WELD FOR A DISTANCE OF 2" MINIMUM ALL AROUND, AND ENSURE THAT THESE AREAS ARE 100% FREE OF ALL GALVANIZING. AFTER WELDING, CLEAN AND PROTECT ALL EXPOSED STEEL AND WELDS BY COLD GALVANIZING.
4. ALL WELDING TO THE TOWER SHALL BE PERFORMED USING THE SMAW PROCESS WITH E70XX LOW HYDROGEN ELECTRODES, UNLESS OTHERWISE INDICATED. LOW HYDROGEN ELECTRODES SHALL BE PURCHASED IN HERMETICALLY SEALED CONTAINERS AND SHALL BE USED WITHIN 4 HOURS AFTER OPENING THE CONTAINER. ELECTRODES NOT USED WITHIN 4 HOURS SHALL BE REDRIED AT A TEMPERATURE BETWEEN 450°F AND 500°F FOR AT LEAST 2 HOURS AND THEN STORED AT 250°F. REDRIED ELECTRODES SHALL BE USED WITHIN 4 HOURS AFTER REMOVAL FROM THE STORAGE OVEN. REDRIED ELECTRODES NOT USED WITHIN 4 HOURS SHALL BE DISCARDED.
5. SPACES BETWEEN INTERMITTENT WELDS SHALL BE FILLED USING CHEM–CALK 915 SEALANT AS MANUFACTURED AND MARKETED BY BOSTIK, INC., WAUWATOSA, WI 53226 (800) 726–7845, OR ENGINEER APPROVED EQUAL.
6. ALL FIELD WELDING SHALL BE VISUALLY INSPECTED BY AN AWS CERTIFIED WELDING INSPECTOR (CWI) IN ACCORDANCE WITH THE ACCEPTANCE CRITERIA OF AWS D1.1., PRIOR TO INSTALLATION OF THE PROPOSED ANTENNAS AND/OR APPURTENANCES. THE CWI SHALL WORK WITH THE GC ON THE LEVEL OF INTERACTION NEEDED TO CONDUCT THE REQUIRED WELDING INSPECTION(S). THE CERTIFIED WELDING INSPECTION IS THE RESPONSIBILITY OF THE GC.
7. DO NOT WELD IF THE TEMPERATURE OF THE STEEL IN THE VICINITY OF THE WELD AREA IS BELOW 0°F. MINIMUM PREHEAT AND INTERPASS TEMPERATURE REQUIREMENTS SHALL COMPLY WITH AWS D1.1.
8. DO NOT WELD ON WET OR FROST–COVERED SURFACES, AND PROVIDE ADEQUATE PROTECTION FROM HIGH WINDS.

TOWER REINFORCEMENT DESIGN CRITERIA

TOWER REINFORCEMENT IS DESIGNED IN CONFORMANCE TO THE REQUIREMENTS OF THE CODES AND STANDARDS LISTED BELOW. ALL TOWER REINFORCEMENT WORK, INCLUDING FABRICATION, ERECTION, ALTERATION, AND MAINTENANCE, SHALL COMPLY WITH THE REQUIREMENTS OF FOLLOWING, UNLESS SPECIFICALLY NOTED OTHERWISE:

- 2018 CONNECTICUT STATE BUILDING CODE
- ANSI/TIA–222–G "STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS"
- ANSI/TIA–322 "LOADING, ANALYSIS, AND DESIGN CRITERIA RELATED TO THE INSTALLATION, ALTERATION AND MAINTENANCE OF COMMUNICATION STRUCTURES"
- ANSI/ASSE A10.48 "CRITERIA FOR SAFETY PRACTICES WITH THE CONSTRUCTION, DEMOLITION, MODIFICATION AND MAINTENANCE OF COMMUNICATION STRUCTURES"

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.
Tectonic Engineering & Surveying Consultants P.C.
70 Pleasant Hill Road — Phone: (845) 534–5959
P.O. Box 37 — (800) 829–6531
Mountainville, NY 10953 — www.tectonicengineering.com
Project Contact Info
1279 Route 300
Newburgh, NY 12550 — Phone: (845) 567–6656

T·Mobile·
NORTHEAST, LLC.

