

## Revised Structural Analysis Report

**Site ID:** 4BN0138A

**Site Name:** BN138/Twr Rd WT RFP

**Project Name:** Anchor

**Address:** 24 Tower Rd  
Ashland, MA 01721

**Client:**



**T - Mobile**

**NORTHEAST, LLC**

**15 Commerce Way, Suite B  
Norton, MA 02766**

**Date: 03/21/2023 Rev. 2**

**12/15/2022 Rev. 1**

**09/28/2022 Rev. 0**

**Scope of Work:**

Centerline Communications was authorized by T-Mobile Northeast LLC to perform an analysis of the existing 89ft guyed tower to determine its capacity to support the proposed and existing equipment listed in this report.

**Existing & Proposed Equipment:**

Carrier	Mounting Level (ft)	Center Line Elevation (ft)	Number of Appurtenances	Antenna Manufacturer	Appurtenance Model	Feed Lines (in)
T-Mobile	86.5	86.5	3	Commscope	FFVV-65A-R2-V1	(2) 6x24 Hybrid
			3	Ericsson	AIR 6419 B41	
			3	Ericsson	RRUS 4480 B71+B85	
			3	Ericsson	RRUS 4460 B25+B66	
			3	-	Standoff Mount	
AT&T	75.0	75.0	3	CCI	OPA-65R-LCUU-H8	(6) 1 5/8" Coax (2) 3/4" DC (1) 3/8" Fiber (1) 1/4" OD
			3	Kathrein	80010766	
			6	-	Pipe Mount	
	65.5	69.0	3	Ericsson	RRUS 11	
		67.0	3	Ericsson	RRUS 32	
		65.5	3	-	Pipe Mount	
		63.0	3	CCI	DTMABP7819VG12A	
		63.0	1	Raycap	DC6-48-60-18-8F	
	62.0	62.0	3	Ericsson	RRUS 11	

*Note: Proposed equipment shown in **bold**.*

**Design Criteria:**

**Design Codes:**

Massachusetts State Building Code 9<sup>th</sup> Edition  
 2015 International Building Code  
 ASCE 7-10  
 TIA-222-G Standards

Ultimate Wind Speed	127 mph
Nominal Wind Speed	98 mph
Wind Speed with Ice	50 mph
Ice Thickness	0.75 in.
Exposure Category	B
Topographic Category	1
Risk Category	II
Site Soil Class (Assumed)	D-Stiff Soil
Seismic Design Category	B
Spectral Response Acceleration Parameter at a Short Periods, $S_s$	0.190 g
Spectral Response Acceleration Parameter at a Period of 1 Second, $S_1$	0.066 g
Short Period Site Coefficient, $F_a$	1.6
Long Period Site Coefficient, $F_v$	2.4

**\*Refer to calculations for additional design criteria.**

**Conclusion:**

**Tower Section Capacity (Summary)**

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$\phi P_{allow}$ lb	% Capacity	Pass Fail
L1	89 - 80	Pole	P5x.258	1	-9936.41	135446.00	48.7	Pass
L2	80 - 60	Pole	P6x.28	2	-13845.20	175813.00	24.0	Pass
L3	60 - 40	Pole	P6x.28	3	-15224.10	175813.00	17.1	Pass
L4	40 - 20	Pole	P6x.28	4	-16282.90	175813.00	17.4	Pass
L5	20 - 0	Pole	P6x.28	5	-20639.50	175813.00	11.8	Pass
L1	89 - 80	Guy A@82	5/16	8	6501.78	6720.00	96.8	Pass
L2	80 - 60	Guy A@67	1/4	11	3140.72	3990.00	78.7	Pass
L4	40 - 20	Guy A@39	1/4	14	999.73	3990.00	25.1	Pass
L5	20 - 0	Guy A@19	1/4	17	1018.67	3990.00	25.5	Pass
L1	89 - 80	Guy B@82	5/16	7	6533.75	6720.00	97.2	Pass
L2	80 - 60	Guy B@67	1/4	10	3126.70	3990.00	78.4	Pass
L4	40 - 20	Guy B@39	1/4	13	976.38	3990.00	24.5	Pass
L5	20 - 0	Guy B@19	1/4	16	1023.36	3990.00	25.6	Pass
L1	89 - 80	Guy C@82	5/16	6	6527.11	6720.00	97.1	Pass
L2	80 - 60	Guy C@67	1/4	9	3043.23	3990.00	76.3	Pass
L4	40 - 20	Guy C@39	1/4	12	973.99	3990.00	24.4	Pass
L5	20 - 0	Guy C@19	1/4	15	1024.50	3990.00	25.7	Pass
							Summary	
							Pole (L1)	48.7 Pass
							Guy A (L1)	96.8 Pass
							Guy B (L1)	97.2 Pass
							Guy C (L1)	97.1 Pass
							<b>RATING =</b>	<b>97.2 Pass</b>

<b>Structure Rating (max from all components) =</b>	<b>97.2%</b>
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\*Note: Foundation information was not provided at the time of analysis and has not been included in this report.

**Recommendations:**

The existing tower has sufficient capacity to support the existing and proposed loading for the final loading configuration. Modifications to the structure are not required.

**Reference Documents:**

- T-Mobile RFDS 4BN0138A\_Anchor\_8\_draft, dated September 13, 2022
- Structure and Antenna Mapping Report by Structural Components, dated March 9, 2022
- Site Photos and Notes by Centerline Communications, dated November 30, 2021
- Structural Analysis by Advanced Engineering Group, dated April 6, 2016

**Assumptions and Limitations:**

- The tower and structures were built and maintained with the manufacturer’s specifications.
- The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in this report and the referenced drawings.

Design Calculations

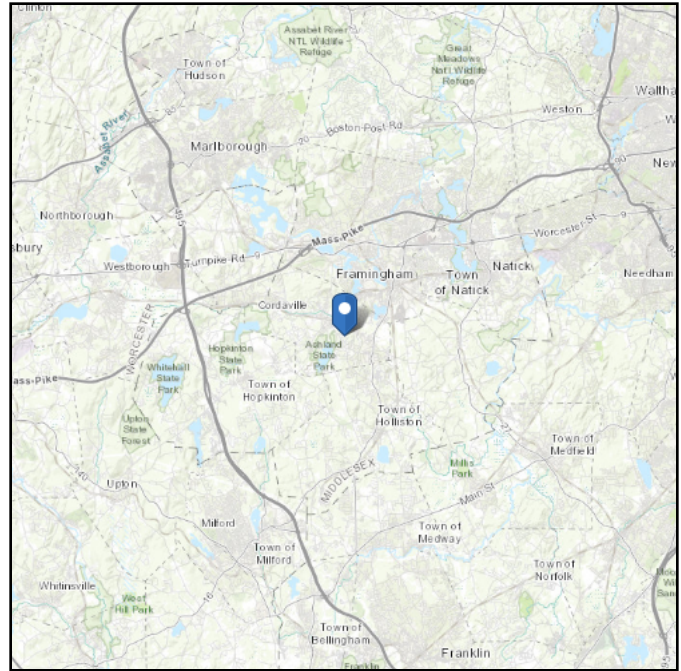
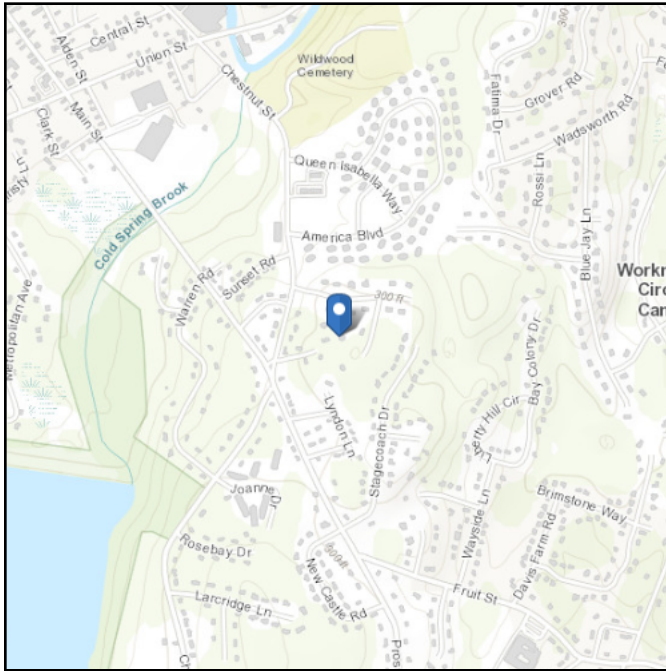


# ASCE 7 Hazards Report

**Address:**  
No Address at This Location

**Standard:** ASCE/SEI 7-10  
**Risk Category:** II  
**Soil Class:** D - Stiff Soil

**Elevation:** 310.81 ft (NAVD 88)  
**Latitude:** 42.250422  
**Longitude:** -71.451596



## Wind

### Results:

Wind Speed	127 Vmph
10-year MRI	78 Vmph
25-year MRI	88 Vmph
50-year MRI	96 Vmph
100-year MRI	103 Vmph

Data Source: ASCE/SEI 7-10, Fig. 26.5-1A and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014

Date Accessed: Tue Sep 27 2022

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

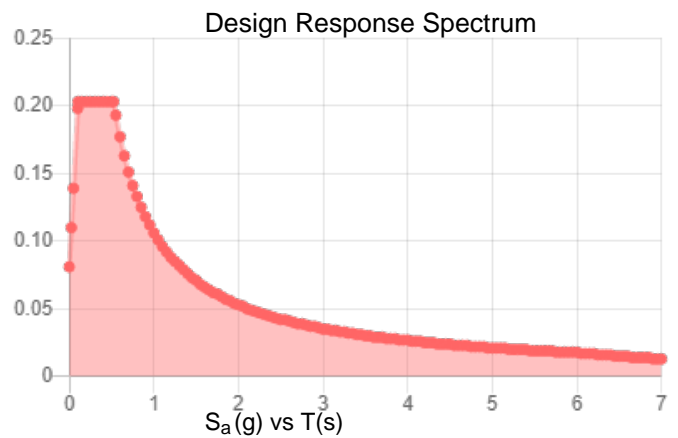
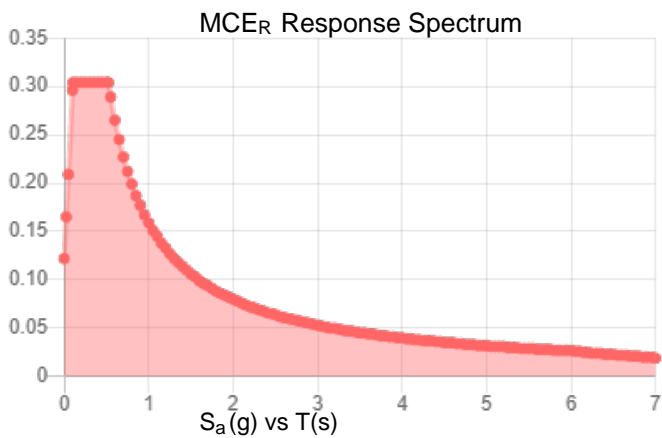
Site is in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2. Glazed openings need not be protected against wind-borne debris.

**Site Soil Class:** D - Stiff Soil

**Results:**

$S_s$ :	0.19	$S_{DS}$ :	0.203
$S_1$ :	0.066	$S_{D1}$ :	0.106
$F_a$ :	1.6	$T_L$ :	6
$F_v$ :	2.4	PGA :	0.097
$S_{MS}$ :	0.304	$PGA_M$ :	0.156
$S_{M1}$ :	0.159	$F_{PGA}$ :	1.6
		$I_e$ :	1

**Seismic Design Category** B



**Data Accessed:** Tue Sep 27 2022

**Date Source:**

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

## Ice

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**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:** Tue Sep 27 2022

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.

## Snow

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**Results:**

Ground Snow Load,  $p_g$  : 40 lb/ft<sup>2</sup>  
Elevation: 310.8 ft

**Data Source:** ASCE/SEI 7-10, Fig. 7-1.

**Date Accessed:** Tue Sep 27 2022

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

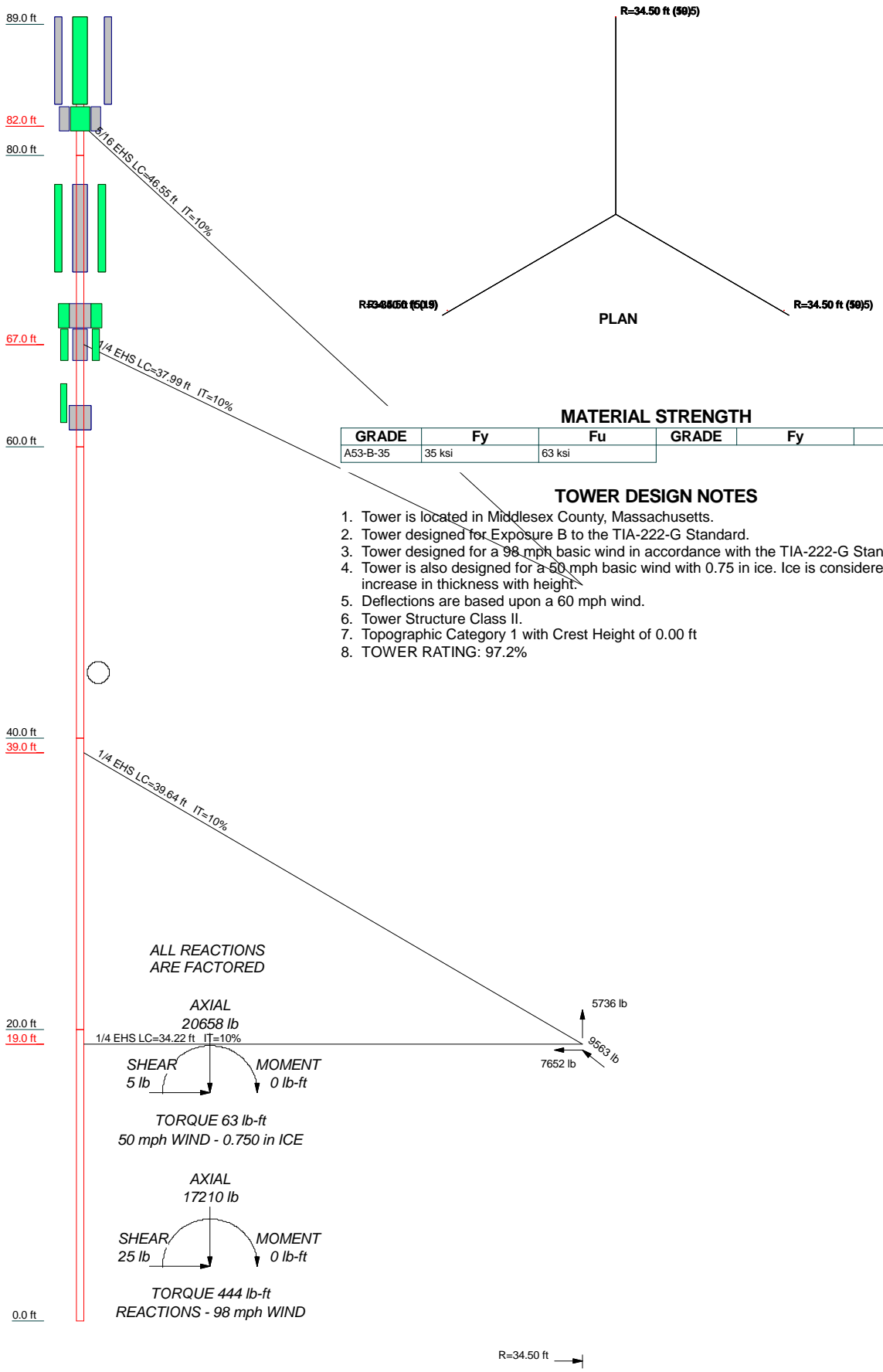
The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

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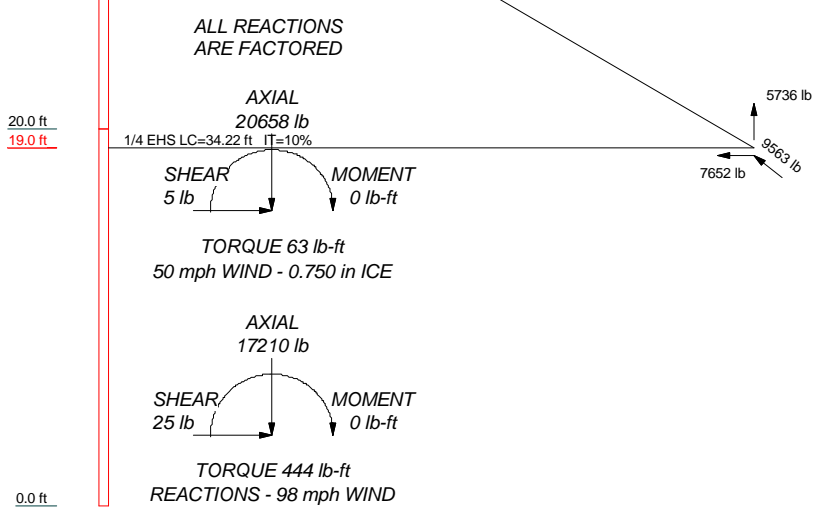


1	P5x.258	9.00	A53-B-35	138.3
2	P6x.28	20.00		398.8
3	P6x.28	20.00		398.8
4	P6x.28	20.00		398.8
5	P6x.28	20.00		398.8
Section			Grade	Weight (lb) 1733.6



GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi			

- TOWER DESIGN NOTES**
1. Tower is located in Middlesex County, Massachusetts.
  2. Tower designed for Exposure B to the TIA-222-G Standard.
  3. Tower designed for a 98 mph basic wind in accordance with the TIA-222-G Standard.
  4. Tower is also designed for a 60 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 II.
  7. Topographic Category 1 with Crest Height of 0.00 ft
  8. TOWER RATING: 97.2%

