

Wednesday, September 15, 2021

Mr. Erich Rose
Pyramid Network Services
6615 Towpath Road, Suite 200
East Syracuse, NY 13057



MISSION 1
COMMUNICATIONS

592 West Perry Road
Ligonier, IN 46767
(800) 377-2929

Structural Analysis Report

Co-Locator: Dish Wireless
180 ft PiROD Monopole Tower
Project ID #: 783308.01.DISH

Tower Owner Information

Company Name: U.S. Cellular Co.
Site Name: Wind Lake
Site Number: 783308

Tower Site Information

Site Address: 6801 Milwaukee Ave
Norway, WI 53185
Racine County

Site Coordinates: Latitude: 42° 48' 37.2" N
Longitude: 88° 9' 40.5" W

Results:

Load Case:

Existing + Proposed Changes

(See table C2.2 for specific load information)

Tower Capacity	96.5%	PASS
Foundation Capacity	85.4%	PASS
Twist & Sway (deg.)		
TIA-222-H Limit	2.2125	4' Dish @ 10 dB degradation
Service Twist & Sway	1.7500	PASS

Twist & Sway limit is based on a 6 GHz Microwave Dish Frequency unless otherwise noted.

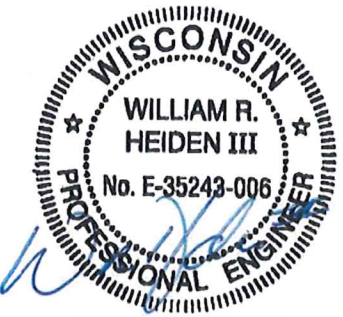
 September 15, 2021	Approved By: William R. Heiden, III, P.E.

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1) INTRODUCTION

Mission 1 Communications is pleased to submit this rigorous structural analysis report to determine if the aforementioned tower meets the current structural codes and standards of this jurisdiction considering all proposed and existing loading as listed in this report.

2) ANALYSIS METHODS AND DATA

This analysis was performed in accordance with Telecommunication Industry Association specifications using Tower Numerics tnxTower v8.0.5. This software is specifically designed for the telecommunications industry and has been used to create a 3-dimensional model of the tower. See Appendices for tnxTower output and other calculations.

2.1) ANALYSIS CRITERIA

Design Standard	TIA-222-H
Building Code	2018 International Building Code
Wind Speed Without Ice	107 mph 3-second gust V_{ult}
Wind Speed With Ice	40 mph 3-second gust
Service Wind Speed	60 mph 3-second gust
Ice Thickness	1.50"
Risk Category	II
Exposure Category	C
Topographic Category	1
Crest Height	0 ft
Seismic Design Category (SDC)	B
Seismic Spectral Response (S_s)	0.083
Seismic Spectral Response (S_1)	0.051

2.2) LOADING CONFIGURATION (FINAL PROPOSED)

Elevations (ft.) ^{1,2}		Qty	Antenna Description/Model	Mount Type	Coax/Feedlines			Carrier	Notes
Mount	Antenna				Qty.	Size	Location		
180.00	180.00	1	6' Lightning Rod	Direct	---	---	---	Existing	
177.50	177.50	1	KMW KASCTPR82008	T-Arm	4	1-5/8" Coax	Inside Pole	US Cellular	Existing
177.50	177.50	1	KMW AM-X-CW-18-65-00T-RET	T-Arm					
177.50	177.50	1	ANTEL WPA-80063-8CF-EDIN-X	T-Arm					
160.00	160.00	2	KMW KASCTPR82008	LP Platform	8	1-5/8" Coax	Inside Pole	US Cellular	Existing
160.00	160.00	2	KMW AM-X-CW-18-65-00T-RET	LP Platform					
160.00	160.00	4	ANTEL WPA-80063-8CF-EDIN-X	LP Platform					
143.00	143.00	3	JMA MX08FRO665-21	LP Platform	1	1.75" Cable	Inside Pole	Dish Wireless	<i>Proposed</i>
143.00	143.00	1	Raycap RDIDC-9181-PF-48	LP Platform					
143.00	143.00	3	Fujitsu TA08025-B605	LP Platform					
143.00	143.00	3	Fujitsu TA08025-B604	LP Platform					
143.00	143.00	1	Commscope MC-PK8-DSH	LP Platform					

Notes:

1. Elevations listed are measured to the centerline of the antenna and mounts unless noted otherwise.
2. Omni or Whip style antennas elevations listed are to the base of the antenna unless noted otherwise.

2.3) ANTENNA AREAS

Proposed Loading

Total Antenna Area: 5952.1 in²

Elevations ^{1,2}		Antennas ^{3,4}				Mount Type	Coax/Feedlines			Carrier
Mount	Equip.	Qty.	Description/Model	Area (ft ²)	Total Area (ft ²)		Qty.	Size	Location	
143.00'	143.00'	3	JMA MX08FRO665-21	10.0000	30.00	LP Platform	1	1.75" Cable	Inside Pole	Dish Wireless
143.00'	143.00'	1	Raycap RDIDC-9181-PF-48	1.5556	1.56	LP Platform				
143.00'	143.00'	3	Fujitsu TA08025-B605	1.6297	4.89	LP Platform				
143.00'	143.00'	3	Fujitsu TA08025-B604	1.6297	4.89	LP Platform				

Notes:

1. Elevations listed are measured to the centerline of the antenna and mounts unless noted otherwise.
2. Omni or Whip style antennas elevations listed are to the base of the antenna unless noted otherwise.
3. Antenna areas listed are frontal areas, "no ice" values.
4. Antenna area calculations do not include Mount or Coax/Feedline areas.