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

APPROVALS

LANDLORD _____
RF _____
CONSTRUCTION _____
OPERATIONS _____
SITE ACQ. _____

PROJECT NUMBER	DESIGNED BY
10473.CTHA242A	EI

REV.	DATE	DESCRIPTION	DRAWN BY
1	10/2/20	FOR COMMENT	MB

ISSUED BY _____ DATE _____

0 1 2 3
ORIGINAL SIZE IN INCHES

SITE INFORMATION

HA242/PORTLANDHS_SST
CTHA242A
95 HIGH STREET
PORTLAND, CT 06480

SHEET TITLE

TOWER REINFORCEMENT DESIGN CRITERIA & NOTES

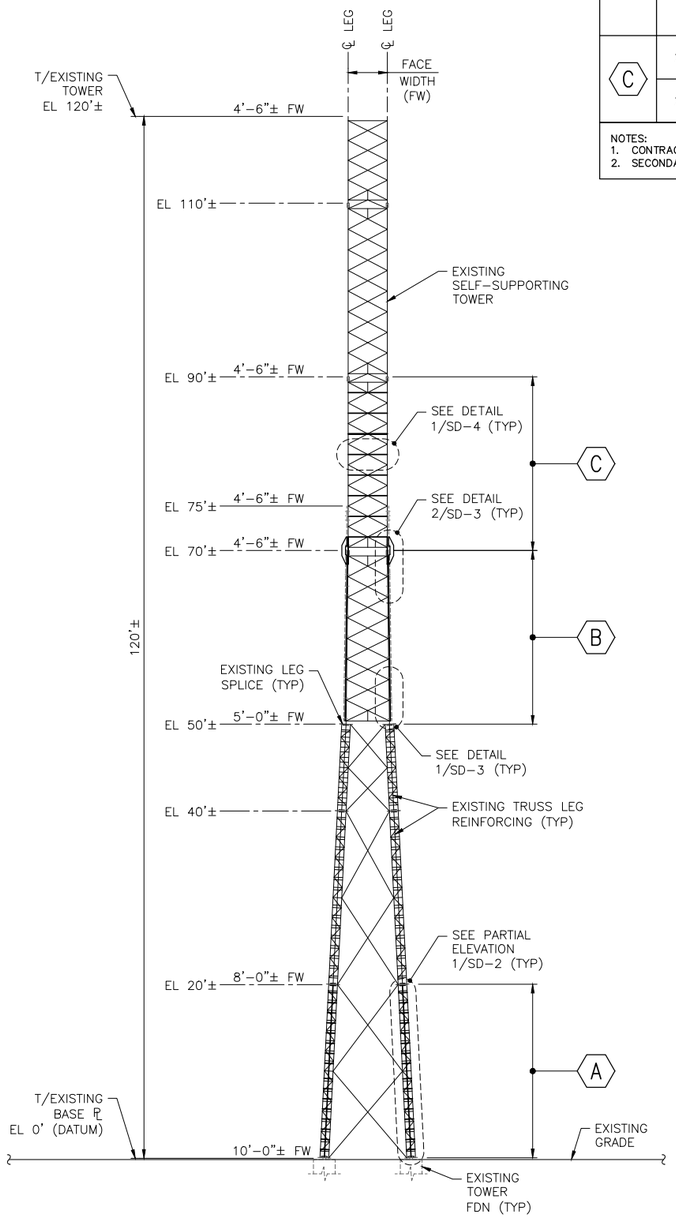
SHEET NUMBER

SN–2

TOWER MODIFICATION SCHEDULE

SECTION	ELEVATION	MEMBER TYPE	EXISTING MEMBER	REINFORCING MEMBER	DESCRIPTION
A	0'± TO 20'±	TRUSS LEG	(3) 1 1/2" DIA SOLID ROD TRUSS LEGS (PIROD P/N: 105217)	(2) 1 1/2" DIA SOLID RODS PER LEG W/VALMONT SITE PRO 1 TIE-ROD BRACING FOR PIROD TOWERS (P/N: TIB112-20-1-2 W/SHIM #127393 AT TOP & BOTTOM)	INSTALL REINFORCING RODS AND TIE-ROD BRACING FOR PIROD TOWERS ON EXISTING TRUSS LEGS. SEE PARTIAL ELEVATION 1/SD-2, SECTION 2/SD-2, AND SECTION 3/SD-2.
B	50'± TO 70'±	LEG REINFORCING	3/4" DIA THREADED ROD	–	REMOVE EXISTING THREADED ROD LEG REINFORCING AND ASSOCIATED U-BOLTED BENT PLATE CLAMPS ON ALL THREE (3) TOWER LEGS. SEE DETAIL 1/SD-3.
		LEG	2 1/4" DIA SOLID ROD	HSS 2.875x0.276 SPLIT PIPE	INSTALL SPLIT PIPE REINFORCING ON ALL THREE (3) TOWER LEGS. SEE DETAIL 1/SD-3, DETAIL 2/SD-3, AND SECTION 3/SD-3.
	70'±	LEG SPLICE	–	(2) ASTM A572 GRADE 50 FLANGE SPLICE BYPASS ℄ 1/2x7±x3'-2"± (VIF) PER LEG	INSTALL FLANGE SPLICE BYPASS PLATES ON ALL THREE (3) TOWER LEGS. SEE DETAIL 2/SD-3, SECTION 4/SD-3, AND ELEVATION 5/SD-3.
C	70'± TO 75'±	LEG REINFORCING	3/4" DIA THREADED ROD	–	REMOVE EXISTING THREADED ROD LEG REINFORCING AND ASSOCIATED U-BOLTED BENT PLATE CLAMPS ON ALL THREE (3) TOWER LEGS. SEE DETAIL 2/SD-3.
	70'± TO 90'±	LEG	2" DIA SOLID ROD	SECONDARY HORIZONTAL 1 1/4" DIA THREADED ROD – VALMONT SITE PRO 1 ADJUSTABLE BOLT-ON BRACING KIT (P/N: BOB114 W/BOB114-CEN CENTER CONNECTION KIT)	INSTALL SECONDARY HORIZONTAL MEMBERS ON ALL THREE (3) TOWER FACES. SEE DETAIL 1/SD-4 AND SECTION 2/SD-4.