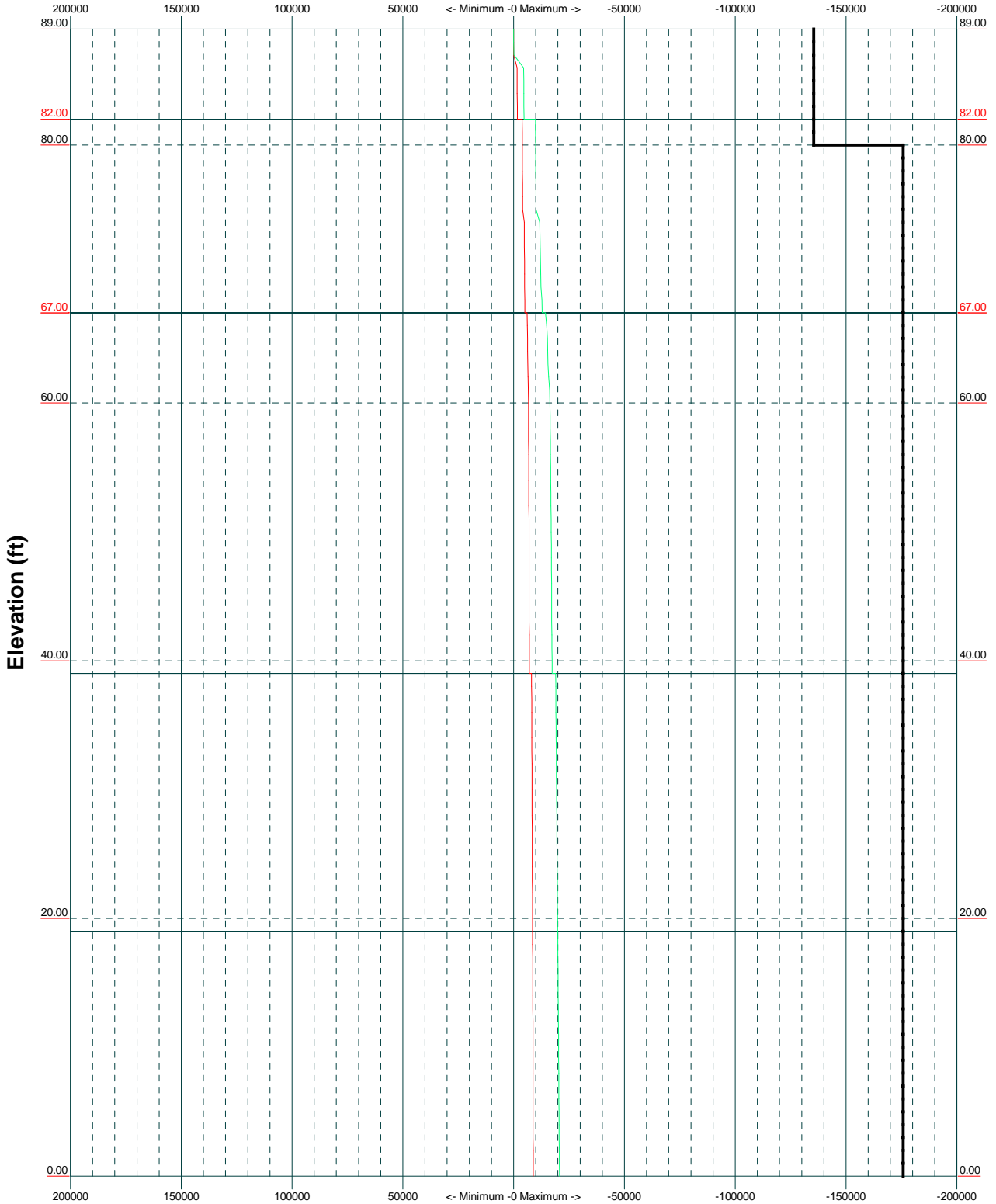


ALL REACTIONS ARE FACTORED

<b>Centerline Communications</b>		Job: <b>4BN0138A</b>	
750 West Center Street, Suite 301		Project: <b>Anchor</b>	
West Bridgewater, MA 02379		Client: T-Mobile	Drawn by: Joshua Gildert
Phone: (781) 713-4725		Code: TIA-222-G	Date: 03/21/23
FAX:		Path:	App'd: NTS
		Dwg No. E-1	

TIA-222-G - 98 mph/50 mph 0.750 in Ice Exposure B

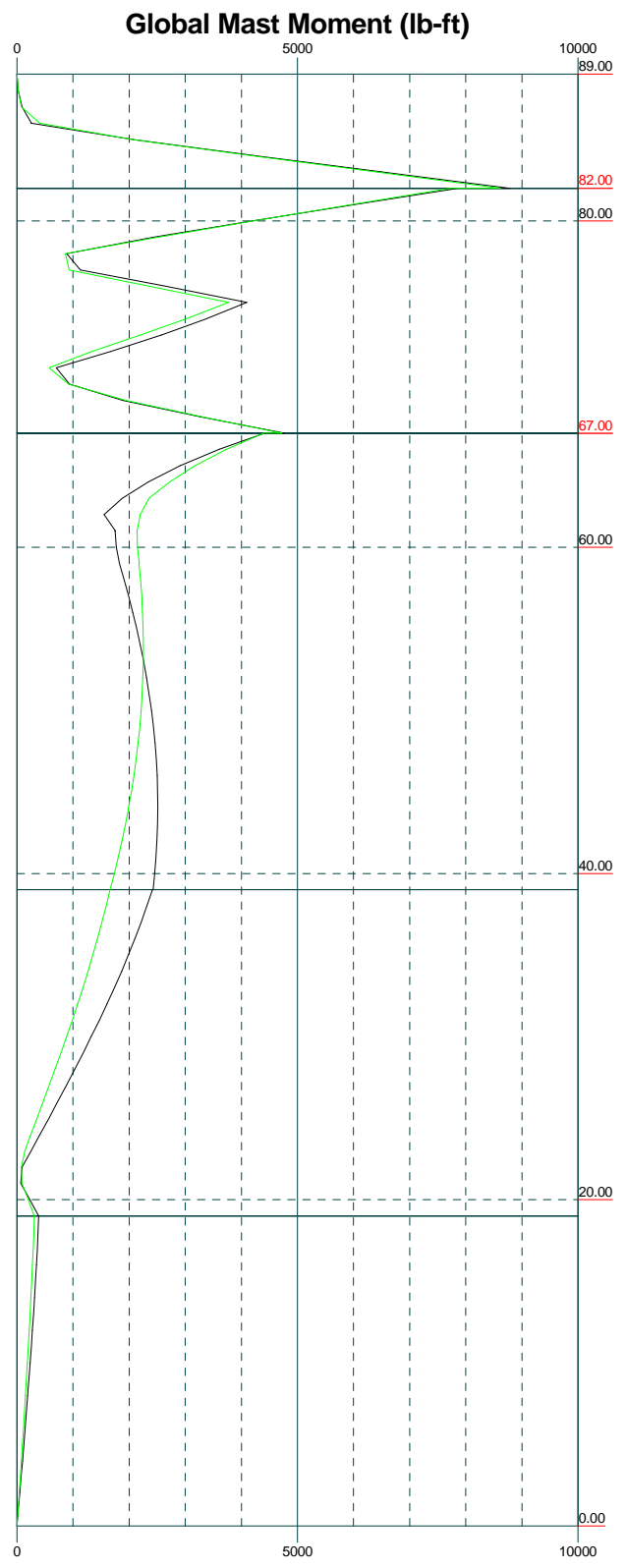
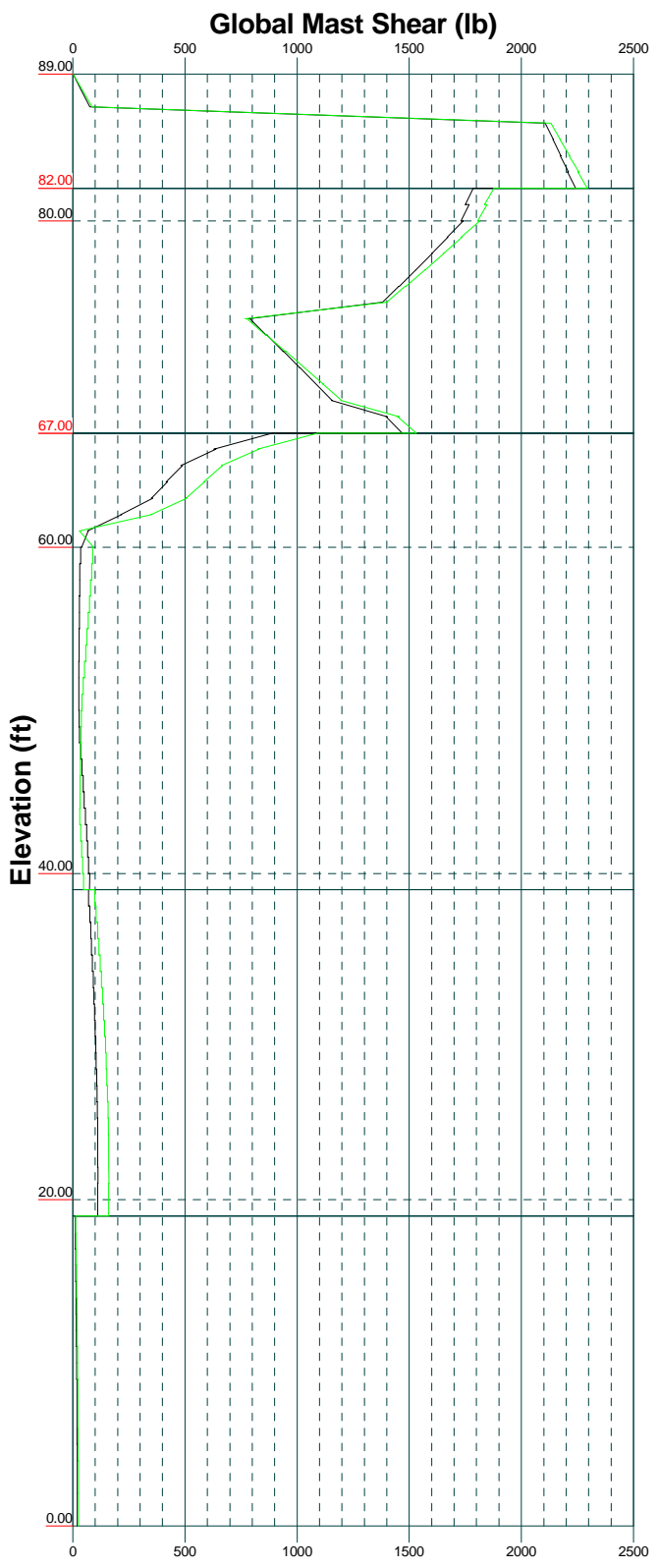
Leg Capacity ——— Leg Compression (lb)



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Phone: (781) 713-4725		Code: TIA-222-G	Date: 03/21/23
FAX:		Path:	Scale: NTS
		Dwg No. E-3	

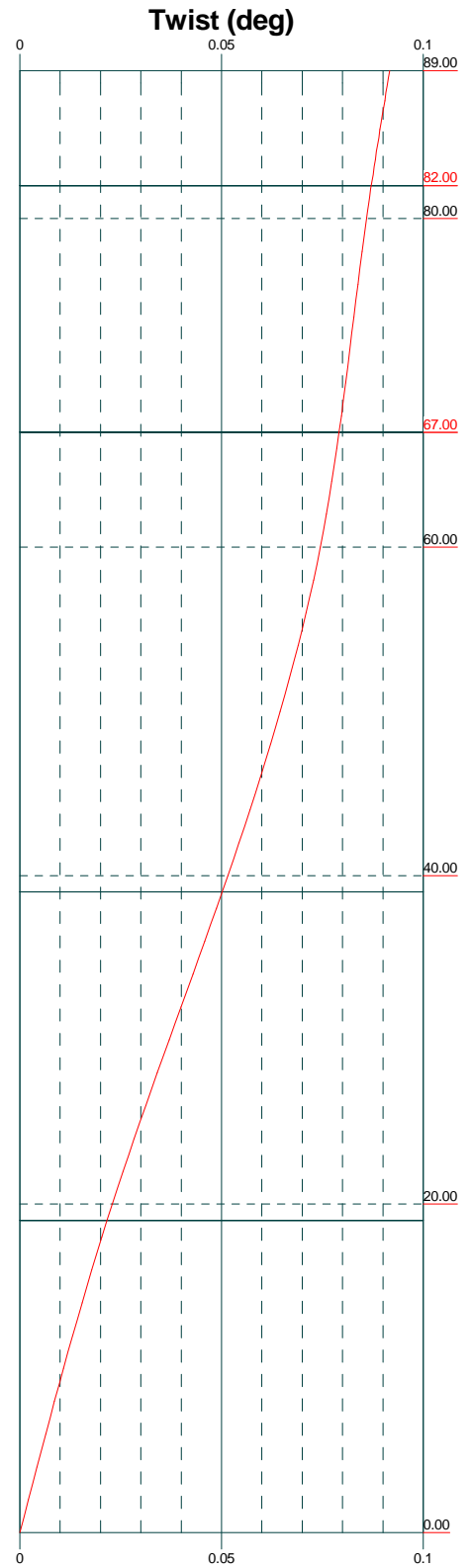
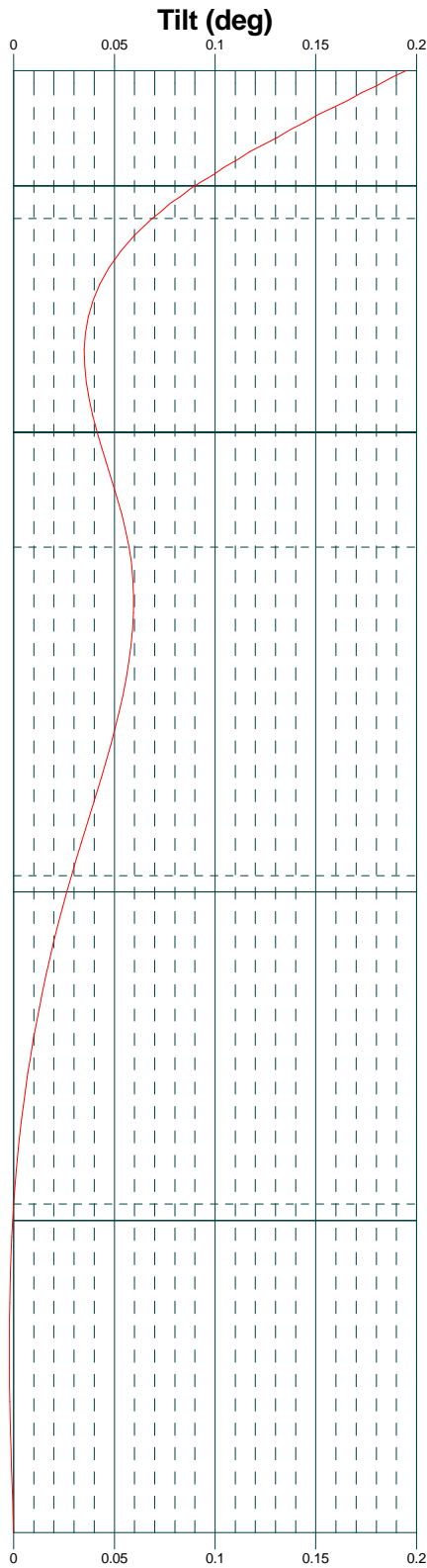
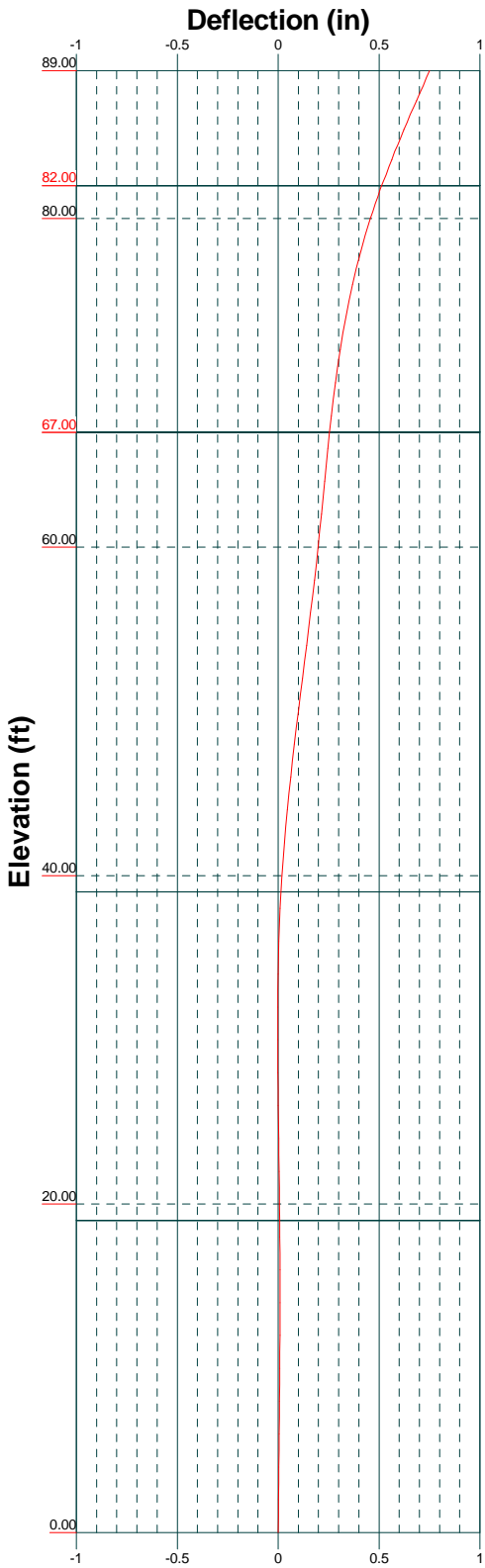
Vx Vz

Mx Mz



**Centerline Communications**  
 750 West Center Street, Suite 301  
 West Bridgewater, MA 02379  
 Phone: (781) 713-4725  
 FAX:

Job: <b>4BN0138A</b>		
Project: <b>Anchor</b>		
Client: T-Mobile	Drawn by: Joshua Gildert	App'd:
Code: TIA-222-G	Date: 03/21/23	Scale: NTS
Path:		Dwg No. E-4



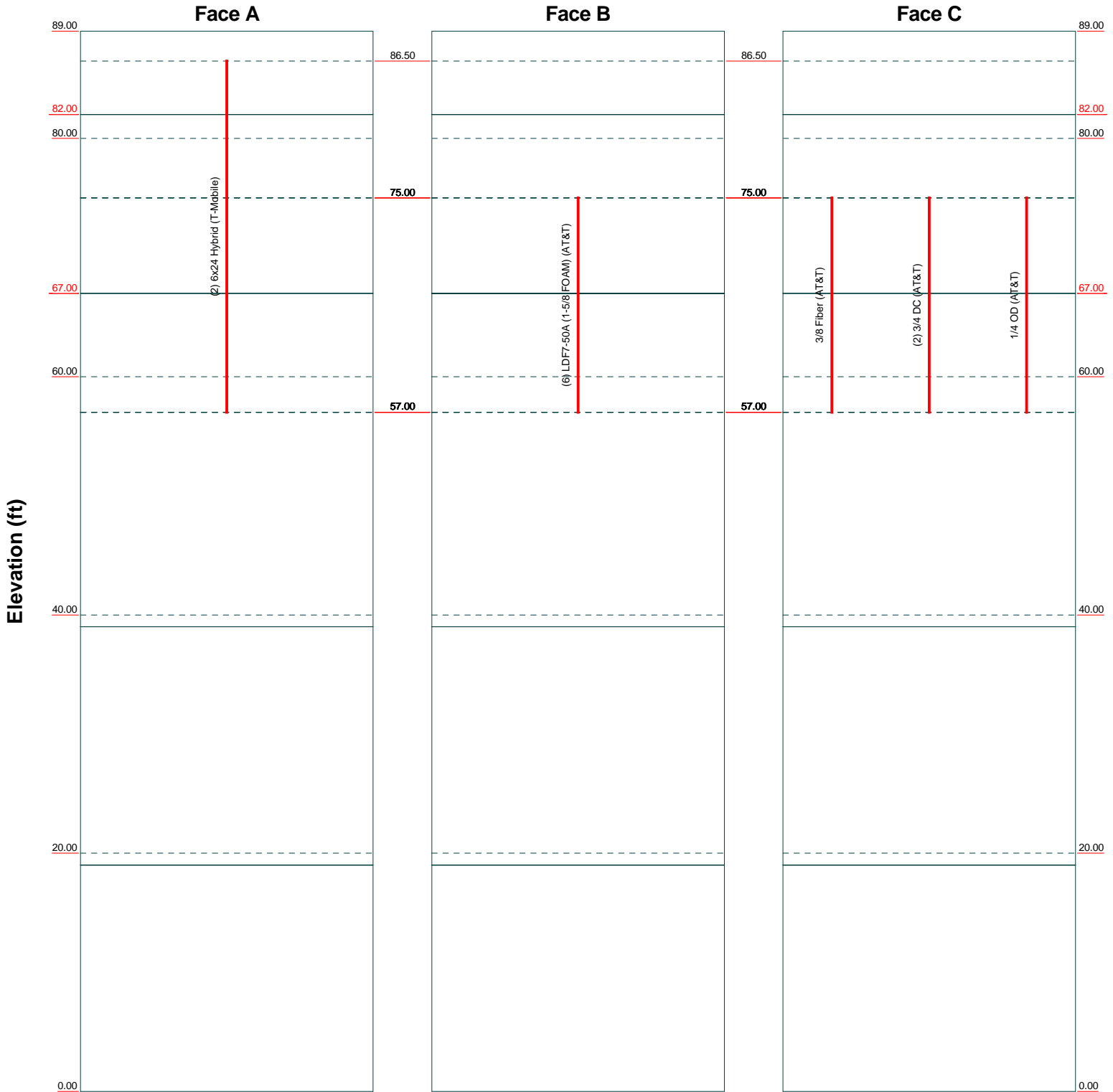
**Centerline Communications**  
 750 West Center Street, Suite 301  
 West Bridgewater, MA 02379  
 Phone: (781) 713-4725  
 FAX:

Job: <b>4BN0138A</b>		
Project: <b>Anchor</b>		
Client: T-Mobile	Drawn by: Joshua Gildert	App'd:
Code: TIA-222-G	Date: 03/21/23	Scale: NTS
Path:		Dwg No. E-5

# Feed Line Distribution Chart

## 0' - 89'

— Round   
 — Flat   
 — App In Face   
 — App Out Face   
 — Truss Leg

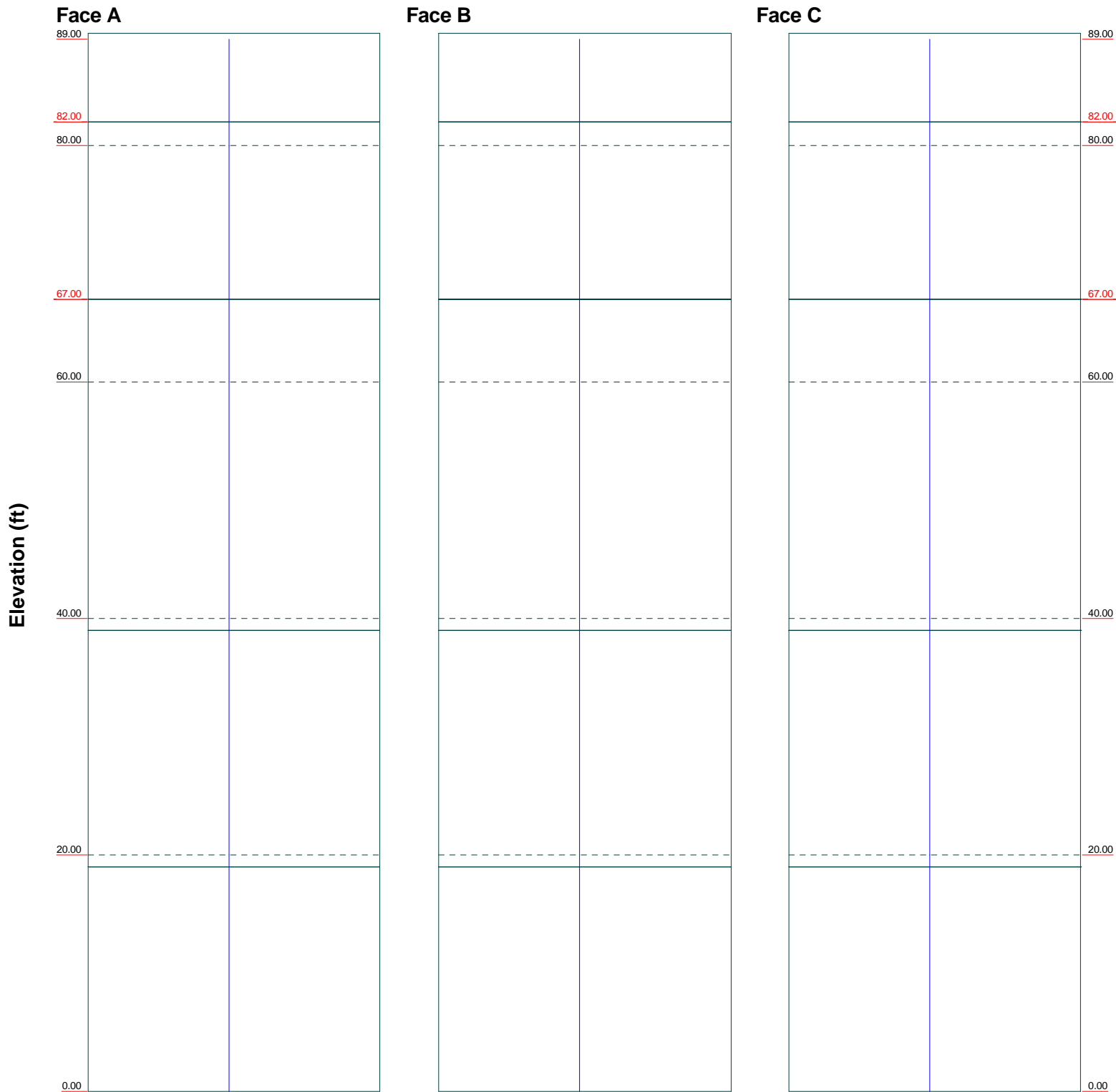


<b>Centerline Communications</b>		Job: <b>4BN0138A</b>	
750 West Center Street, Suite 301		Project: <b>Anchor</b>	
West Bridgewater, MA 02379		Client: T-Mobile	Drawn by: Joshua Gildert
Phone: (781) 713-4725		Code: TIA-222-G	Date: 03/21/23
FAX:		Path:	App'd:
			Scale: NTS
			Dwg No. E-7

# Stress Distribution Chart

0' - 89'

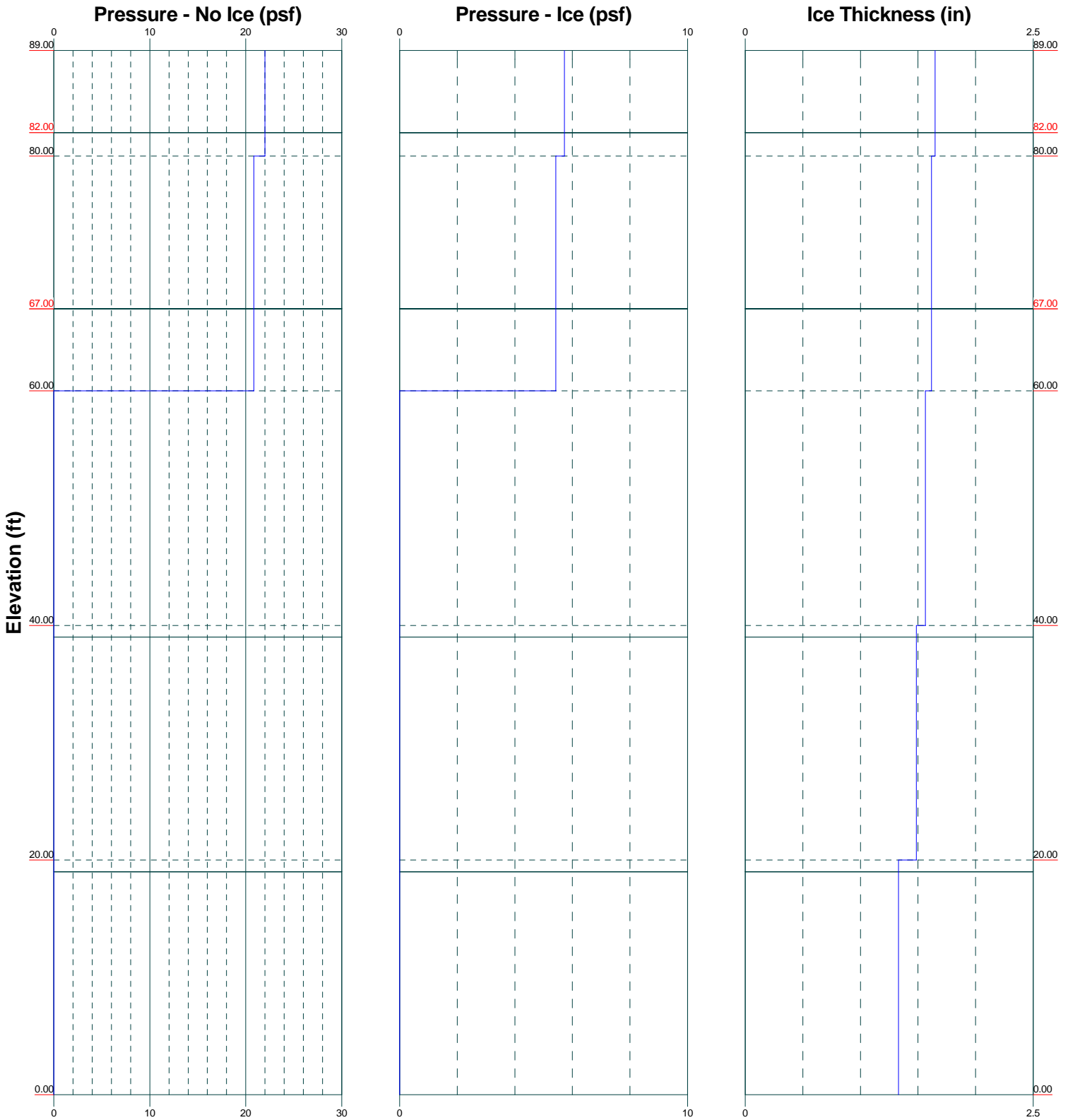
█ > 100% 
 █ 90%-100% 
 █ 75%-90% 
 █ 50%-75% 
 █ < 50% Overstress



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 Phone: (781) 713-4725  
 FAX:

Job: <b>4BN0138A</b>		
Project: <b>Anchor</b>		
Client: T-Mobile	Drawn by: Joshua Gildert	App'd:
Code: TIA-222-G	Date: 03/21/23	Scale: NTS
Path:		Dwg No. E-8

**Wind Pressures and Ice Thickness**  
**TIA-222-G - 98 mph/50 mph 0.750 in Ice Exposure B**



<b>Centerline Communications</b>		Job: <b>4BN0138A</b>	
750 West Center Street, Suite 301		Project: <b>Anchor</b>	
West Bridgewater, MA 02379		Client: T-Mobile	Drawn by: Joshua Gildert
Phone: (781) 713-4725		Code: TIA-222-G	Date: 03/21/23
FAX:		Path:	App'd:
			Scale: NTS
			Dwg No. E-9

<b>tnxTower</b>  <b>Centerline Communications</b> 750 West Center Street, Suite 301 West Bridgewater, MA 02379 Phone: (781) 713-4725 FAX:	<b>Job</b> 4BN0138A	<b>Page</b> 1 of 16
	<b>Project</b> Anchor	<b>Date</b> 09:37:59 03/21/23
	<b>Client</b> T-Mobile	<b>Designed by</b> Joshua Gildert

## Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

- Tower is located in Middlesex County, Massachusetts.
- ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
- Basic wind speed of 98 mph.
- Structure Class II.
- Exposure Category B.
- Topographic Category 1.
- Crest Height 0.00 ft.
- Nominal ice thickness of 0.750 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Safety factor used in guy design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>Consider Moments - Legs</li> <li>Consider Moments - Horizontals</li> <li>Consider Moments - Diagonals</li> <li>Use Moment Magnification</li> <li>√ Use Code Stress Ratios</li> <li>√ Use Code Safety Factors - Guys</li> <li>Escalate Ice</li> <li>Always Use Max Kz</li> <li>Use Special Wind Profile</li> <li>Include Bolts In Member Capacity</li> <li>Leg Bolts Are At Top Of Section</li> <li>Secondary Horizontal Braces Leg</li> <li>Use Diamond Inner Bracing (4 Sided)</li> <li>SR Members Have Cut Ends</li> <li>SR Members Are Concentric</li> </ul> | <ul style="list-style-type: none"> <li>Distribute Leg Loads As Uniform</li> <li>Assume Legs Pinned</li> <li>√ Assume Rigid Index Plate</li> <li>√ Use Clear Spans For Wind Area</li> <li>Use Clear Spans For KL/r</li> <li>Retention Guys To Initial Tension</li> <li>√ Bypass Mast Stability Checks</li> <li>√ Use Azimuth Dish Coefficients</li> <li>√ Project Wind Area of Appurt.</li> <li>Autocalc Torque Arm Areas</li> <li>Add IBC .6D+W Combination</li> <li>√ Sort Capacity Reports By Component</li> <li>Triangulate Diamond Inner Bracing</li> <li>Treat Feed Line Bundles As Cylinder</li> <li>Ignore KL/ry For 60 Deg. Angle Legs</li> </ul> | <ul style="list-style-type: none"> <li>Use ASCE 10 X-Brace Ly Rules</li> <li>Calculate Redundant Bracing Forces</li> <li>Ignore Redundant Members in FEA</li> <li>SR Leg Bolts Resist Compression</li> <li>All Leg Panels Have Same Allowable</li> <li>Offset Girt At Foundation</li> <li>√ Consider Feed Line Torque</li> <li>Include Angle Block Shear Check</li> <li>Use TIA-222-G Bracing Resist. Exemption</li> <li>Use TIA-222-G Tension Splice Exemption</li> <li style="text-align: center;">Poles</li> <li>√ Include Shear-Torsion Interaction</li> <li>Always Use Sub-Critical Flow</li> <li>Use Top Mounted Sockets</li> <li>Pole Without Linear Attachments</li> <li>Pole With Shroud Or No Appurtenances</li> <li>Outside and Inside Corner Radii Are Known</li> </ul> |
|--|---|---|

## Pole Section Geometry

Section	Elevation	Section Length	Pole Size	Pole Grade	Socket Length
	ft	ft			ft

<b>tnxTower</b>  <b>Centerline Communications</b> 750 West Center Street, Suite 301 West Bridgewater, MA 02379 Phone: (781) 713-4725 FAX:	<b>Job</b>	4BN0138A	<b>Page</b>	2 of 16
	<b>Project</b>	Anchor	<b>Date</b>	09:37:59 03/21/23
	<b>Client</b>	T-Mobile	<b>Designed by</b>	Joshua Gildert

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	89.00-80.00	9.00	P5x.258	A53-B-35 (35 ksi)	
L2	80.00-60.00	20.00	P6x.28	A53-B-35 (35 ksi)	
L3	60.00-40.00	20.00	P6x.28	A53-B-35 (35 ksi)	
L4	40.00-20.00	20.00	P6x.28	A53-B-35 (35 ksi)	
L5	20.00-0.00	20.00	P6x.28	A53-B-35 (35 ksi)	

Tower Elevation ft	Gusset Area (per face) ft <sup>2</sup>	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>f</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 89.00-80.00				1	1	1.05			
L2 80.00-60.00				1	1	1.05			
L3 60.00-40.00				1	1	1.05			
L4 40.00-20.00				1	1	1.05			
L5 20.00-0.00				1	1	1.05			

### Guy Data

Guy Elevation ft	Guy Grade	Guy Size	Initial Tension lb	%	Guy Modulus ksi	Guy Weight plf	L <sub>u</sub> ft	Anchor Radius ft	Anchor Azimuth Adj. °	Anchor Elevation ft	End Fitting Efficiency %	
82	EHS	A	5/16	1120.00	10%	21000	0.205	46.50	34.50	0.000	50.50	100%
		B	5/16	1120.00	10%	21000	0.205	46.50	34.50	0.000	50.50	100%
		C	5/16	1120.00	10%	21000	0.205	46.50	34.50	0.000	50.50	100%
67	EHS	A	1/4	665.00	10%	21000	0.121	37.96	34.50	0.000	50.50	100%
		B	1/4	665.00	10%	21000	0.121	37.96	34.50	0.000	50.50	100%
		C	1/4	665.00	10%	21000	0.121	37.96	34.50	0.000	50.50	100%
39	EHS	A	1/4	665.00	10%	21000	0.121	39.60	34.50	0.000	19.00	100%
		B	1/4	665.00	10%	21000	0.121	39.60	34.50	0.000	19.00	100%
		C	1/4	665.00	10%	21000	0.121	39.60	34.50	0.000	19.00	100%
19	EHS	A	1/4	665.00	10%	21000	0.121	34.19	34.50	0.000	19.00	100%
		B	1/4	665.00	10%	21000	0.121	34.19	34.50	0.000	19.00	100%
		C	1/4	665.00	10%	21000	0.121	34.19	34.50	0.000	19.00	100%

### Guy Data(cont'd)

Guy Elevation ft	Mount Type	Torque-Arm Spread ft	Torque-Arm Leg Angle °	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
82	Corner						
67	Corner						
39	Corner						

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Guy Elevation ft	Mount Type	Torque-Arm Spread ft	Torque-Arm Leg Angle °	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
19	Corner						

### Guy Data (cont'd)

Guy Elevation ft	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
82.00	A572-50 (50 ksi)	Solid Round				A572-50 (50 ksi)	Solid Round	
67.00	A572-50 (50 ksi)	Solid Round				A572-50 (50 ksi)	Solid Round	
39.00	A572-50 (50 ksi)	Solid Round				A572-50 (50 ksi)	Solid Round	
19.00	A572-50 (50 ksi)	Solid Round				A572-50 (50 ksi)	Solid Round	

### Guy Data (cont'd)

Guy Elevation ft	Cable Weight A lb	Cable Weight B lb	Cable Weight C lb	Cable Weight D lb	Tower Intercept A ft	Tower Intercept B ft	Tower Intercept C ft	Tower Intercept D ft
82	9.53	9.53	9.53		0.20	0.20	0.20	
					0.8 sec/pulse	0.8 sec/pulse	0.8 sec/pulse	
67	4.59	4.59	4.59		0.13	0.13	0.13	
					0.6 sec/pulse	0.6 sec/pulse	0.6 sec/pulse	
39	4.79	4.79	4.79		0.14	0.14	0.14	
					0.7 sec/pulse	0.7 sec/pulse	0.7 sec/pulse	
19	4.14	4.14	4.14		0.11	0.11	0.11	
					0.6 sec/pulse	0.6 sec/pulse	0.6 sec/pulse	

### Guy Data (cont'd)

Guy Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Torque Arm		Pull Off		Diagonal	
			K <sub>x</sub>	K <sub>y</sub>	K <sub>x</sub>	K <sub>y</sub>	K <sub>x</sub>	K <sub>y</sub>
82	No	No			1	1	1	1
67	No	No			1	1	1	1
39	No	No			1	1	1	1
19	No	No			1	1	1	1

### Guy Data (cont'd)

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Guy Elevation ft	Torque-Arm				Pull Off				Diagonal			
	Bolt Size in	Number	Net Width Deduct in	U	Bolt Size in	Number	Net Width Deduct in	U	Bolt Size in	Number	Net Width Deduct in	U
82	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75
67	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75
39	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75
19	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75	0.625 A325N	0	0.000	0.75

### Guy Pressures

Guy Elevation ft	Guy Location	z ft	q <sub>z</sub> psf	q <sub>z</sub> Ice psf	Ice Thickness in
82	A	66.25	21	5	1.608
	B	66.25	21	5	1.608
	C	66.25	21	5	1.608
67	A	58.75	0	0	1.589
	B	58.75	0	0	1.589
	C	58.75	0	0	1.589
39	A	29.00	0	0	1.481
	B	29.00	0	0	1.481
	C	29.00	0	0	1.481
19	A	19.00	0	0	1.419
	B	19.00	0	0	1.419
	C	19.00	0	0	1.419

### Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
6x24 Hybrid (T-Mobile)	A	No	Surface Ar (CaAa)	86.50 - 57.00	2	2	-0.500 0.500	2.000		2.30
LDF7-50A (1-5/8 FOAM) (AT&T)	B	No	Surface Ar (CaAa)	75.00 - 57.00	6	3	-0.500 0.500	1.980		0.82
3/8 Fiber (AT&T)	C	No	Surface Ar (CaAa)	75.00 - 57.00	1	1	0.000 0.000	0.375		0.22
3/4 DC (AT&T)	C	No	Surface Ar (CaAa)	75.00 - 57.00	2	2	0.050 0.150	0.750		0.60
1/4 OD (AT&T)	C	No	Surface Ar (CaAa)	75.00 - 57.00	1	1	0.200 0.200	0.250		0.10