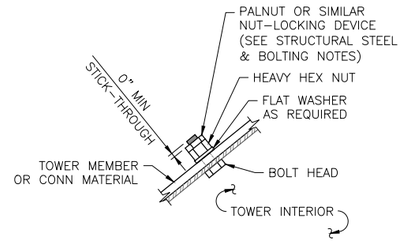
NOTES:
1. CONTRACTOR SHALL PROVIDE NECESSARY SITE DETAILS AND COORDINATE WITH THE MANUFACTURER FOR THE REQUIRED PRODUCT, SPECIFICATIONS, AND INSTALLATION GUIDELINES.
2. SECONDARY HORIZONTAL AND TIE-ROD BRACING MEMBERS AND THEIR CONNECTIONS TO THE EXISTING TOWER SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN SPECIFICATIONS AND REQUIREMENTS.



1 SD-1 TOWER REINFORCEMENT ELEVATION

SCALE: 1/8" = 1'-0"

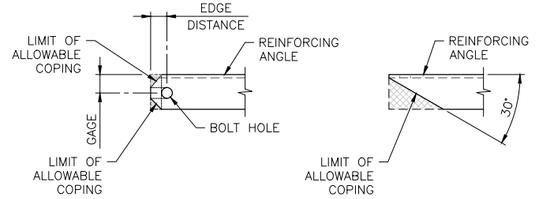
NOTES:
1. REINFORCEMENT OF THE EXISTING TOWER HAS BEEN DESIGNED TO SUPPORT THE ANTENNAS AND CABLES LISTED IN THE STRUCTURAL MODIFICATION ANALYSIS REPORT BY TECTONIC, DATED 10/2/20. REINFORCEMENT DETAILS AS SHOWN ARE BASED ON THE RECOMMENDATIONS OUTLINED AND DOCUMENTS REFERENCED IN THE REPORT. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO FABRICATION OF STEEL OR ORDERING OF ANY PRODUCTS.
2. EXISTING ANTENNAS, CABLES, AND OTHER APPURTENANCES ARE NOT SHOWN FOR CLARITY. CONTRACTOR SHALL IDENTIFY TO THE OWNER'S REPRESENTATIVE ALL EXISTING WAVEGUIDES, CABLES, CABLE ATTACHMENTS, ANTENNAS, AND ANTENNA SUPPORT FRAMES THAT MUST BE TEMPORARILY REMOVED OR PERMANENTLY REPOSITIONED AS REQUIRED TO ALLOW FOR INSTALLATION OF PROPOSED REINFORCEMENT. CONTRACTOR SHALL PLAN AND COORDINATE ALL TEMPORARY REMOVAL AND/OR PERMANENT RELOCATION DIRECTLY WITH THE OWNER'S REPRESENTATIVE AND OBTAIN WRITTEN PERMISSION FROM THE REPRESENTATIVE PRIOR TO ALTERATION OF ANY EXISTING WAVEGUIDES, CABLES, ANTENNAS, OR OTHER APPURTENANCES. MAINTAIN EXISTING ANTENNA AZIMUTHS.
3. EXISTING SHELTERS, EQUIPMENT, FENCE, AND OTHER SITE FEATURES ARE NOT SHOWN FOR CLARITY.



NOTE:
ALL BOLTS SHALL BE INSTALLED "UP AND OUT" SO THAT:
- THE BOLT HEAD IS BENEATH THE CONNECTED MEMBERS AND/OR TOWARD THE INTERIOR OF THE TOWER.
- THE NUT IS ON TOP OF THE CONNECTED MEMBERS AND/OR TOWARD THE EXTERIOR OF THE TOWER.

2 SD-1 TYPICAL BOLT INSTALLATION DETAIL

SCALE: N.T.S.



3 SD-1 TYPICAL ANGLE COPING LIMITS

SCALE: N.T.S.