### Feed Line/Linear Appurtenances Section Areas

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Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight lb
L1	89.00-80.00	A	0.000	0.000	2.600	0.000	29.90
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
L2	80.00-60.00	A	0.000	0.000	8.000	0.000	92.00
		B	0.000	0.000	8.910	0.000	73.80
		C	0.000	0.000	3.188	0.000	22.80
L3	60.00-40.00	A	0.000	0.000	1.200	0.000	13.80
		B	0.000	0.000	1.782	0.000	14.76
		C	0.000	0.000	0.637	0.000	4.56
L4	40.00-20.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
L5	20.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight lb
L1	89.00-80.00	A	1.648	0.000	0.000	5.928	0.000	96.47
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
L2	80.00-60.00	A	1.617	0.000	0.000	18.086	0.000	291.92
		B		0.000	0.000	17.202	0.000	370.53
		C		0.000	0.000	19.517	0.000	222.18
L3	60.00-40.00	A	1.564	0.000	0.000	2.673	0.000	42.52
		B		0.000	0.000	3.400	0.000	72.23
		C		0.000	0.000	3.799	0.000	42.20
L4	40.00-20.00	A	1.486	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
L5	20.00-0.00	A	1.331	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

### Feed Line Center of Pressure

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L1	89.00-80.00	-2.303	-1.330	-2.194	-1.267
L2	80.00-60.00	0.397	-1.595	-0.137	-0.158
L3	60.00-40.00	0.328	-0.532	0.108	0.002
L4	40.00-20.00	0.000	0.000	0.000	0.000
L5	20.00-0.00	0.000	0.000	0.000	0.000

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

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### Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K <sub>a</sub> No Ice	K <sub>a</sub> Ice
L1	1	6x24 Hybrid	80.00 - 86.50	1.0000	1.0000
L2	1	6x24 Hybrid	60.00 - 80.00	1.0000	1.0000
L2	4	LDF7-50A (1-5/8 FOAM)	60.00 - 75.00	1.0000	1.0000
L2	5	3/8 Fiber	60.00 - 75.00	1.0000	1.0000
L2	6	3/4 DC	60.00 - 75.00	1.0000	1.0000
L2	7	1/4 OD	60.00 - 75.00	1.0000	1.0000
L3	1	6x24 Hybrid	57.00 - 60.00	1.0000	1.0000
L3	4	LDF7-50A (1-5/8 FOAM)	57.00 - 60.00	1.0000	1.0000
L3	5	3/8 Fiber	57.00 - 60.00	1.0000	1.0000
L3	6	3/4 DC	57.00 - 60.00	1.0000	1.0000
L3	7	1/4 OD	57.00 - 60.00	1.0000	1.0000

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight lb	
**86.5**									
AIR 6419 B41 (T-Mobile)	A	From Face	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	6.32 6.64 6.97	2.88 3.12 3.38	83.30 126.75 174.68
AIR 6419 B41 (T-Mobile)	B	From Face	2.00 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	6.32 6.64 6.97	2.88 3.12 3.38	83.30 126.75 174.68
AIR 6419 B41 (T-Mobile)	C	From Face	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	6.32 6.64 6.97	2.88 3.12 3.38	83.30 126.75 174.68
FFVV-65A-R2-V1 (T-Mobile)	A	From Face	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	10.12 10.53 10.95	4.11 4.42 4.74	73.20 137.40 207.15
FFVV-65A-R2-V1 (T-Mobile)	B	From Face	2.00 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	10.12 10.53 10.95	4.11 4.42 4.74	73.20 137.40 207.15
FFVV-65A-R2-V1 (T-Mobile)	C	From Face	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	10.12 10.53 10.95	4.11 4.42 4.74	73.20 137.40 207.15
(2) 2" x 8' PIPE MOUNT (T-Mobile)	A	From Leg	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	1.90 2.73 3.40	1.90 2.73 3.40	29.28 43.62 63.24
(2) 2" x 8' PIPE MOUNT (T-Mobile)	B	From Leg	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	1.90 2.73 3.40	1.90 2.73 3.40	29.28 43.62 63.24
(2) 2" x 8' PIPE MOUNT (T-Mobile)	C	From Leg	1.50 0.00 0.00	0.000	86.50	No Ice 1/2" Ice 1" Ice	1.90 2.73 3.40	1.90 2.73 3.40	29.28 43.62 63.24
6' x 2" Pipe Mount	A	From Leg	2.00	0.000	86.50	No Ice	1.43	1.43	21.96

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement	CAAA Front	CAAA Side	Weight
			ft ft ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	lb
(T-Mobile)			0.00			1/2" Ice	1.92	32.79
			0.00			1" Ice	2.29	47.67
6' x 2" Pipe Mount (T-Mobile)	B	From Leg	2.00	0.000	86.50	No Ice	1.43	21.96
			0.00			1/2" Ice	1.92	32.79
			0.00			1" Ice	2.29	47.67
Ring Mount+Standoff (T-Mobile)	C	None		0.000	86.50	No Ice	2.50	280.00
						1/2" Ice	3.50	370.00
						1" Ice	4.50	460.00
4480 B71+B85 (T-Mobile)	A	From Face	1.00	0.000	86.50	No Ice	2.45	87.00
			0.00			1/2" Ice	2.65	106.69
			-4.00			1" Ice	2.85	129.33
4480 B71+B85 (T-Mobile)	B	From Face	1.00	0.000	86.50	No Ice	2.45	87.00
			0.00			1/2" Ice	2.65	106.69
			-4.00			1" Ice	2.85	129.33
4480 B71+B85 (T-Mobile)	C	From Face	1.00	0.000	86.50	No Ice	2.45	87.00
			0.00			1/2" Ice	2.65	106.69
			-4.00			1" Ice	2.85	129.33
4460 B25+B66 (T-Mobile)	A	From Face	1.00	0.000	86.50	No Ice	2.14	108.00
			0.00			1/2" Ice	2.32	130.16
			-4.00			1" Ice	2.51	155.36
4460 B25+B66 (T-Mobile)	B	From Face	1.00	0.000	86.50	No Ice	2.14	108.00
			0.00			1/2" Ice	2.32	130.16
			-4.00			1" Ice	2.51	155.36
4460 B25+B66 (T-Mobile)	C	From Face	1.00	0.000	86.50	No Ice	2.14	108.00
			0.00			1/2" Ice	2.32	130.16
			-4.00			1" Ice	2.51	155.36
***								
80010766 (AT&T)	A	From Leg	1.50	0.000	75.00	No Ice	11.31	87.60
			0.00			1/2" Ice	11.93	170.09
			0.00			1" Ice	12.55	262.23
80010766 (AT&T)	B	From Leg	1.50	0.000	75.00	No Ice	11.31	87.60
			0.00			1/2" Ice	11.93	170.09
			0.00			1" Ice	12.55	262.23
80010766 (AT&T)	C	From Leg	1.50	0.000	75.00	No Ice	11.31	87.60
			0.00			1/2" Ice	11.93	170.09
			0.00			1" Ice	12.55	262.23
OPA-65R-LCUU-H8 (AT&T)	A	From Leg	1.50	0.000	75.00	No Ice	12.83	93.50
			0.00			1/2" Ice	13.44	187.01
			0.00			1" Ice	14.05	290.22
OPA-65R-LCUU-H8 (AT&T)	B	From Leg	1.50	0.000	75.00	No Ice	12.83	93.50
			0.00			1/2" Ice	13.44	187.01
			0.00			1" Ice	14.05	290.22
OPA-65R-LCUU-H8 (AT&T)	C	From Leg	1.50	0.000	75.00	No Ice	12.83	93.50
			0.00			1/2" Ice	13.44	187.01
			0.00			1" Ice	14.05	290.22
RRUS 11 (AT&T)	A	From Leg	1.00	0.000	69.00	No Ice	2.79	51.00
			0.00			1/2" Ice	3.00	71.87
			0.00			1" Ice	3.21	95.78
RRUS 11 (AT&T)	B	From Leg	1.00	0.000	69.00	No Ice	2.79	51.00
			0.00			1/2" Ice	3.00	71.87
			0.00			1" Ice	3.21	95.78
RRUS 11 (AT&T)	C	From Leg	1.00	0.000	69.00	No Ice	2.79	51.00
			0.00			1/2" Ice	3.00	71.87
			0.00			1" Ice	3.21	95.78
RRUS 32 (AT&T)	A	From Leg	1.00	0.000	67.00	No Ice	2.69	60.00
			0.00			1/2" Ice	2.91	80.40
			0.00			1" Ice	3.14	103.95

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	<b>Client</b>	T-Mobile	<b>Designed by</b>	Joshua Gildert

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	CAAA Front	CAAA Side	Weight	
			Horz	Vert						
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	lb	
RRUS 32 (AT&T)	B	From Leg	1.00	0.00	0.000	67.00	No Ice	2.69	1.57	60.00
			0.00	0.00			1/2" Ice	2.91	1.76	80.40
			0.00	0.00			1" Ice	3.14	1.95	103.95
RRUS 32 (AT&T)	C	From Leg	1.00	0.00	0.000	67.00	No Ice	2.69	1.57	60.00
			0.00	0.00			1/2" Ice	2.91	1.76	80.40
			0.00	0.00			1" Ice	3.14	1.95	103.95
DTMABP7819VG12A TMA (AT&T)	A	From Leg	1.00	0.00	0.000	63.00	No Ice	0.58	0.40	13.20
			0.00	0.00			1/2" Ice	0.69	0.49	18.38
			0.00	0.00			1" Ice	0.80	0.59	25.16
DTMABP7819VG12A TMA (AT&T)	B	From Leg	1.00	0.00	0.000	63.00	No Ice	0.58	0.40	13.20
			0.00	0.00			1/2" Ice	0.69	0.49	18.38
			0.00	0.00			1" Ice	0.80	0.59	25.16
DTMABP7819VG12A TMA (AT&T)	C	From Leg	1.00	0.00	0.000	63.00	No Ice	0.58	0.40	13.20
			0.00	0.00			1/2" Ice	0.69	0.49	18.38
			0.00	0.00			1" Ice	0.80	0.59	25.16
DC6-48-60-18-8F (AT&T)	C	From Leg	1.00	0.00	0.000	63.00	No Ice	1.14	1.14	32.00
			0.00	0.00			1/2" Ice	1.79	1.79	52.38
			0.00	0.00			1" Ice	2.00	2.00	75.56
RRUS 11 (T-Mobile)	A	From Leg	1.00	0.00	0.000	62.00	No Ice	2.79	1.19	51.00
			0.00	0.00			1/2" Ice	3.00	1.34	71.87
			0.00	0.00			1" Ice	3.21	1.50	95.78
RRUS 11 (T-Mobile)	A	From Leg	1.00	0.00	0.000	62.00	No Ice	2.79	1.19	51.00
			0.00	0.00			1/2" Ice	3.00	1.34	71.87
			0.00	0.00			1" Ice	3.21	1.50	95.78
RRUS 11 (T-Mobile)	A	From Leg	1.00	0.00	0.000	62.00	No Ice	2.79	1.19	51.00
			0.00	0.00			1/2" Ice	3.00	1.34	71.87
			0.00	0.00			1" Ice	3.21	1.50	95.78
2" x 8ft Pipe (AT&T)	A	From Leg	0.50	0.00	0.000	65.50	No Ice	0.00	1.90	29.28
			0.00	0.00			1/2" Ice	0.00	2.73	43.62
			0.00	0.00			1" Ice	0.00	3.40	63.24
2" x 8ft Pipe (AT&T)	B	From Leg	0.50	0.00	0.000	65.50	No Ice	0.00	1.90	29.28
			0.00	0.00			1/2" Ice	0.00	2.73	43.62
			0.00	0.00			1" Ice	0.00	3.40	63.24
2" x 8ft Pipe (AT&T)	C	From Leg	0.50	0.00	0.000	65.50	No Ice	0.00	1.90	29.28
			0.00	0.00			1/2" Ice	0.00	2.73	43.62
			0.00	0.00			1" Ice	0.00	3.40	63.24
(2) 2" x 8ft Pipe (AT&T)	A	From Leg	0.50	0.00	0.000	75.00	No Ice	0.00	1.90	29.28
			0.00	0.00			1/2" Ice	0.00	2.73	43.62
			0.00	0.00			1" Ice	0.00	3.40	63.24
(2) 2" x 8ft Pipe (AT&T)	B	From Leg	0.50	0.00	0.000	75.00	No Ice	0.00	1.90	29.28
			0.00	0.00			1/2" Ice	0.00	2.73	43.62
			0.00	0.00			1" Ice	0.00	3.40	63.24
(2) 2" x 8ft Pipe (AT&T)	C	From Leg	0.50	0.00	0.000	75.00	No Ice	0.00	1.90	29.28
			0.00	0.00			1/2" Ice	0.00	2.73	43.62
			0.00	0.00			1" Ice	0.00	3.40	63.24

## Load Combinations

Comb. No.	Description
1	Dead Only

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	<b>Client</b>	T-Mobile	<b>Designed by</b>	Joshua Gildert

Comb. No.	Description
2	1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy
3	1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy
4	1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy
5	1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy
6	1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy
7	1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy
8	1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy
9	1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy
10	1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy
11	1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy
12	1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy
13	1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy
14	1.2 Dead+1.0 Ice+1.0 Temp+Guy
15	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy
16	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy
17	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy
18	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy
19	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy
20	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy
21	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy
22	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy
23	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy
24	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy
25	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy
26	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy
27	Dead+Wind 0 deg - Service+Guy
28	Dead+Wind 30 deg - Service+Guy
29	Dead+Wind 60 deg - Service+Guy
30	Dead+Wind 90 deg - Service+Guy
31	Dead+Wind 120 deg - Service+Guy
32	Dead+Wind 150 deg - Service+Guy
33	Dead+Wind 180 deg - Service+Guy
34	Dead+Wind 210 deg - Service+Guy
35	Dead+Wind 240 deg - Service+Guy
36	Dead+Wind 270 deg - Service+Guy
37	Dead+Wind 300 deg - Service+Guy
38	Dead+Wind 330 deg - Service+Guy

## Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb	
Mast	Max. Vert	15	20657.91	0.05	5.05	
	Max. H <sub>x</sub>	10	16878.79	19.61	-11.39	
	Max. H <sub>z</sub>	2	17209.93	0.03	25.07	
	Max. M <sub>x</sub>	1	0.00	0.03	0.13	
	Max. M <sub>z</sub>	1	0.00	0.03	0.13	
	Max. Torsion	5	443.50	-17.68	-4.89	
	Min. Vert	1	8895.86	0.03	0.13	
	Min. H <sub>x</sub>	6	16544.80	-18.75	-10.92	
	Min. H <sub>z</sub>	7	15538.72	-13.41	-13.18	
	Min. M <sub>x</sub>	1	0.00	0.03	0.13	
	Min. M <sub>z</sub>	1	0.00	0.03	0.13	
	Min. Torsion	11	-444.37	17.79	-4.91	
	Guy C @ 34.5 ft Elev 50.5 ft Azimuth 240 deg	Max. Vert	10	-35.63	-29.17	16.84
		Max. H <sub>x</sub>	10	-35.63	-29.17	16.84

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Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Guy B @ 34.5 ft Elev 50.5 ft Azimuth 120 deg	Max. H <sub>z</sub>	3	-5677.86	-6508.91	3829.20
	Min. Vert	5	-5688.04	-6573.23	3724.51
	Min. H <sub>x</sub>	5	-5688.04	-6573.23	3724.51
	Min. H <sub>z</sub>	10	-35.63	-29.17	16.84
	Max. Vert	6	-36.49	30.08	17.36
	Max. H <sub>x</sub>	13	-5736.45	6595.14	3880.70
	Max. H <sub>z</sub>	13	-5736.45	6595.14	3880.70
	Min. Vert	13	-5736.45	6595.14	3880.70
	Min. H <sub>x</sub>	6	-36.49	30.08	17.36
	Min. H <sub>z</sub>	6	-36.49	30.08	17.36
Guy A @ 34.5 ft Elev 50.5 ft Azimuth 0 deg	Max. Vert	2	-34.95	0.00	-32.66
	Max. H <sub>x</sub>	10	-4980.52	85.08	-6628.21
	Max. H <sub>z</sub>	2	-34.95	0.00	-32.66
	Min. Vert	7	-5721.06	-62.35	-7640.83
	Min. H <sub>x</sub>	6	-4811.24	-80.36	-6414.93
	Min. H <sub>z</sub>	7	-5721.06	-62.35	-7640.83
	Max. Vert	8	-302.35	-1056.98	610.26
Guy C @ 34.5 ft Elev 19 ft Azimuth 240 deg	Max. H <sub>x</sub>	5	-315.36	-1002.69	578.99
	Max. H <sub>z</sub>	23	-341.40	-1563.69	902.75
	Min. Vert	18	-358.26	-1549.45	894.54
	Min. H <sub>x</sub>	23	-341.40	-1563.69	902.75
	Min. H <sub>z</sub>	5	-315.36	-1002.69	578.99
	Max. Vert	7	-302.75	1101.97	636.20
Guy B @ 34.5 ft Elev 19 ft Azimuth 120 deg	Max. H <sub>x</sub>	19	-342.61	1564.51	903.22
	Max. H <sub>z</sub>	19	-342.61	1564.51	903.22
	Min. Vert	24	-359.46	1550.28	895.00
	Min. H <sub>x</sub>	10	-305.89	997.90	576.24
	Min. H <sub>z</sub>	10	-305.89	997.90	576.24
	Max. Vert	2	-287.81	0.01	-1279.65
	Max. H <sub>x</sub>	6	-324.40	0.04	-1177.92
Guy A @ 34.5 ft Elev 19 ft Azimuth 0 deg	Max. H <sub>z</sub>	10	-322.20	-0.06	-1173.12
	Min. Vert	20	-371.22	0.00	-1808.46
	Min. H <sub>x</sub>	10	-322.20	-0.06	-1173.12
	Min. H <sub>z</sub>	15	-357.08	0.00	-1826.69

## Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear <sub>x</sub> lb	Shear <sub>z</sub> lb	Overturning Moment, M <sub>x</sub> lb-ft	Overturning Moment, M <sub>z</sub> lb-ft	Torque lb-ft
Dead Only	8895.86	-0.03	-0.13	0.00	0.00	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy	17209.93	-0.03	-25.07	0.00	0.00	93.50
1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy	15512.02	4.35	-18.15	0.00	0.00	-109.94
1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy	12418.23	8.01	-6.15	0.00	0.00	-361.86

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	<p style="text-align: center;"><b>Project</b></p> <p style="text-align: center;">Anchor</p>	<p style="text-align: center;"><b>Date</b></p> <p style="text-align: center;">09:37:59 03/21/23</p>
	<p style="text-align: center;"><b>Client</b></p> <p style="text-align: center;">T-Mobile</p>	<p style="text-align: center;"><b>Designed by</b></p> <p style="text-align: center;">Joshua Gildert</p>