ANGLE GAGE & BOLT EDGE DISTANCE & SPACING CHART

ANGLE LEG	RECOMMENDED GAGE	BOLT DIAMETER	MIN EDGE DISTANCE	MIN SPACING
1 3/4"	1"	1/2"	3/4"	1 3/8"
2"	1 1/8"	5/8"	15/16"	1 3/4"
2 1/2"	1 3/8"	3/4"	1 1/8"	2"
3"	1 3/4"	7/8"	1 5/16"	2 3/8"
3 1/2"	2"	1"	1 1/2"	2 3/4"
4"	2 1/2"	1 1/8"	1 11/16"	3"

NOTE:
RECOMMENDED GAGES LISTED ABOVE MAY BE ADJUSTED AS REQUIRED FOR NEW ANGLES INSTALLED BACK-TO-BACK WITH EXISTING MAIN DIAGONAL MEMBERS IN ORDER TO MATCH EXISTING BOLT HOLES, PROVIDED THAT ALL TIA MINIMUM EDGE DISTANCE AND SPACING REQUIREMENTS AND AISC BOLT ENTERING/TIGHTENING CLEARANCES ARE SATISFIED. SEE STRUCTURAL STEEL & BOLTING NOTES.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.
Tectonic Engineering & Surveying Consultants P.C.
70 Pleasant Hill Road
P.O. Box 37
Mountainville, NY 10953
Phone: (845) 534-5959
(800) 829-6531
www.tectonicengineering.com
Project Contact Info
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-6656

T-Mobile
NORTHEAST, LLC.
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

APPROVALS

LANDLORD _____
RF _____
CONSTRUCTION _____
OPERATIONS _____
SITE ACQ. _____

PROJECT NUMBER	DESIGNED BY
10473.CTHA242A	EI

REV.	DATE	DESCRIPTION	DRAWN BY
A	10/2/20	FOR COMMENT	MB

ISSUED BY | DATE

0 1 2 3
ORIGINAL SIZE IN INCHES

SITE INFORMATION

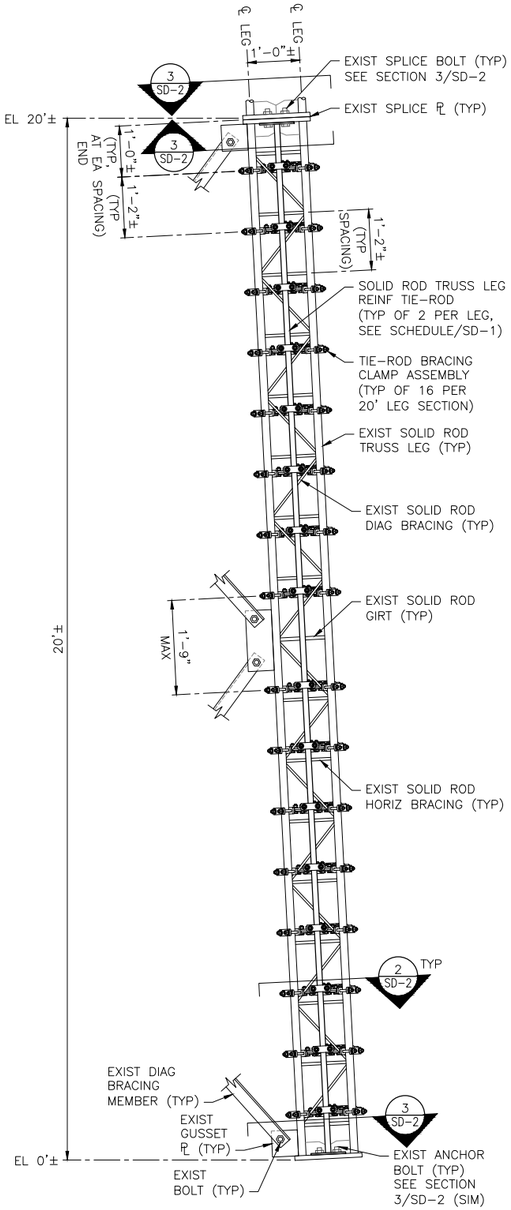
HA242/PORTLANDHS_SST
CTHA242A
95 HIGH STREET
PORTLAND, CT 06480

SHEET TITLE

TOWER REINFORCEMENT ELEVATION, MOD SCHED & TYPICAL DETAILS

SHEET NUMBER

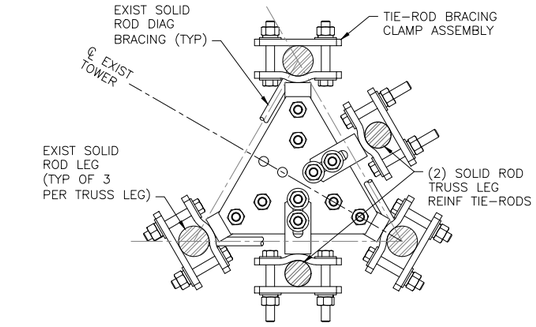
SD-1



NOTE:
EXISTING ANTENNA MOUNTS AND CABLES NOT SHOWN FOR CLARITY.