Load Combination	Vertical lb	Shear <sub>x</sub> lb	Shear <sub>z</sub> lb	Overturning Moment, M <sub>x</sub> lb-ft	Overturning Moment, M <sub>z</sub> lb-ft	Torque lb-ft
1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy	15495.54	17.68	4.89	0.00	0.00	-443.50
1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy	16544.80	18.75	10.92	0.00	0.00	-424.08
1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy	15538.72	13.41	13.18	0.00	0.00	-319.33
1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy	12539.57	-0.07	10.68	0.00	0.00	-96.82
1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy	15440.45	-13.06	12.73	0.00	0.00	110.88
1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy	16878.79	-19.61	11.39	0.00	0.00	356.10
1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy	15487.86	-17.79	4.91	0.00	0.00	444.37
1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy	12258.34	-7.86	-5.91	0.00	0.00	432.28
1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy	15602.60	-4.55	-18.80	0.00	0.00	317.52
1.2 Dead+1.0 Ice+1.0 Temp+Guy	19960.73	0.09	-1.32	0.00	0.00	-0.05
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy	20657.91	-0.05	-5.05	0.00	0.00	17.11
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy	20516.34	1.22	-3.98	0.00	0.00	-10.04
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy	20420.68	2.40	-2.71	0.00	0.00	-44.38
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy	20531.76	3.46	-0.86	0.00	0.00	-62.85
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy	20640.77	2.29	-0.53	0.00	0.00	-61.24
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy	20511.89	2.18	1.46	0.00	0.00	-43.59
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy	20382.04	0.20	0.93	0.00	0.00	-17.42
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy	20461.31	-1.43	0.74	0.00	0.00	10.06
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy	20622.06	-3.71	0.85	0.00	0.00	44.55
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy	20506.89	-3.44	-1.01	0.00	0.00	62.90
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy	20404.75	-2.40	-2.88	0.00	0.00	61.09
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy	20542.52	-1.37	-4.37	0.00	0.00	43.23
Dead+Wind 0 deg - Service+Guy	8902.31	-0.03	-1.55	0.00	0.00	19.60
Dead+Wind 30 deg - Service+Guy	8904.24	0.67	-1.32	0.00	0.00	-24.56
Dead+Wind 60 deg - Service+Guy	8906.43	1.28	-0.87	0.00	0.00	-76.98
Dead+Wind 90 deg - Service+Guy	8904.15	1.49	-0.11	0.00	0.00	-94.60
Dead+Wind 120 deg - Service+Guy	8900.96	1.26	0.64	0.00	0.00	-90.86
Dead+Wind 150 deg - Service+Guy	8904.17	0.73	1.20	0.00	0.00	-68.10
Dead+Wind 180 deg - Service+Guy	8906.52	-0.03	1.31	0.00	0.00	-19.59
Dead+Wind 210 deg - Service+Guy	8903.91	-0.73	1.09	0.00	0.00	24.58
Dead+Wind 240 deg - Service+Guy	8901.37	-1.34	0.65	0.00	0.00	76.99

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Load Combination	Vertical lb	Shear <sub>x</sub> lb	Shear <sub>z</sub> lb	Overturning Moment, M <sub>x</sub> lb-ft	Overturning Moment, M <sub>z</sub> lb-ft	Torque lb-ft
Service+Guy						
Dead+Wind 270 deg - Service+Guy	8904.05	-1.54	-0.11	0.00	0.00	94.60
Dead+Wind 300 deg - Service+Guy	8905.75	-1.32	-0.85	0.00	0.00	90.85
Dead+Wind 330 deg - Service+Guy	8904.42	-0.78	-1.42	0.00	0.00	68.09

### Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.00	-4972.92	0.00	-0.00	4972.92	0.00	0.000%
2	0.00	-5960.29	-6913.98	0.00	5960.29	6913.98	0.000%
3	3203.41	-5953.67	-5666.21	-3203.41	5953.67	5666.21	0.000%
4	5689.64	-5947.05	-3352.89	-5689.64	5947.05	3352.89	0.000%
5	6498.71	-5953.67	0.00	-6498.71	5953.67	-0.00	0.000%
6	5507.92	-5960.29	3247.98	-5507.92	5960.29	-3247.98	0.000%
7	3250.91	-5953.67	5748.49	-3250.92	5953.67	-5748.49	0.000%
8	0.00	-5947.05	6913.98	-0.00	5947.06	-6913.99	0.000%
9	-3203.41	-5953.67	5666.21	3203.41	5953.67	-5666.21	0.000%
10	-5689.64	-5960.29	3352.89	5689.64	5960.29	-3352.89	0.000%
11	-6498.71	-5953.67	0.00	6498.71	5953.67	-0.00	0.000%
12	-5507.92	-5947.05	-3247.98	5507.92	5947.05	3247.98	0.000%
13	-3250.91	-5953.67	-5748.49	3250.92	5953.67	5748.49	0.000%
14	0.00	-15734.70	0.00	-0.01	15734.69	0.05	0.000%
15	0.00	-15746.85	-1725.51	0.00	15746.89	1725.72	0.001%
16	840.34	-15734.70	-1476.87	-840.35	15734.72	1477.06	0.001%
17	1519.77	-15722.54	-889.77	-1519.81	15722.55	889.81	0.000%
18	1780.22	-15734.70	0.00	-1780.37	15734.76	-0.09	0.001%
19	1518.61	-15746.85	889.10	-1517.27	15746.83	-887.68	0.012%
20	871.26	-15734.70	1530.43	-871.41	15734.76	-1530.52	0.001%
21	0.00	-15722.54	1725.51	-0.01	15722.56	-1725.56	0.000%
22	-840.34	-15734.70	1476.87	840.50	15734.78	-1477.02	0.001%
23	-1519.77	-15746.85	889.77	1519.82	15746.84	-889.79	0.000%
24	-1780.22	-15734.70	0.00	1780.37	15734.77	-0.08	0.001%
25	-1518.61	-15722.54	-889.10	1518.66	15722.55	889.15	0.000%
26	-871.26	-15734.70	-1530.43	871.25	15734.72	1530.59	0.001%
27	0.00	-4974.31	-1450.32	0.00	4974.31	1450.32	0.000%
28	672.00	-4972.92	-1188.63	-672.00	4972.92	1188.63	0.000%
29	1193.54	-4971.53	-703.34	-1193.54	4971.53	703.34	0.000%
30	1363.27	-4972.92	0.00	-1363.27	4972.92	-0.00	0.000%
31	1155.44	-4974.31	681.35	-1155.44	4974.31	-681.35	0.000%
32	681.96	-4972.92	1205.87	-681.96	4972.92	-1205.87	0.000%
33	0.00	-4971.53	1450.32	0.00	4971.53	-1450.32	0.000%
34	-672.00	-4972.92	1188.63	672.00	4972.92	-1188.63	0.000%
35	-1193.54	-4974.31	703.34	1193.54	4974.31	-703.34	0.000%
36	-1363.27	-4972.92	0.00	1363.27	4972.92	-0.00	0.000%
37	-1155.44	-4971.53	-681.35	1155.44	4971.53	681.35	0.000%
38	-681.96	-4972.92	-1205.87	681.96	4972.92	1205.87	0.000%

### Non-Linear Convergence Results

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Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.0000001	0.0000001
2	Yes	6	0.0000001	0.00033444
3	Yes	6	0.0000001	0.00012650
4	Yes	6	0.0000001	0.00011814
5	Yes	6	0.0000001	0.00056028
6	Yes	7	0.0000001	0.00020382
7	Yes	6	0.0000001	0.00041008
8	Yes	5	0.0000001	0.00039841
9	Yes	6	0.0000001	0.00013329
10	Yes	7	0.0000001	0.00018638
11	Yes	6	0.0000001	0.00055115
12	Yes	6	0.0000001	0.00011312
13	Yes	6	0.0000001	0.00039109
14	Yes	4	0.0000001	0.00008958
15	Yes	5	0.0000001	0.00060071
16	Yes	5	0.0000001	0.00033987
17	Yes	5	0.0000001	0.00007553
18	Yes	5	0.0000001	0.00049348
19	Yes	5	0.0000001	0.00073077
20	Yes	5	0.0000001	0.00044012
21	Yes	5	0.0000001	0.00004829
22	Yes	5	0.0000001	0.00023295
23	Yes	5	0.0000001	0.00054147
24	Yes	5	0.0000001	0.00040579
25	Yes	5	0.0000001	0.00012017
26	Yes	5	0.0000001	0.00048753
27	Yes	4	0.0000001	0.00003946
28	Yes	4	0.0000001	0.00005334
29	Yes	4	0.0000001	0.00018720
30	Yes	4	0.0000001	0.00022009
31	Yes	4	0.0000001	0.00016347
32	Yes	4	0.0000001	0.00014214
33	Yes	4	0.0000001	0.00003976
34	Yes	4	0.0000001	0.00004307
35	Yes	4	0.0000001	0.00013514
36	Yes	4	0.0000001	0.00020189
37	Yes	4	0.0000001	0.00019836
38	Yes	4	0.0000001	0.00015843

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	89 - 80	0.751	29	0.195	0.093
L2	80 - 60	0.457	27	0.070	0.088
L3	60 - 40	0.198	33	0.058	0.075
L4	40 - 20	0.019	33	0.026	0.050
L5	20 - 0	0.007	33	0.000	0.025

### Critical Deflections and Radius of Curvature - Service Wind

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	<b>Client</b>	T-Mobile	<b>Designed by</b>	Joshua Gildert

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
86.50	AIR 6419 B41	29	0.660	0.155	0.092	10959
82.00	Guy	27	0.510	0.091	0.089	8119
75.00	80010766	33	0.359	0.041	0.086	8223
69.00	RRUS 11	33	0.282	0.038	0.082	14274
67.00	Guy	33	0.262	0.042	0.081	18914
65.50	2" x 8ft Pipe	33	0.248	0.046	0.079	25012
63.00	DTMABP7819VG12A TMA	33	0.225	0.052	0.077	51706
62.00	RRUS 11	33	0.216	0.055	0.076	66160
39.00	Guy	33	0.015	0.024	0.048	18513
19.00	Guy	33	0.008	0.000	0.024	77470

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	89 - 80	7.732	2	1.414	0.439
L2	80 - 60	5.402	2	0.893	0.415
L3	60 - 40	1.970	2	0.673	0.350
L4	40 - 20	0.071	2	0.209	0.233
L5	20 - 0	0.073	2	0.046	0.116

### Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
86.50	AIR 6419 B41	2	7.056	1.250	0.432	2472
82.00	Guy	2	5.885	0.985	0.420	1828
75.00	80010766	2	4.331	0.750	0.403	1699
69.00	RRUS 11	2	3.266	0.691	0.386	2139
67.00	Guy	2	2.952	0.684	0.379	2341
65.50	2" x 8ft Pipe	2	2.728	0.682	0.373	2520
63.00	DTMABP7819VG12A TMA	2	2.373	0.685	0.363	2874
62.00	RRUS 11	2	2.236	0.683	0.359	3015
39.00	Guy	23	0.048	0.189	0.227	1874
19.00	Guy	2	0.082	0.044	0.111	6941

### Guy Design Data

Section No.	Elevation ft	Size	Initial Tension lb	Breaking Load lb	Actual $T_u$ lb	Allowable $\phi T_n$ lb	Required S.F.	Actual S.F.
L1	82.00 (A) (8)	5/16 EHS	1120.00	11199.98	6501.78	6720.00	1.000	1.034
	82.00 (B) (7)	5/16 EHS	1120.00	11199.98	6533.75	6720.00	1.000	1.029
	82.00 (C) (6)	5/16 EHS	1120.00	11199.98	6527.11	6720.00	1.000	1.030
L2	67.00 (A) (11)	1/4 EHS	665.00	6649.98	3140.72	3990.00	1.000	1.270
	67.00 (B) (10)	1/4 EHS	665.00	6649.98	3126.70	3990.00	1.000	1.276

<b>tnxTower</b>  <b>Centerline Communications</b> 750 West Center Street, Suite 301 West Bridgewater, MA 02379 Phone: (781) 713-4725 FAX:	<b>Job</b> 4BN0138A	<b>Page</b> 15 of 16
	<b>Project</b> Anchor	<b>Date</b> 09:37:59 03/21/23
	<b>Client</b> T-Mobile	<b>Designed by</b> Joshua Gildert

Section No.	Elevation ft	Size	Initial Tension lb	Breaking Load lb	Actual $T_u$ lb	Allowable $\phi T_n$ lb	Required S.F.	Actual S.F.
L4	67.00 (C) (9)	1/4 EHS	665.00	6649.98	3043.23	3990.00	1.000	1.311
	39.00 (A) (14)	1/4 EHS	665.00	6649.98	999.73	3990.00	1.000	3.991
	39.00 (B) (13)	1/4 EHS	665.00	6649.98	976.38	3990.00	1.000	4.087
L5	39.00 (C) (12)	1/4 EHS	665.00	6649.98	973.99	3990.00	1.000	4.097
	19.00 (A) (17)	1/4 EHS	665.00	6649.98	1018.67	3990.00	1.000	3.917
	19.00 (B) (16)	1/4 EHS	665.00	6649.98	1023.36	3990.00	1.000	3.899
	19.00 (C) (15)	1/4 EHS	665.00	6649.98	1024.50	3990.00	1.000	3.895

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	$L_u$ ft	Kl/r	A in <sup>2</sup>	$P_u$ lb	$\phi P_n$ lb	Ratio $\frac{P_u}{\phi P_n}$
L1	89 - 80 (1)	P5x.258	9.00	0.00	0.0	4.300	-9936.41	135446.00	0.073
L2	80 - 60 (2)	P6x.28	20.00	0.00	0.0	5.581	-13845.20	175813.00	0.079
L3	60 - 40 (3)	P6x.28	20.00	0.00	0.0	5.581	-15224.10	175813.00	0.087
L4	40 - 20 (4)	P6x.28	20.00	0.00	0.0	5.581	-16282.90	175813.00	0.093
L5	20 - 0 (5)	P6x.28	20.00	0.00	0.0	5.581	-20639.50	175813.00	0.117

### Pole Bending Design Data

Section No.	Elevation ft	Size	$M_{ux}$ lb-ft	$\phi M_{nx}$ lb-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	$M_{uy}$ lb-ft	$\phi M_{ny}$ lb-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	89 - 80 (1)	P5x.258	7864.49	19074.92	0.412	0.00	19074.92	0.000
L2	80 - 60 (2)	P6x.28	4766.64	29609.58	0.161	0.00	29609.58	0.000
L3	60 - 40 (3)	P6x.28	2506.98	29609.58	0.085	0.00	29609.58	0.000
L4	40 - 20 (4)	P6x.28	2414.36	29609.58	0.082	0.00	29609.58	0.000
L5	20 - 0 (5)	P6x.28	4.94	29609.58	0.000	0.00	29609.58	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V_u$ lb	$\phi V_n$ lb	Ratio $\frac{V_u}{\phi V_n}$	Actual $T_u$ lb-ft	$\phi T_n$ lb-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	89 - 80 (1)	P5x.258	1869.42	67722.90	0.028	92.39	28618.17	0.003
L2	80 - 60 (2)	P6x.28	710.78	87906.30	0.008	197.10	44602.67	0.004
L3	60 - 40 (3)	P6x.28	11.08	87906.30	0.000	94.11	44602.67	0.002
L4	40 - 20 (4)	P6x.28	97.57	87906.30	0.001	93.73	44602.67	0.002
L5	20 - 0 (5)	P6x.28	5.05	87906.30	0.000	17.11	44602.67	0.000

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	<b>Project</b> Anchor	<b>Date</b> 09:37:59 03/21/23
	<b>Client</b> T-Mobile	<b>Designed by</b> Joshua Gildert

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$P_u$	$M_{ux}$	$M_{uy}$	$V_u$	$T_u$			
L1	89 - 80 (1)	0.073	0.412	0.000	0.028	0.003	0.487	1.000	4.8.2
L2	80 - 60 (2)	0.079	0.161	0.000	0.008	0.004	0.240	1.000	4.8.2
L3	60 - 40 (3)	0.087	0.085	0.000	0.000	0.002	0.171	1.000	4.8.2
L4	40 - 20 (4)	0.093	0.082	0.000	0.001	0.002	0.174	1.000	4.8.2
L5	20 - 0 (5)	0.117	0.000	0.000	0.000	0.000	0.118	1.000	4.8.2

### Section Capacity Table


Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$\phi P_{allow}$ lb	% Capacity	Pass Fail	
L1	89 - 80	Pole	P5x.258	1	-9936.41	135446.00	48.7	Pass	
L2	80 - 60	Pole	P6x.28	2	-13845.20	175813.00	24.0	Pass	
L3	60 - 40	Pole	P6x.28	3	-15224.10	175813.00	17.1	Pass	
L4	40 - 20	Pole	P6x.28	4	-16282.90	175813.00	17.4	Pass	
L5	20 - 0	Pole	P6x.28	5	-20639.50	175813.00	11.8	Pass	
L1	89 - 80	Guy A@82	5/16	8	6501.78	6720.00	96.8	Pass	
L2	80 - 60	Guy A@67	1/4	11	3140.72	3990.00	78.7	Pass	
L4	40 - 20	Guy A@39	1/4	14	999.73	3990.00	25.1	Pass	
L5	20 - 0	Guy A@19	1/4	17	1018.67	3990.00	25.5	Pass	
L1	89 - 80	Guy B@82	5/16	7	6533.75	6720.00	97.2	Pass	
L2	80 - 60	Guy B@67	1/4	10	3126.70	3990.00	78.4	Pass	
L4	40 - 20	Guy B@39	1/4	13	976.38	3990.00	24.5	Pass	
L5	20 - 0	Guy B@19	1/4	16	1023.36	3990.00	25.6	Pass	
L1	89 - 80	Guy C@82	5/16	6	6527.11	6720.00	97.1	Pass	
L2	80 - 60	Guy C@67	1/4	9	3043.23	3990.00	76.3	Pass	
L4	40 - 20	Guy C@39	1/4	12	973.99	3990.00	24.4	Pass	
L5	20 - 0	Guy C@19	1/4	15	1024.50	3990.00	25.7	Pass	
							Summary		
							Pole (L1)	48.7	Pass
							Guy A (L1)	96.8	Pass
							Guy B (L1)	97.2	Pass
							Guy C (L1)	97.1	Pass
							<b>RATING =</b>	<b>97.2</b>	<b>Pass</b>

## Mount Analysis Report

<b>Site Address</b>	24 Tower Rd Ashland, MA 01721
<b>Site Name</b>	BN138/Twr Rd WT RFP
<b>Site ID</b>	4BN0138A
<b>Project Name</b>	Anchor
<b>Design Codes</b>	Massachusetts State Building Code 9 <sup>th</sup> Edition 2015 International Building Code ASCE 7-10 TIA-222-G Standards

	<b>Stress Ratio</b>	<b>Overall Result</b>
<b>Proposed Mounts</b>	<b>26%</b>	<b>PASS</b>

**Client:**

  
**T - Mobile**  
**NORTHEAST, LLC**  
**15 Commerce Way, Suite B**  
**Norton, MA 02766**

**Date: 09/28/2022**

**Scope of Work:**

Centerline Communications was authorized by T-Mobile Northeast LLC to perform an analysis of the proposed antenna mounts to determine their capacity to support the proposed T-Mobile equipment listed in this report. These mounts were analyzed using RISA 3D v17.0.4.

**Final Appurtenances Configuration:**

Elevation (ft)	Position <sup>1</sup>	Azimuth (degrees)	Quantity	Appurtenance	Sector
86.5	MP1	45	1	Commscope FFVV-65A-R2-V1 Antenna	Sector 1
86.5	MP2	45	1	Ericsson AIR 6419 B41 Antenna	
86.5	MP2	45	1	Ericsson 4460 B25+B66 RRH	
86.5	MP1	45	1	Ericsson 4480 B71 +B85 RRH	
86.5	-	190	1	Commscope FFVV-65A-R2-V1 Antenna	Sector 2
86.5	-	190	1	Ericsson AIR 6419 B41 Antenna	
86.5	-	190	1	Ericsson 4460 B25+B66 RRH	
86.5	-	190	1	Ericsson 4480 B71 +B85 RRH	
86.5	-	300	1	Commscope FFVV-65A-R2-V1 Antenna	Sector 3
86.5	-	300	1	Ericsson AIR 6419 B41 Antenna	
86.5	-	300	1	Ericsson 4460 B25+B66 RRH	
86.5	-	300	1	Ericsson 4480 B71 +B85 RRH	

Notes:

1. MP represents Mount Pipe.
2. Existing Appurtenance
3. **Proposed Appurtenance**

**Design Criteria:**

**Design Codes:**

Massachusetts State Building Code 9<sup>th</sup> Edition  
 2015 International Building Code  
 ASCE 7-10  
 TIA-222-G Standards

Ultimate Wind Speed	127 mph
Nominal Wind Speed	98 mph
Wind Speed with Ice	50 mph
Ice Thickness	0.75 in.
Exposure Category	B
Topographic Category	1
Risk Category	II
Site Soil Class (Assumed)	D-Stiff Soil
Seismic Design Category	B
Spectral Response Acceleration Parameter at a Short Periods, $S_s$	0.190 g
Spectral Response Acceleration Parameter at a Period of 1 Second, $S_1$	0.066 g
Short Period Site Coefficient, $F_a$	1.6
Long Period Site Coefficient, $F_v$	2.4

\*Refer to calculations for additional design criteria.