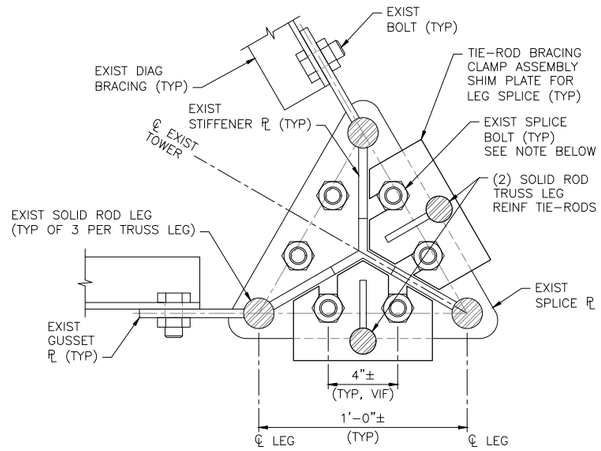
1 SD-2 PARTIAL ELEVATION

SCALE: N.T.S.



2 SD-2 TYP TIE ROD BRACING SECTION

SCALE: N.T.S.



NOTE:
REMOVAL OF EXISTING SPLICE BOLTS IS NOT PERMITTED. A MAXIMUM OF TWO (2) EXISTING SPLICE BOLTS SHALL BE LOOSENED AT ANY TIME, AS REQUIRED TO ACCOMMODATE INSTALLATION OF TIE-ROD BRACING CLAMP ASSEMBLY FOR LEG SPLICE. BOLTS SHALL BE RETIGHTENED PER TOWER MANUFACTURER'S RECOMMENDATIONS UPON COMPLETION OF TIE ROD BRACING INSTALLATION.

3 SD-2 TYP TRUSS LEG REINF SECTION AT LEG SPLICE

SCALE: N.T.S.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.
Tectonic Engineering & Surveying Consultants P.C.
70 Pleasant Hill Road
P.O. Box 37
Mountainville, NY 10953
Phone: (845) 534-5959
(800) 829-6531
www.tectonicengineering.com
Project Contact Info
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-6656