**Conclusion:**

Based on the results of the analysis, we have determined that the proposed T-Mobile mounts are adequate to support the proposed T-Mobile appurtenances. Mount summary is as follows:

- Install (2) new Site Pro 1 UGLM ring mounts spaced 42" vertically with small pole adapter plates.
- Install (2) new Site Pro 1 MM01 standoffs with 2" STD x 42" long horizontal pipes in each sector.
- Install (1) new 2" STD x 96" long mount pipe at each position.

	<b>Stress Ratio</b>	<b>Overall Result</b>
<b>Proposed Mounts</b>	<b>26%</b>	<b>PASS</b>

**Reference Documents:**

- T-Mobile RFDS 4BN0138A\_Anchor\_8\_draft, dated September 13, 2022
- Structure and Antenna Mapping Report by Structural Components, dated March 9, 2022
- Site Photos and Notes by Centerline Communications, dated November 30, 2021
- Structural Analysis by Advanced Engineering Group, dated April 6, 2016

**Assumptions and Limitations:**


- The calculations performed by Centerline Communications are limited to the structural members in these calculations only.
- The analysis is only for the T-Mobile equipment loading listed in the report.
- The calculation assumes all structural members to be in good condition i.e. no damage, rust, or other defects.

**Photos:**



Overall

Design Calculations



Site Details	
Site Name	BN138/Twr Rd WT RFP
Carrier	T-Mobile
City, State	Ashland, MA
Project	Anchor

Mount Details	
Mount Type	T-Arm
Mount Height, z	86.5 ft
Number of Sectors	3
Structure Type	Water Tank
Structure Height, h	89.5 ft

Topographic Factors	
Topographic Category	1
Feature	Flat
Crest Height, H	N/A ft
Distance from Crest, x	N/A ft
Slope (H/L)	N/A
Topographic Factor, $K_{zt}$	1.00

Seismic Factors	
Importance Factor, $I_E$	1
Short Period Spectral Acceleration, $S_s$	0.19 g
1 Second Period Spectral Acceleration, $S_1$	0.066 g
Long-Period Transition Period, $T_L$	6
Design Category	B
Short Period Site Coefficient, $F_a$	1.60
Long-Period Site Coefficient, $F_v$	2.4

Site Parameters	
Ultimate Wind Speed, $V_{ULT}$	127 mph
Nominal Wind Speed, V	98 mph
Wind Speed with Ice, $V_i$	50 mph
Design Ice Thickness, $t_i$	0.75 in
Structural Class	II
Exposure Category	B
Site Soil Class	D-Stiff Soil (Assumed)

Code	
Building Code	2015 IBC
TIA Code	TIA-222-G
ASCE Code	7-10

Site Constants	
Importance Factor, I (Wind no Ice)	1.00
Importance Factor, I (Ice Thickness)	1.00
Importance Factor, I (wind with Ice)	1.00
Wind Direction Prob. Factor, $K_d$	0.95
Velocity Pressure Coefficient, $K_z$	0.95
Gust Effect Factor, $G_h$	1.00
Design Ice Thickness, $t_{iz}$	1.65 in
Velocity Pressure, $q_z$	22.31 psf
Velocity Pressure with Ice, $q_{zi}$	5.76 psf
Shielding Factor, $K_a$	1.00
Flat Velocity Pressure ( $Ca = 2.0$ )	44.63 psf
Round Velocity Pressure ( $Ca = 1.2$ )	26.78 psf
Round Velocity Pressure with Ice ( $Ca = 1.2$ )	6.92 psf
Engineer Initials	JG

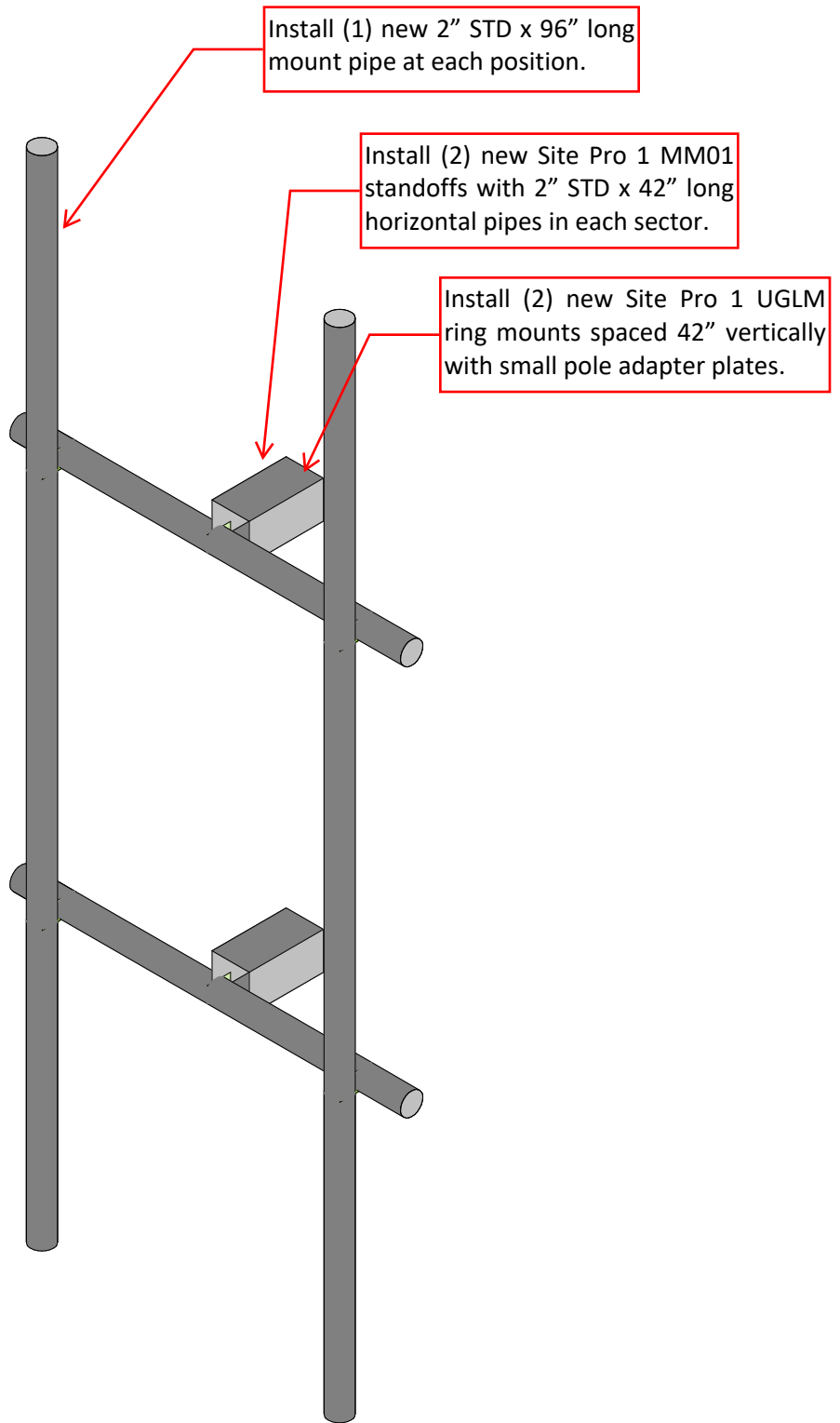
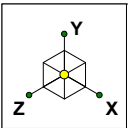






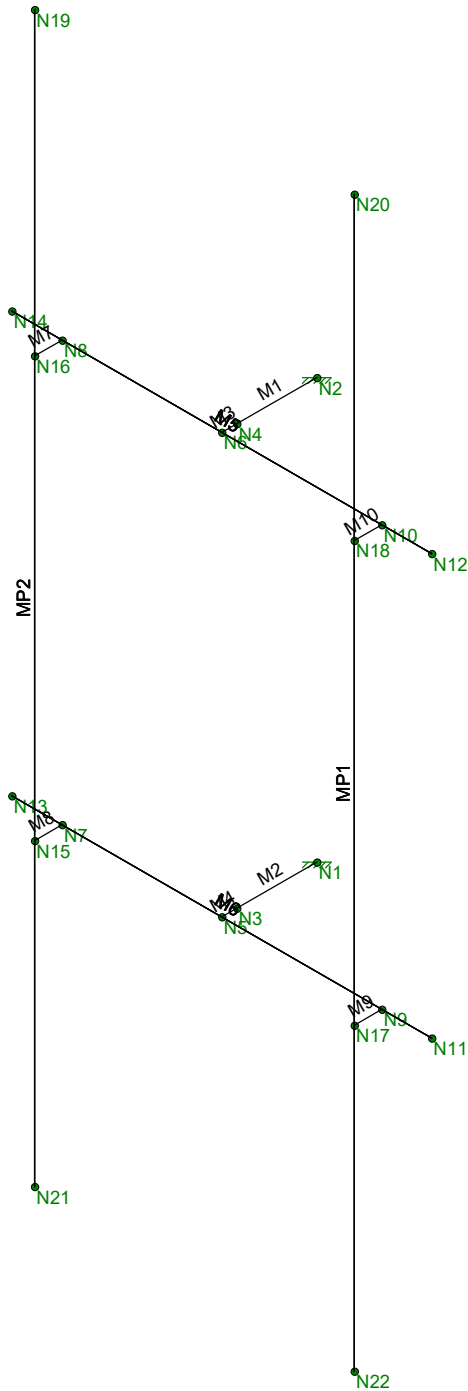
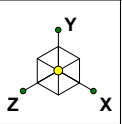
Proposed Mounts Results





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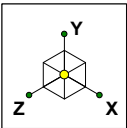
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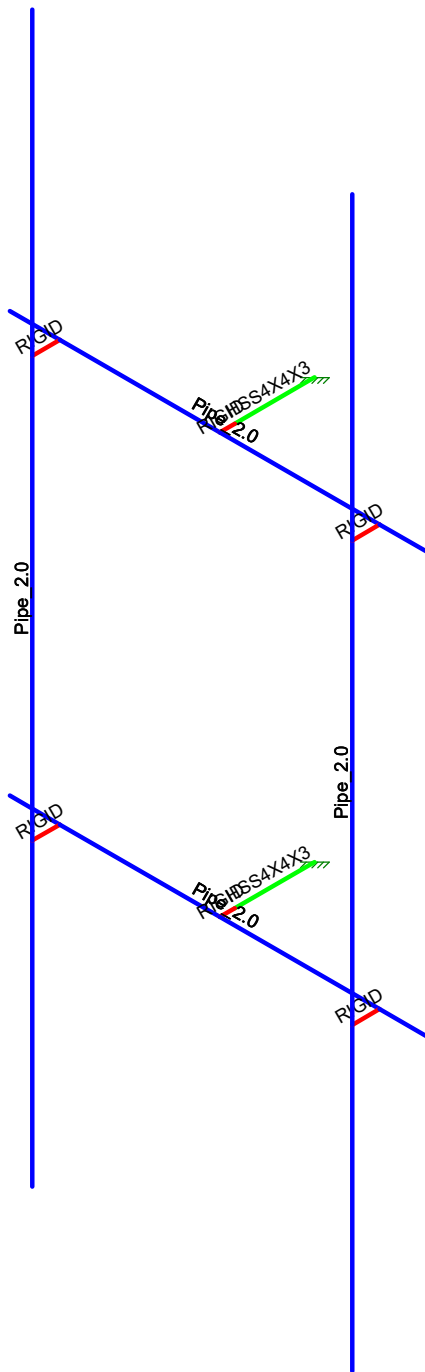
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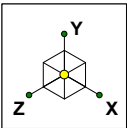


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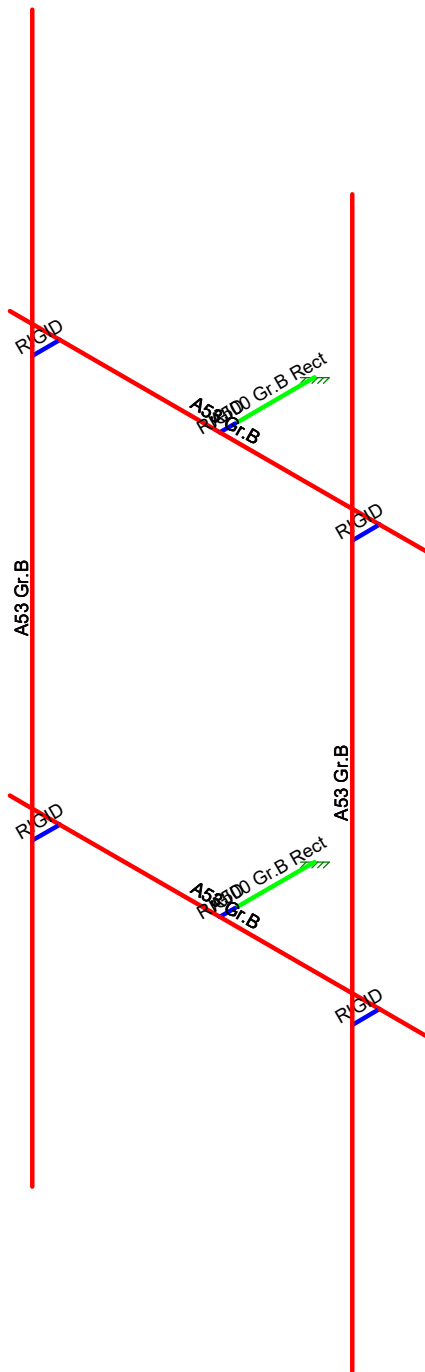


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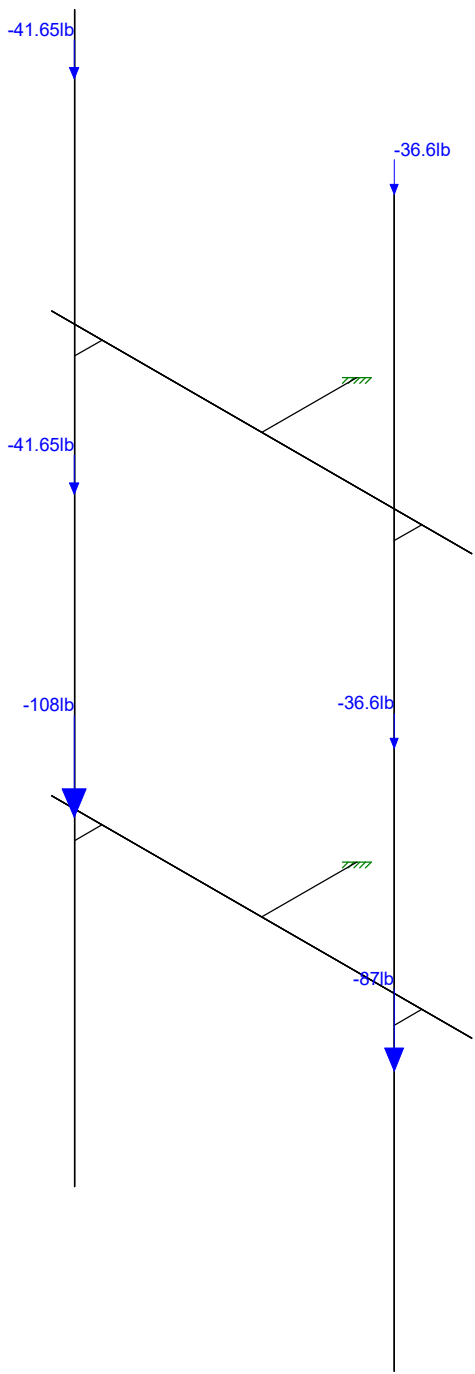
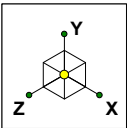


Material Sets	
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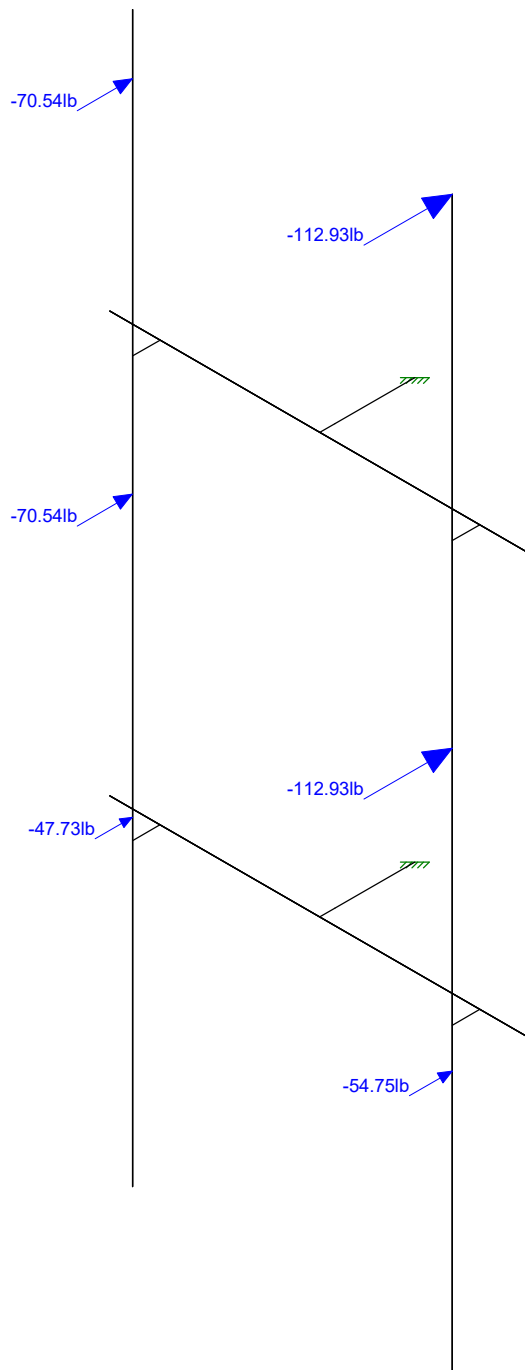
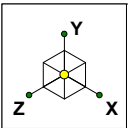
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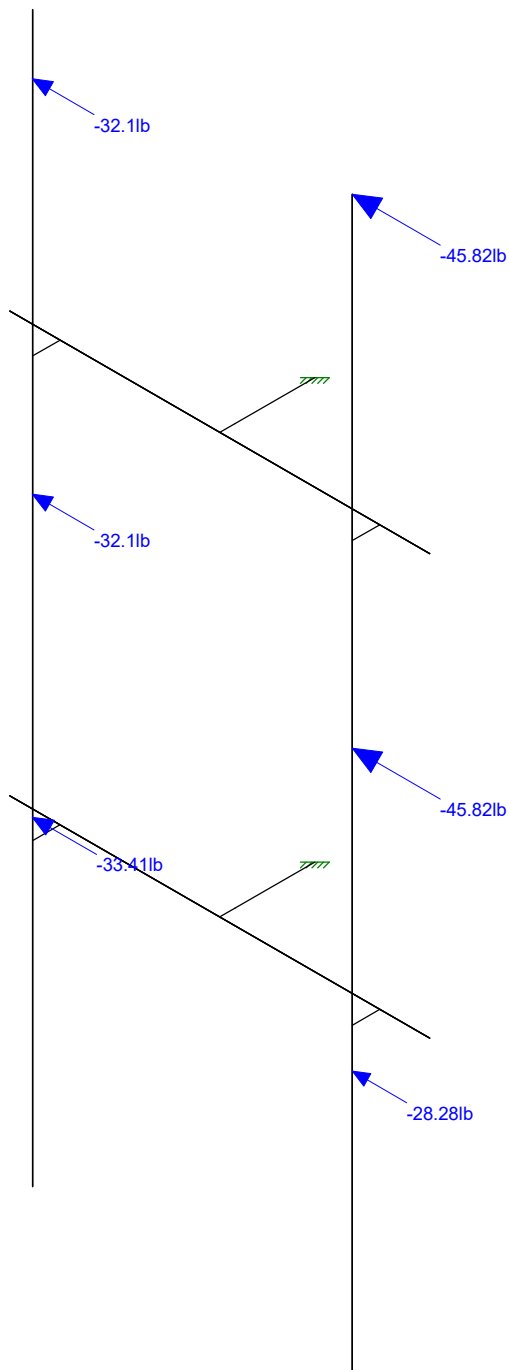
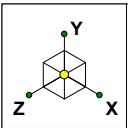
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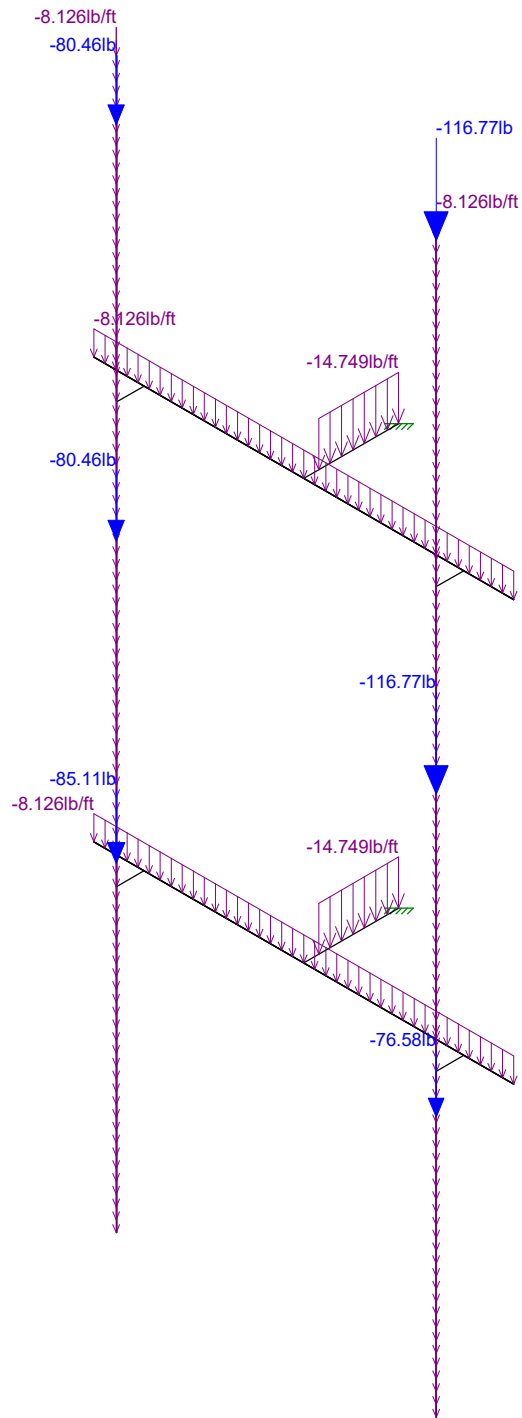
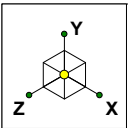
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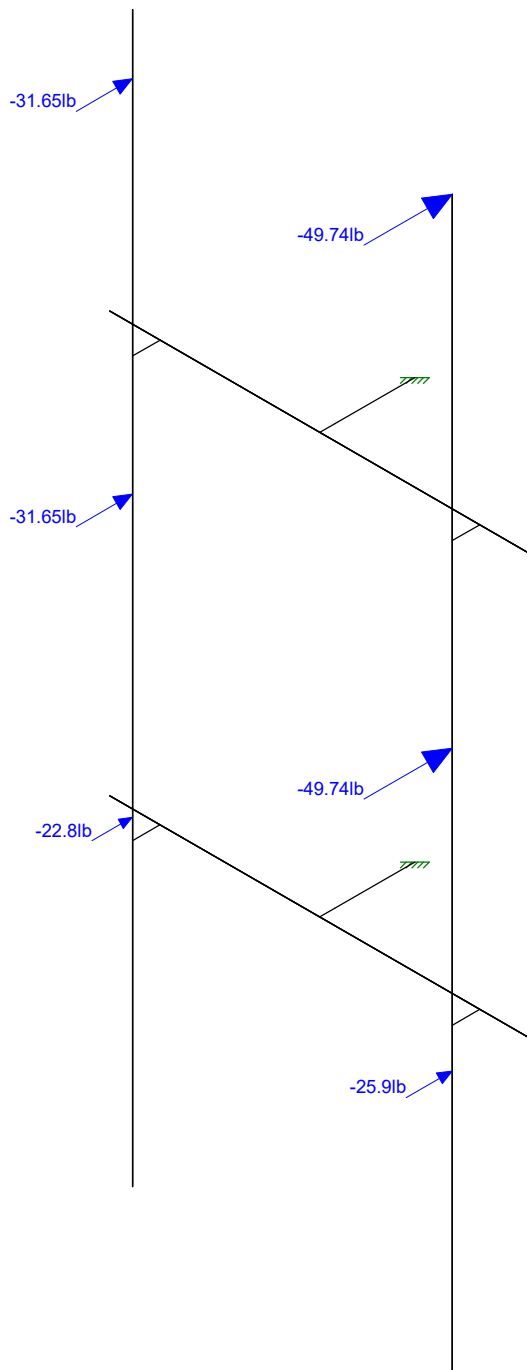
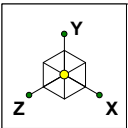
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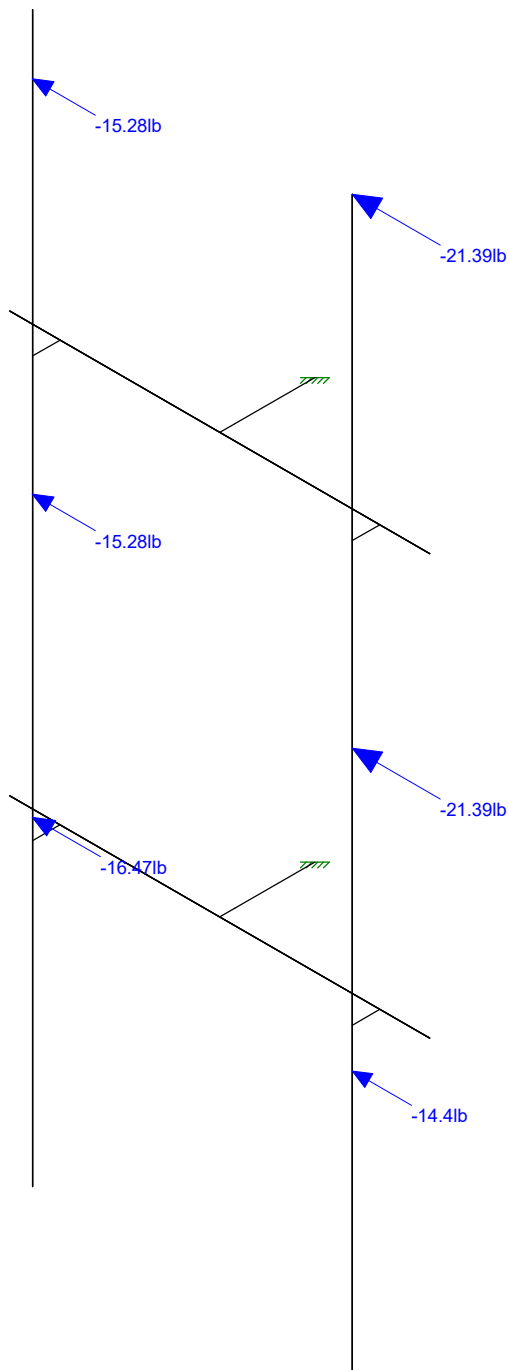
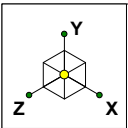
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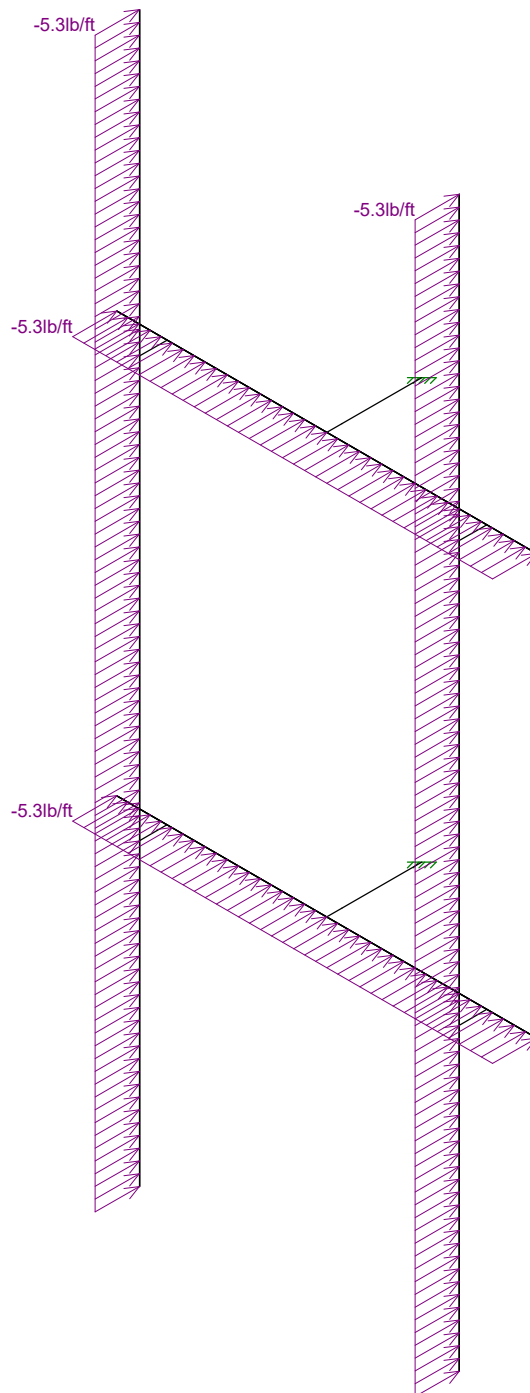
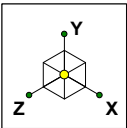
Loads: BLC 10, Ice + Wind 0  
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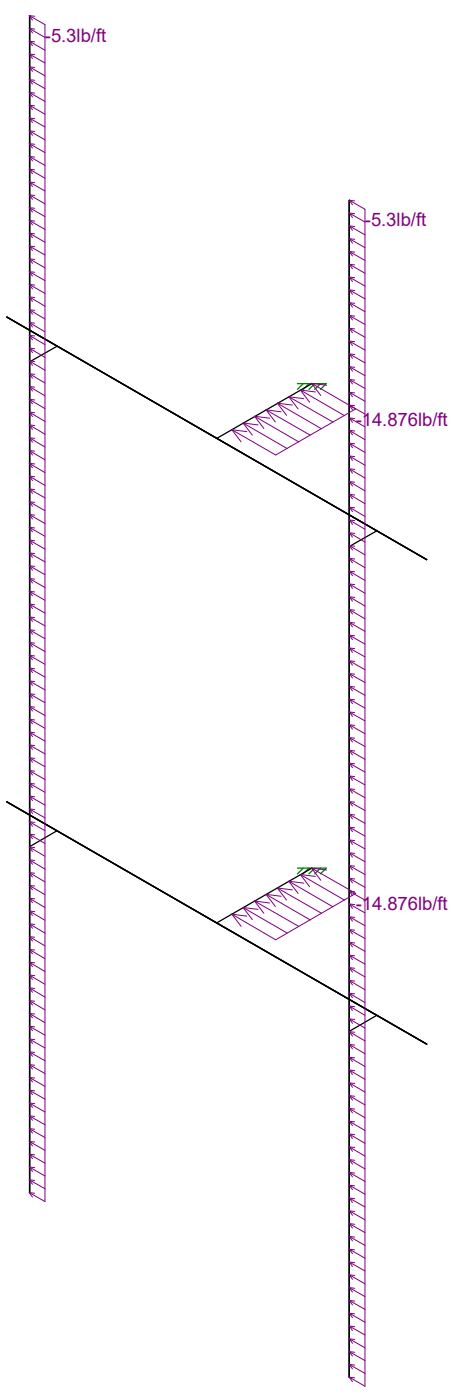
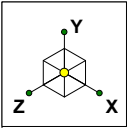
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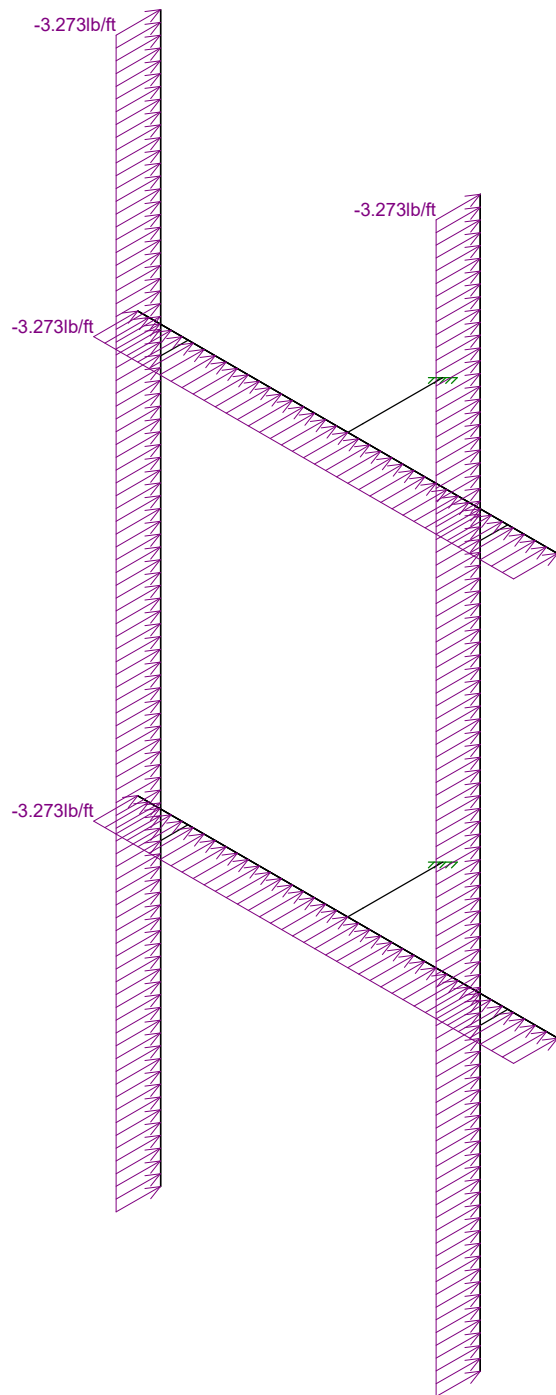
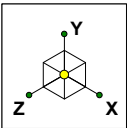
Loads: BLC 17, Distri. Wind Z  
Envelope Only Solution

Centerline Communcation...	4BN0138A_MA	DISTR. WIND Z
AP		Sept 28, 2022 at 9:37 AM
		4BN0138A_MA.r3d



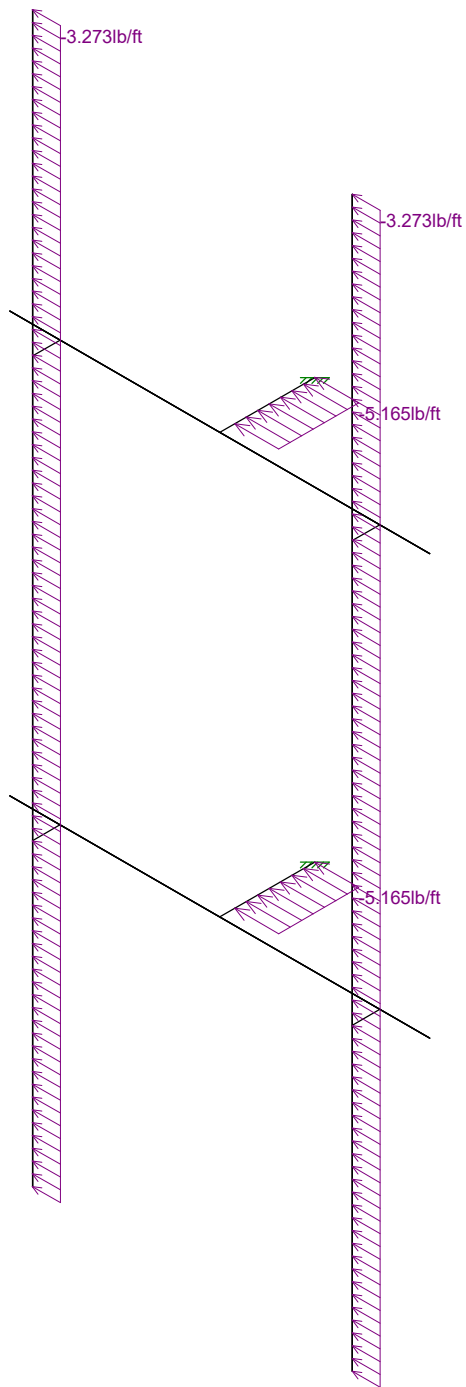
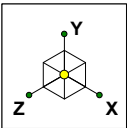
Loads: BLC 18, Distri. Wind X  
Envelope Only Solution

Centerline Communcation...	4BN0138A_MA	DISTR. WIND X
AP		Sept 28, 2022 at 9:37 AM
		4BN0138A_MA.r3d



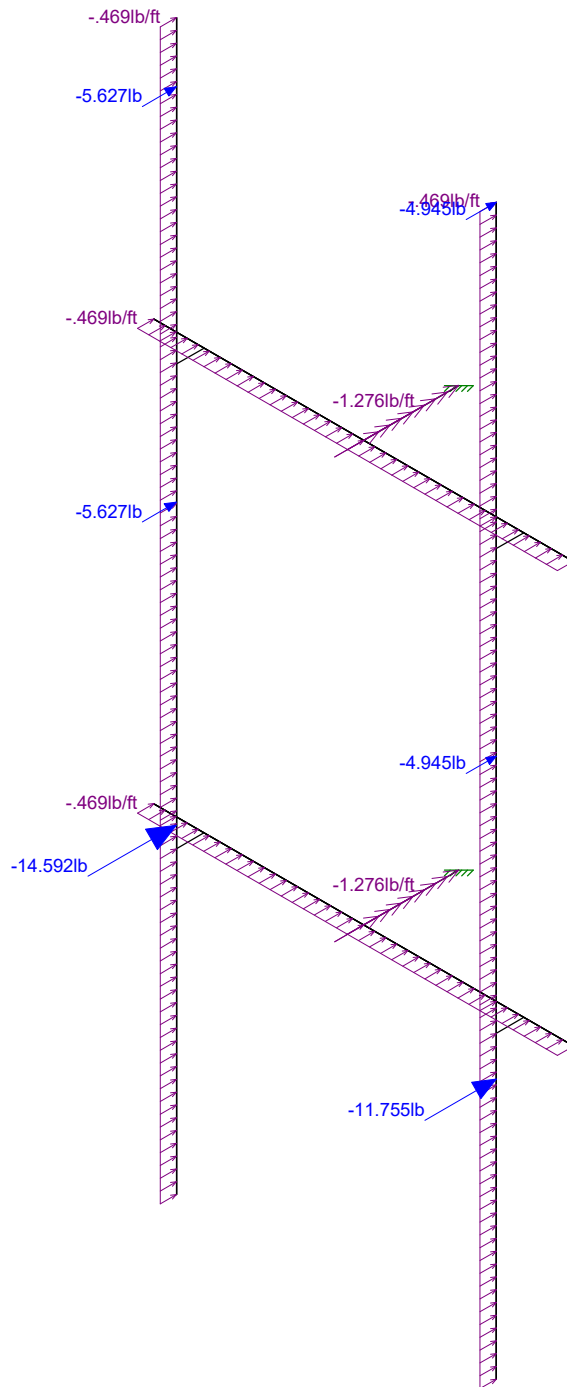
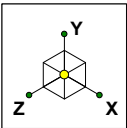
Loads: BLC 19, Distri. Ice + Wind Z  
Envelope Only Solution