T-Mobile
NORTHEAST, LLC.
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

APPROVALS

LANDLORD _____
RF _____
CONSTRUCTION _____
OPERATIONS _____
SITE ACQ. _____

PROJECT NUMBER	DESIGNED BY
10473.CTHA242A	EI

REV.	DATE	DESCRIPTION	DRAWN BY
A	10/2/20	FOR COMMENT	MB

ISSUED BY | DATE

0 1 2 3
ORIGINAL SIZE IN INCHES

SITE INFORMATION

HA242/PORTLANDHS_SST
CTHA242A
95 HIGH STREET
PORTLAND, CT 06480

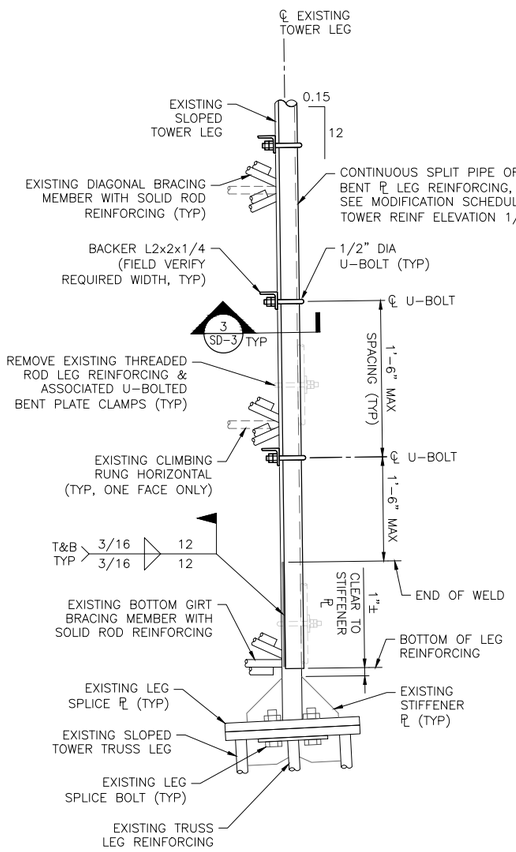
SHEET TITLE

TOWER REINFORCEMENT TRUSS LEG TIE-ROD BRACING PARTIAL ELEVATION & SECTIONS

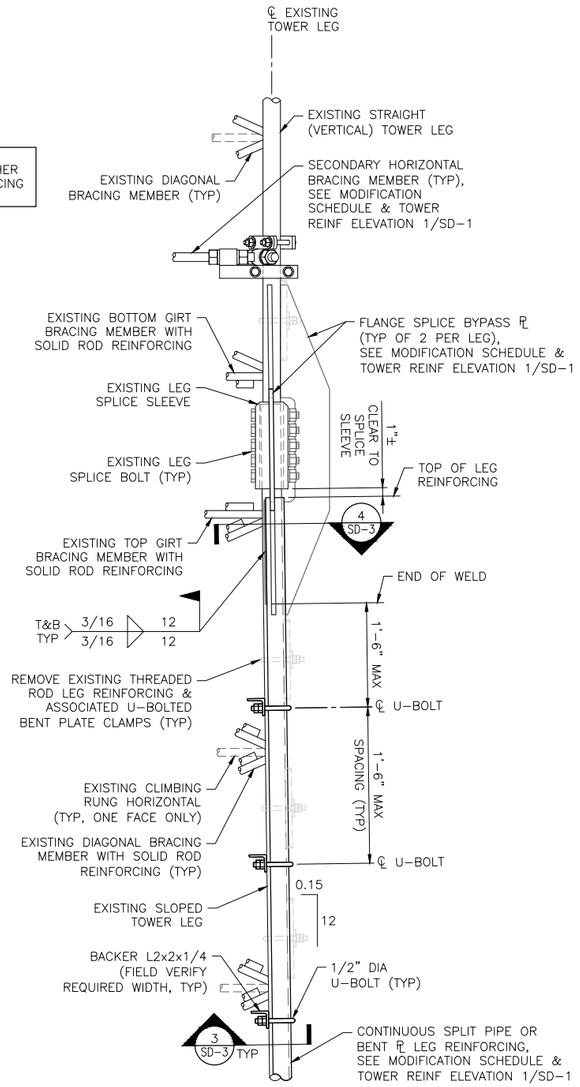
SHEET NUMBER

SD-2

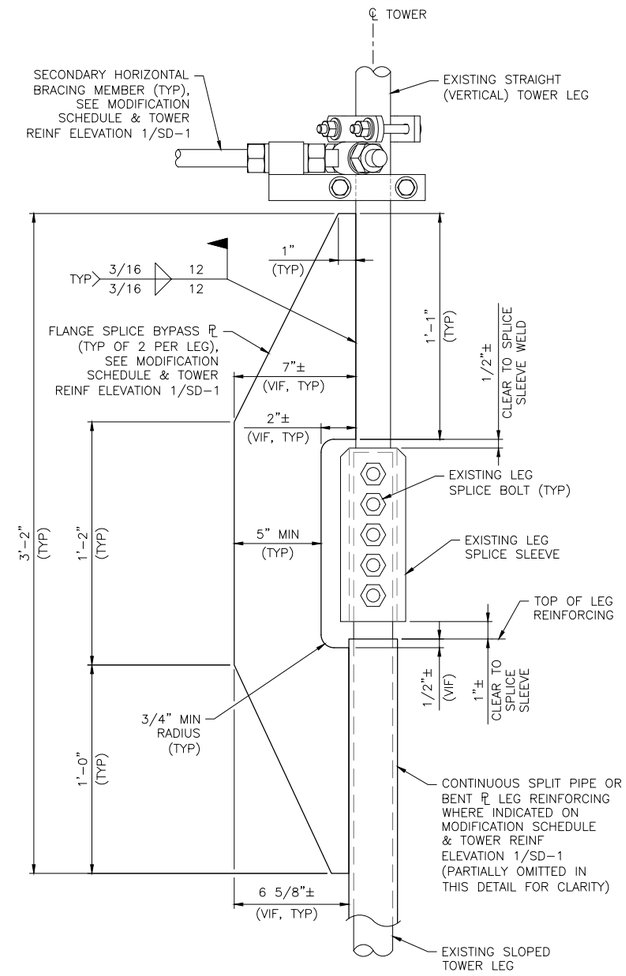
NOTE:
EXISTING ANTENNA MOUNTS, CABLES, CABLE ATTACHMENTS, AND OTHER APPURTENANCES NOT SHOWN FOR CLARITY. ADJUST VERTICAL SPACING OF U-BOLTS AS REQUIRED TO AVOID EXISTING APPURTENANCES.