Centerline Communcation...	4BN0138A_MA	DISTR. ICE + WIND Z
AP		Sept 28, 2022 at 9:37 AM
		4BN0138A_MA.r3d



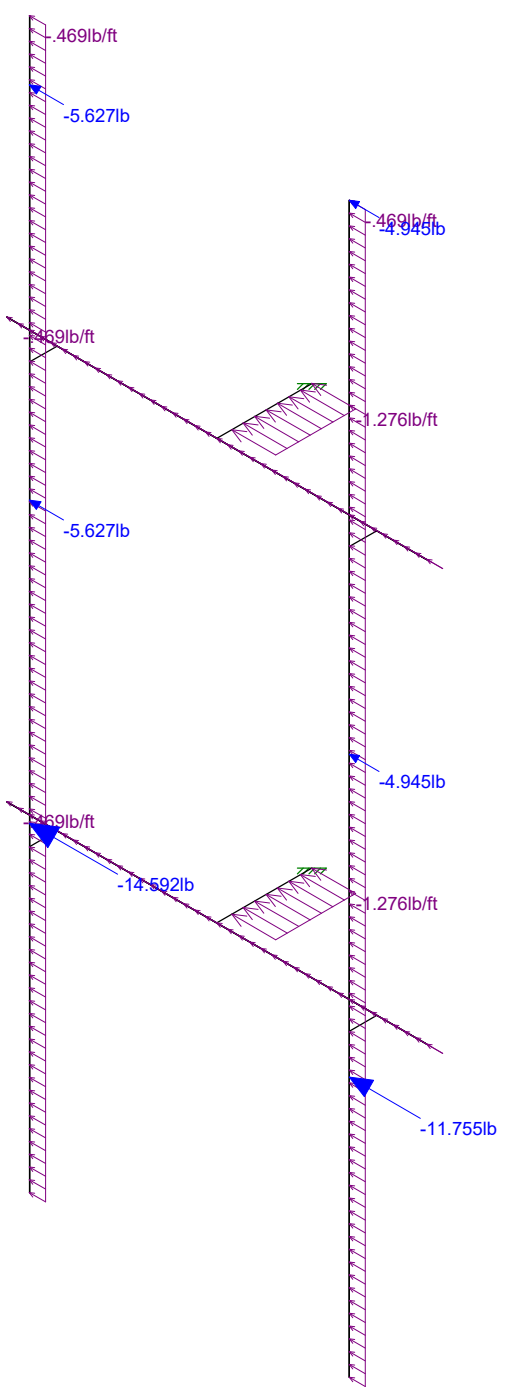
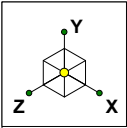
Loads: BLC 20, Distr. Ice + Wind X  
Envelope Only Solution

Centerline Communcation...	4BN0138A_MA	DISTR. ICE + WIND X
AP		Sept 28, 2022 at 9:37 AM
		4BN0138A_MA.r3d



Loads: BLC 21, Seismic Load Z  
Envelope Only Solution

Centerline Communcation...		SEISMIC Z
AP	4BN0138A_MA	Sept 28, 2022 at 9:37 AM
		4BN0138A_MA.r3d



Loads: BLC 22, Seismic Load X  
Envelope Only Solution

Centerline Communcation...		SEISMIC X
AP	4BN0138A_MA	Sept 28, 2022 at 9:37 AM
		4BN0138A_MA.r3d

### Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[lb/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A992	29000	11154	.3	.65	490	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	490	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	490	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	490	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	490	50	1.25	65	1.15
8	A913 Gr.65	29000	11154	.3	.65	490	65	1.1	80	1.1

### Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Pipe 2.0	PIPE 2.0	None	None	A53 Gr.B	Typical	1.02	.627	.627	1.25
2	HSS4X4X3	HSS4X4X3	None	None	A500 Gr.B ...	Typical	2.58	6.21	6.21	10

### Joint Coordinates and Temperatures

	Label	X [in]	Y [in]	Z [in]	Temp [F]	Detach From Di...
1	N1	0	0	0	0	
2	N2	0	42	0	0	
3	N3	0	0	8	0	
4	N4	0	42	8	0	
5	N5	0	0	9.5	0	
6	N6	0	42	9.5	0	
7	N7	-16	0	9.5	0	
8	N8	-16	42	9.5	0	
9	N9	16	0	9.5	0	
10	N10	16	42	9.5	0	
11	N11	21	0	9.5	0	
12	N12	21	42	9.5	0	
13	N13	-21	0	9.5	0	
14	N14	-21	42	9.5	0	
15	N15	-16	0	12.25	0	
16	N16	-16	42	12.25	0	
17	N17	16	0	12.25	0	
18	N18	16	42	12.25	0	
19	N19	-16	69	12.25	0	
20	N20	16	69	12.25	0	
21	N21	-16	-27	12.25	0	
22	N22	16	-27	12.25	0	

### 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	N1	max	187.298	12	670.834	22	319.311	2	-112.159	10	196.165	13	143.61	57
2		min	-61.703	37	119.593	10	-273.373	15	-540.27	22	-63.516	2	-177.016	39
3	N2	max	329.576	5	670.712	17	633.327	9	-7.01	9	339.747	6	141.423	51
4		min	-52.301	50	122.351	15	-679.335	8	-571.561	22	-133.335	9	-166.367	43
5	Totals:	max	515.456	5	1295.411	16	946.103	2						
6		min	0	15	399.526	15	-946.103	15						



### Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

### Hot Rolled Steel Design Parameters

	Label	Shape	Length[...]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torq...	Kyy	Kzz	Cb	Funct...
1	M1	HSS4X4X3	8			Lbyy						Lateral
2	M2	HSS4X4X3	8			Lbyy						Lateral
3	M5	Pipe 2.0	42			Lbyy						Lateral
4	M6	Pipe 2.0	42			Lbyy						Lateral
5	MP1	Pipe 2.0	96			Lbyy						Lateral
6	MP2	Pipe 2.0	96			Lbyy						Lateral

### Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design R...
1	M1	N2	N4			HSS4X4X3	None	None	A500 Gr.B Rect	Typical
2	M2	N1	N3			HSS4X4X3	None	None	A500 Gr.B Rect	Typical
3	M3	N4	N6			RIGID	None	None	RIGID	Typical
4	M4	N3	N5			RIGID	None	None	RIGID	Typical
5	M5	N14	N12			Pipe 2.0	None	None	A53 Gr.B	Typical
6	M6	N13	N11			Pipe 2.0	None	None	A53 Gr.B	Typical
7	M7	N8	N16			RIGID	None	None	RIGID	Typical
8	M8	N7	N15			RIGID	None	None	RIGID	Typical
9	M9	N9	N17			RIGID	None	None	RIGID	Typical
10	M10	N10	N18			RIGID	None	None	RIGID	Typical
11	MP1	N20	N22			Pipe 2.0	None	None	A53 Gr.B	Typical
12	MP2	N19	N21			Pipe 2.0	None	None	A53 Gr.B	Typical

### Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Ra...	Analysis Offs...	Inactive	Seismi...
1	M1						Yes	** NA **			None
2	M2						Yes	** NA **			None
3	M3						Yes	** NA **			None
4	M4						Yes	** NA **			None
5	M5						Yes	** NA **			None
6	M6						Yes	** NA **			None
7	M7						Yes	** NA **			None
8	M8						Yes	** NA **			None
9	M9						Yes	** NA **			None
10	M10						Yes	** NA **			None
11	MP1						Yes	** NA **			None
12	MP2						Yes	** NA **			None

### Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Grav...	Joint	Point	Distrib...	Area(...	Surfac...
1	Dead Load	DL		-1			6			
2	Wind 0	WLZ					12			
3	Wind 30	None					12			
4	Wind 60	None					12			
5	Wind 90	WLX					12			
6	Wind 120	None					12			



**Basic Load Cases (Continued)**

BLC Description	Category	X Gra...	Y Gra...	Z Grav...	Joint	Point	Distrib...	Area(...	Surfac...
7 Wind 150	None					12			
8 Wind 180	WLZ					12			
9 Ice Weight	DL					6	12		
10 Ice + Wind 0	WLZ					12			
11 Ice + Wind 30	None					12			
12 Ice + Wind 60	None					12			
13 Ice + Wind 90	WLX					12			
14 Ice + Wind 120	None					12			
15 Ice + Wind 150	None					12			
16 Ice + Wind 180	WLZ					12			
17 Distri. Wind Z	WLZ						12		
18 Distri. Wind X	WLX						12		
19 Distri. Ice + Wind Z	WLZ						12		
20 Distr. Ice + Wind X	WLX						12		
21 Seismic Load Z	ELZ					6	12		
22 Seismic Load X	ELX					6	12		
23 Live Load 1	LL					1			
24 Live Load 2	LL					1			
25 Live Load 3	LL					1			

**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...B...	Fa...B...	Fa...B...	Fa...B...
1 1.4D	Y...Y	1 1.4													
2 1.2D + 1.6W 0°	Y...Y	1 1.2 2 1.6 17 1.6 18													
3 1.2D + 1.6W 30°	Y...Y	1 1.2 3 1.6 17 1.8 18 .8													
4 1.2D + 1.6W 60°	Y...Y	1 1.2 4 1.6 17 .8 18 1.0...													
5 1.2D + 1.6W 90°	Y...Y	1 1.2 5 1.6 17 18 1.6													
6 1.2D + 1.6W 120°	Y...Y	1 1.2 6 1.6 17 -.8 18 1.0...													
7 1.2D + 1.6W 150°	Y...Y	1 1.2 7 1.6 17 -1.0... 18 .8													
8 1.2D + 1.6W 180°	Y...Y	1 1.2 8 1.6 17 -1.6 18													
9 0.9D + 1.6W 0°	Y...Y	1 .9 2 1.6 17 1.6 18													
10 0.9D + 1.6W 30°	Y...Y	1 .9 3 1.6 17 1.8 .8													
11 0.9D + 1.6W 60°	Y...Y	1 .9 4 1.6 17 .8 18 1.0...													
12 0.9D + 1.6W 90°	Y...Y	1 .9 5 1.6 17 18 1.6													
13 0.9D + 1.6W 120°	Y...Y	1 .9 6 1.6 17 -.8 18 1.0...													
14 0.9D + 1.6W 150°	Y...Y	1 .9 7 1.6 17 -1.0... 18 .8													
15 0.9D + 1.6W 180°	Y...Y	1 .9 8 1.6 17 -1.6 18													
16 1.2D + 1.0Di + 1.0Wi 0°	Y...Y	1 1.2 9 1 10 1 19 1 20													
17 1.2D + 1.0Di + 1.0Wi 30°	Y...Y	1 1.2 9 1 11 1 19 .866 20 .5													
18 1.2D + 1.0Di + 1.0Wi 60°	Y...Y	1 1.2 9 1 12 1 19 .5 20 .866													
19 1.2D + 1.0Di + 1.0Wi 90°	Y...Y	1 1.2 9 1 13 1 19 20 1													
20 1.2D + 1.0Di + 1.0Wi 120°	Y...Y	1 1.2 9 1 14 1 19 -.5 20 .866													
21 1.2D + 1.0Di + 1.0Wi 150°	Y...Y	1 1.2 9 1 15 1 19 -.8... 20 .5													
22 1.2D + 1.0Di + 1.0Wi 180°	Y...Y	1 1.2 9 1 16 1 19 -1 20													
23 1.2D + 1.0Eh 0°	Y...Y	1 1.2 21 1 22													
24 1.2D + 1.0Eh 30°	Y...Y	1 1.2 21 .866 22 .5													
25 1.2D + 1.0Eh 60°	Y...Y	1 1.2 21 .5 22 .866													
26 1.2D + 1.0Eh 90°	Y...Y	1 1.2 21 22 1													
27 1.2D + 1.0Eh 120°	Y...Y	1 1.2 21 -.5 22 .866													
28 1.2D + 1.0Eh 150°	Y...Y	1 1.2 21 -.8... 22 .5													
29 1.2D + 1.0Eh 180°	Y...Y	1 1.2 21 -1 22													
30 0.9D + 1.0Eh 0°	Y...Y	1 .9 21 1 22													
31 0.9D + 1.0Eh 30°	Y...Y	1 .9 21 .866 22 .5													
32 0.9D + 1.0Eh 60°	Y...Y	1 .9 21 .5 22 .866													
33 0.9D + 1.0Eh 90°	Y...Y	1 .9 21 22 1													



**Load Combinations (Continued)**

Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...
34 0.9D + 1.0Eh 120°	Y...	Y		1	.9	21	-.5	22	.866											
35 0.9D + 1.0Eh 150°	Y...	Y		1	.9	21	-.8	22	.5											
36 0.9D + 1.0Eh 180°	Y...	Y		1	.9	21	-.1	22												
37 1.0D + 1.5Lv + 1.0W (60 mph) 0°	Y...	Y		1	1	23	1.5	2	.333	17	.333	18								
38 1.0D + 1.5Lv + 1.0W (60 mph) 30°	Y...	Y		1	1	23	1.5	3	.333	17	.288	18	.166							
39 1.0D + 1.5Lv + 1.0W (60 mph) 60°	Y...	Y		1	1	23	1.5	4	.333	17	.166	18	.288							
40 1.0D + 1.5Lv + 1.0W (60 mph) 90°	Y...	Y		1	1	23	1.5	5	.333	17		18	.333							
41 1.0D + 1.5Lv + 1.0W (60 mph) 120°	Y...	Y		1	1	23	1.5	6	.333	17	-.1	18	.288							
42 1.0D + 1.5Lv + 1.0W (60 mph) 150°	Y...	Y		1	1	23	1.5	7	.333	17	-.2	18	.166							
43 1.0D + 1.5Lv + 1.0W (60 mph) 180°	Y...	Y		1	1	23	1.5	8	.333	17	-.3	18								
44 1.0D + 1.5Lv + 1.0W (60 mph) 0°	Y...	Y		1	1	24	1.5	2	.333	17	.333	18								
45 1.0D + 1.5Lv + 1.0W (60 mph) 30°	Y...	Y		1	1	24	1.5	3	.333	17	.288	18	.166							
46 1.0D + 1.5Lv + 1.0W (60 mph) 60°	Y...	Y		1	1	24	1.5	4	.333	17	.166	18	.288							
47 1.0D + 1.5Lv + 1.0W (60 mph) 90°	Y...	Y		1	1	24	1.5	5	.333	17		18	.333							
48 1.0D + 1.5Lv + 1.0W (60 mph) 120°	Y...	Y		1	1	24	1.5	6	.333	17	-.1	18	.288							
49 1.0D + 1.5Lv + 1.0W (60 mph) 150°	Y...	Y		1	1	24	1.5	7	.333	17	-.2	18	.166							
50 1.0D + 1.5Lv + 1.0W (60 mph) 180°	Y...	Y		1	1	24	1.5	8	.333	17	-.3	18								
51 1.0D + 1.5Lv + 1.0W (60 mph) 0°	Y...	Y		1	1	25	1.5	2	.333	17	.333	18								
52 1.0D + 1.5Lv + 1.0W (60 mph) 30°	Y...	Y		1	1	25	1.5	3	.333	17	.288	18	.166							
53 1.0D + 1.5Lv + 1.0W (60 mph) 60°	Y...	Y		1	1	25	1.5	4	.333	17	.166	18	.288							
54 1.0D + 1.5Lv + 1.0W (60 mph) 90°	Y...	Y		1	1	25	1.5	5	.333	17		18	.333							
55 1.0D + 1.5Lv + 1.0W (60 mph) 120°	Y...	Y		1	1	25	1.5	6	.333	17	-.1	18	.288							
56 1.0D + 1.5Lv + 1.0W (60 mph) 150°	Y...	Y		1	1	25	1.5	7	.333	17	-.2	18	.166							
57 1.0D + 1.5Lv + 1.0W (60 mph) 180°	Y...	Y		1	1	25	1.5	8	.333	17	-.3	18								
58 1.2D + 1.0Lv + 1.0W (30 mph) 0°	Y...	Y		1	1.2	23	1	2	.093	17	.093	18								
59 1.2D + 1.0Lv + 1.0W (30 mph) 30°	Y...	Y		1	1.2	23	1	3	.093	17	.081	18	.046							
60 1.2D + 1.0Lv + 1.0W (30 mph) 60°	Y...	Y		1	1.2	23	1	4	.093	17	.046	18	.081							
61 1.2D + 1.0Lv + 1.0W (30 mph) 90°	Y...	Y		1	1.2	23	1	5	.093	17		18	.093							
62 1.2D + 1.0Lv + 1.0W (30 mph) 120°	Y...	Y		1	1.2	23	1	6	.093	17	-.0	18	.081							
63 1.2D + 1.0Lv + 1.0W (30 mph) 150°	Y...	Y		1	1.2	23	1	7	.093	17	-.0	18	.046							
64 1.2D + 1.0Lv + 1.0W (30 mph) 180°	Y...	Y		1	1.2	23	1	8	.093	17	-.0	18								
65 1.2D + 1.0Lv + 1.0W (30 mph) 0°	Y...	Y		1	1.2	24	1	2	.093	17	.093	18								
66 1.2D + 1.0Lv + 1.0W (30 mph) 30°	Y...	Y		1	1.2	24	1	3	.093	17	.081	18	.046							
67 1.2D + 1.0Lv + 1.0W (30 mph) 60°	Y...	Y		1	1.2	24	1	4	.093	17	.046	18	.081							
68 1.2D + 1.0Lv + 1.0W (30 mph) 90°	Y...	Y		1	1.2	24	1	5	.093	17		18	.093							
69 1.2D + 1.0Lv + 1.0W (30 mph) 120°	Y...	Y		1	1.2	24	1	6	.093	17	-.0	18	.081							
70 1.2D + 1.0Lv + 1.0W (30 mph) 150°	Y...	Y		1	1.2	24	1	7	.093	17	-.0	18	.046							
71 1.2D + 1.0Lv + 1.0W (30 mph) 180°	Y...	Y		1	1.2	24	1	8	.093	17	-.0	18								
72 1.2D + 1.0Lv + 1.0W (30 mph) 0°	Y...	Y		1	1.2	25	1	2	.093	17	.093	18								
73 1.2D + 1.0Lv + 1.0W (30 mph) 30°	Y...	Y		1	1.2	25	1	3	.093	17	.081	18	.046							
74 1.2D + 1.0Lv + 1.0W (30 mph) 60°	Y...	Y		1	1.2	25	1	4	.093	17	.046	18	.081							
75 1.2D + 1.0Lv + 1.0W (30 mph) 90°	Y...	Y		1	1.2	25	1	5	.093	17		18	.093							
76 1.2D + 1.0Lv + 1.0W (30 mph) 120°	Y...	Y		1	1.2	25	1	6	.093	17	-.0	18	.081							
77 1.2D + 1.0Lv + 1.0W (30 mph) 150°	Y...	Y		1	1.2	25	1	7	.093	17	-.0	18	.046							
78 1.2D + 1.0Lv + 1.0W (30 mph) 180°	Y...	Y		1	1.2	25	1	8	.093	17	-.0	18								

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

Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	.....	phi*Pnc [lb]	phi*Pnt [lb]	...phi*...	Cb	Eqn
1	M5 PIPE 2.0	.262	21	2	.135	21	8	27741.09	32130	...187...	1.828	H1-1b
2	MP1 PIPE 2.0	.233	27	2	.040	27	8	14916.096	32130	...187...	3.654	H1-1b
3	M6 PIPE 2.0	.158	21	22	.044	21	...	27741.09	32130	...187...	1.918	H1-1b
4	MP2 PIPE 2.0	.124	27	2	.026	27	8	14916.096	32130	...187...	4.262	H1-1b
5	M1 HSS4X4X3	.053	0	6	.029	0	y...	106621.126	106812	...126...	1.266	H1-1b
6	M2 HSS4X4X3	.047	0	20	.030	0	y...	106621.126	106812	...126...	1.485	H1-1b