1 SD-3 TYP SPLIT PIPE LEG REINF DETAIL (AT LOWER END)
SCALE: N.T.S.

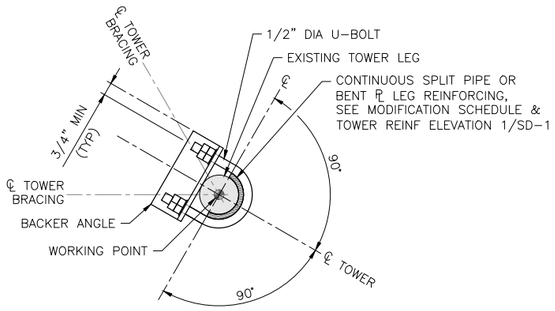


2 SD-3 TYP SPLIT PIPE LEG REINF DETAIL (AT UPPER END)
SCALE: N.T.S.

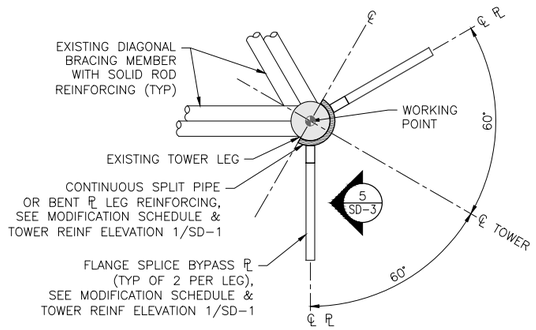


NOTE:
EXISTING TOWER LEG IS SLOPED BELOW LEG SPLICE ONLY, SO VERTICAL INSTALLATION OF FLANGE SPLICE BYPASS PLATES MAY NOT BE FEASIBLE. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO FABRICATION OF ANY STEEL. BEVEL EDGES OF FLANGE SPLICE BYPASS PLATES AS REQUIRED TO MATCH SLOPE OF TOWER LEG TO ALLOW PROPER FIT-UP. FABRICATE PLATES WITH ADDITIONAL MATERIAL AT EDGES TO BE FIELD WELDED, AND FIELD TRIM EXCESS AS REQUIRED FOR FIT-UP WITH EXISTING TOWER LEG AND PROPOSED SPLIT PIPE REINFORCING.

5 SD-3 TYP FLANGE SPLICE BYPASS PL ELEVATION
SCALE: N.T.S.



3 SD-3 TYP SPLIT PIPE LEG REINF SECTION (AT U-BOLT CONN)
SCALE: N.T.S.



4 SD-3 TYP SPLIT PIPE LEG REINF SECTION (AT FLANGE SPLICE BYPASS PL)
SCALE: N.T.S.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.
Tectonic Engineering & Surveying Consultants P.C.
70 Pleasant Hill Road
P.O. Box 37
Mountainville, NY 10953
Phone: (845) 534-5959
(800) 829-6531
www.tectonicengineering.com
Project Contact Info
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-6656

T-Mobile
NORTHEAST, LLC.

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

APPROVALS

LANDLORD _____
RF _____
CONSTRUCTION _____
OPERATIONS _____
SITE ACQ. _____

PROJECT NUMBER	DESIGNED BY
10473.CTHA242A	EI

REV.	DATE	DESCRIPTION	DRAWN BY
1	10/2/20	FOR COMMENT	MB

ISSUED BY | DATE

0 1 2 3
ORIGINAL SIZE IN INCHES

SITE INFORMATION

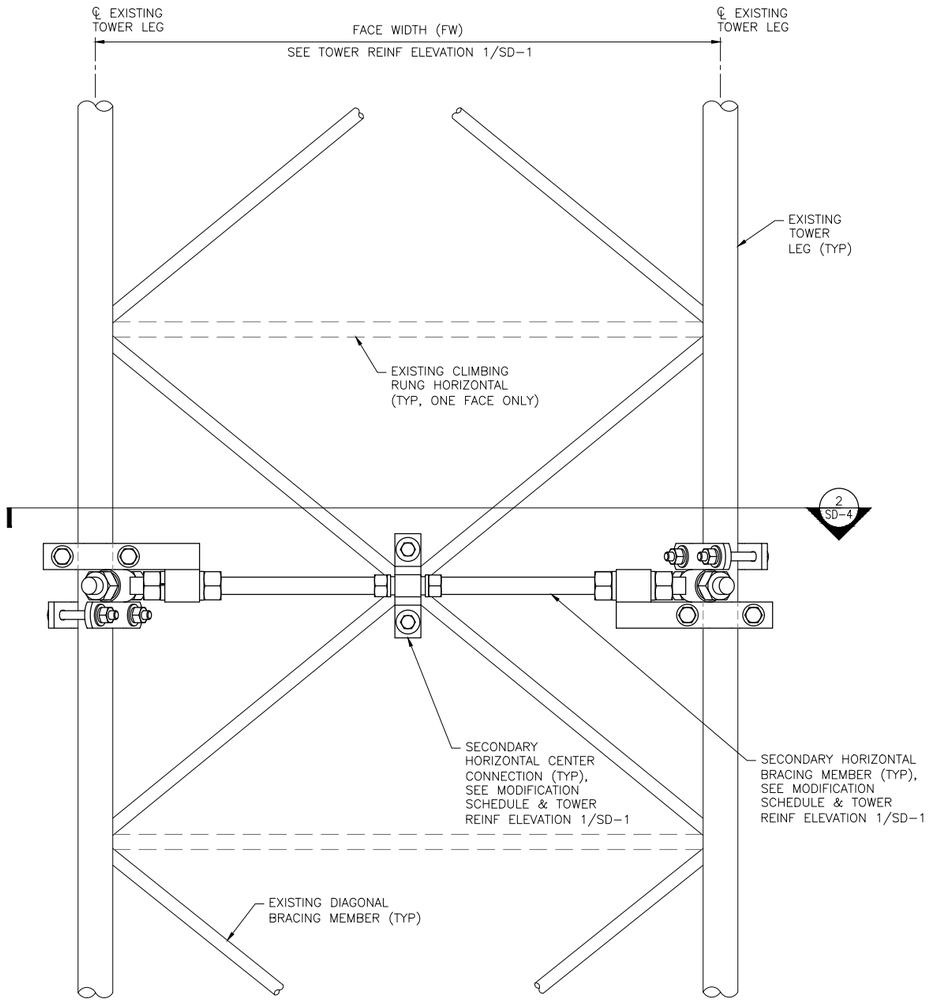
HA242/PORTLANDHS_SST
CTHA242A
95 HIGH STREET
PORTLAND, CT 06480

SHEET TITLE

TOWER REINFORCEMENT SPLICE BYPASS PLATE & SPLIT PIPE LEG REINFORCING DETAILS

SHEET NUMBER

SD-3

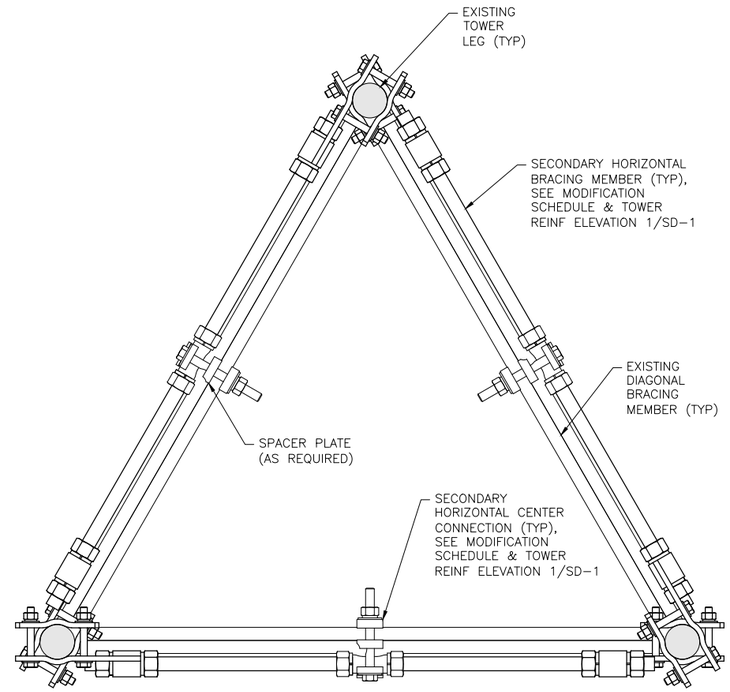


1 SD-4 TYP SECONDARY HORIZONTAL TOWER LEG CONN DETAIL

SCALE: N.T.S.

NOTES:

1. EXISTING ANTENNA MOUNTS, CABLES, CABLE ATTACHMENTS, AND OTHER APPURTENANCES NOT SHOWN FOR CLARITY.
2. EXISTING CABLE LADDERS SHALL BE TEMPORARILY REMOVED AS REQUIRED TO ALLOW FOR INSTALLATION OF SECONDARY HORIZONTAL BRACING MEMBERS AND REINSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
3. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS, INCLUDING FITTING OF THE PROPOSED MODIFICATIONS, PRIOR TO ORDERING OF ANY PRODUCTS.



2 SD-4 TYP SECONDARY HORIZONTAL TOWER LEG CONN SECTION

SCALE: N.T.S.

Tectonic
PRACTICAL SOLUTIONS. EXCEPTIONAL SERVICE.
Tectonic Engineering & Surveying Consultants P.C.
70 Pleasant Hill Road
P.O. Box 37
Mountainville, NY 10953
Phone: (845) 534-5959
(800) 829-6531
www.tectonicengineering.com
Project Contact Info
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-6656

T-Mobile
NORTHEAST, LLC.

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

APPROVALS

LANDLORD _____
RF _____
CONSTRUCTION _____
OPERATIONS _____
SITE ACQ. _____

PROJECT NUMBER	DESIGNED BY
10473.CTHA242A	EI

REV.	DATE	DESCRIPTION	DRAWN BY
A	10/2/20	FOR COMMENT	MB

ISSUED BY | DATE

0 1 2 3
ORIGINAL SIZE IN INCHES

SITE INFORMATION

HA242/PORTLANDHS_SST
CTHA242A
95 HIGH STREET
PORTLAND, CT 06480

SHEET TITLE

TOWER REINFORCEMENT SECONDARY HORIZONTAL DETAIL & SECTION

SHEET NUMBER

SD-4