2.4) REFERENCE INFORMATION

Document	Author Information	Source
Tower Data	Drawings and Calculations, PiROD, A-111933, 12/12/95	US Cellular SiteVizion
Foundation Data	Drawings and Calculations, PiROD, A-111933, 12/12/95	US Cellular SiteVizion
Geotechnical Data	Geotechnical Report, Ramaker, 2375-95, 11/21/95	US Cellular SiteVizion
Loading Data	Antenna Coax Mapping, Edge, 1720, 2/25/21 Dish Wireless Proposed Loading, PNS, 783308, 08/17/21	Pyramid Network Services Pyramid Network Services

2.5) ASSUMPTIONS

The following assumptions were made to complete this analysis. If any of the assumptions are not valid Mission 1 Communications must be notified so the appropriate changes can be made to the analysis, conclusions, and recommendations.

1. The tower and structures were built in accordance with manufacturer's specifications.
2. The tower and structures have been maintained in accordance with the manufacturer's specifications.
3. Mount areas and weights are assumed based on photographs and other provided information.
4. All connections are assumed to develop the full member capacity unless noted otherwise in this report.
5. All prior structural modifications are assumed to be properly installed and fully effective.
6. Material grades are per supplied data, or as assumed and noted in Appendix B.
7. Feedlines and appurtenances are configured as shown in this report. All feedlines and appurtenances are assumed to be properly supported per manufacturer's specifications.
8. Theoretical Twist & Sway values are reported for reference only and must be reviewed by the engineer responsible for the microwave equipment operation to ensure proper alignment will be maintained.

3) RESULTS AND CONCLUSIONS

3.1) MEMBER CAPACITY

<i>Section No.</i>	<i>Elevation (ft.)</i>	<i>Component</i>	<i>Size</i>	<i>P kips</i>	<i>øP_{allow} kips</i>	<i>% Capacity</i>	<i>Pass Fail</i>
L1	180 - 160	Pole	P12x.375	-1.4161	551.084	17.4	Pass
L2	160 - 140	Pole	P18x.375	-7.925	784.878	47.4	Pass
L3	140 - 120	Pole	P24x3/8	-10.6232	1052.07	62.8	Pass
L4	120 - 90	Pole	P30x3/8	-15.6324	1311.06	81	Pass
L5	90 - 60	Pole	P36x3/8	-21.6315	1490.1	90.3	Pass
L6	60 - 40	Pole	P42x3/8	-26.2617	1668.87	85.8	Pass
L7	40 - 20	Pole	P48x3/8	-31.4948	1847.49	82.1	Pass
L8	20 - 0	Pole	P54x3/8	-37.3363	2026	79	Pass

Summary

Pole (L5)	90.3	Pass
Base Plate	96.5	Pass
RATING =	96.5	Pass

3.2) FOUNDATION CAPACITY

Reaction Type	Current Maximum Reactions	Status
Moment (kip-ft)	2242	Pad and Pier Foundation PASSES
Shear (kips)	20	
Axial (kips)	37	

3.3) TWIST & SWAY RESULTS

Elevation (ft.)	Appurtenance	Gov. Load Comb.	Deflection (in.)	Angular Deflection (deg.)		
				Tilt	Twist	Resultant
183	5/8" x 72" Lightning Rod	47	33.671	1.7496	0.0363	1.7500
177.5	Side Arm Mount [SO 101-1]	47	32.756	1.7436	0.0345	1.7439
171.67	KMW - KASCTPR82008	47	30.625	1.7275	0.0304	1.7278
165.83	KMW - KASCTPR82008	47	28.517	1.7042	0.0263	1.7044
160	Sabre - 12ft LP Platform w/handrails (C10851001)	47	26.447	1.6688	0.0225	1.6690
143	Commscope MC-PK8-DSH	47	20.752	1.4931	0.0133	1.4932

3.4) CONCLUSIONS AND RECOMMENDATIONS

The existing tower and foundation are structurally adequate to satisfy the requirements of the applicable codes and standards. Based on the loading configuration, reinforcement modifications are not required at this time.

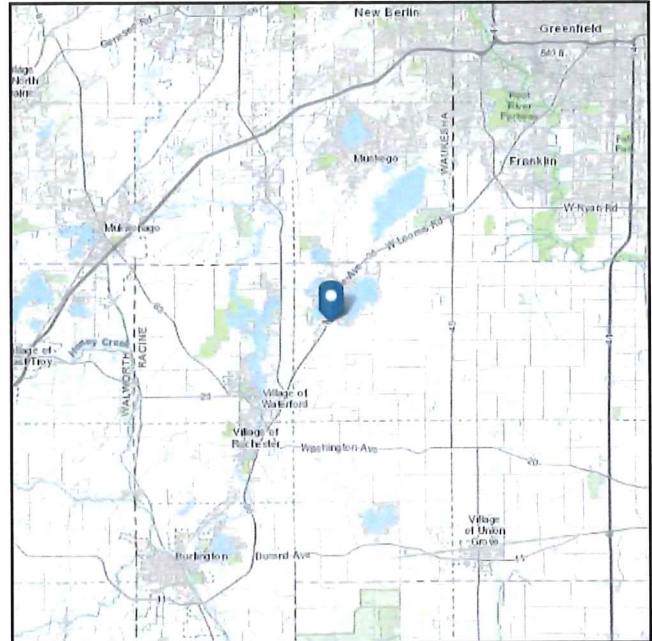
APPENDIX A
ASCE 7 SITE DESIGN CRITERIA

ASCE 7 Hazards Report

Address:
No Address at This
Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see
Section 11.4.3)

Elevation: 775.19 ft (NAVD 88)
Latitude: 42.8103
Longitude: -88.16125



Wind

Results:

Wind Speed:	107 Vmph
10-year MRI	73 Vmph
25-year MRI	81 Vmph
50-year MRI	85 Vmph
100-year MRI	91 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2

Date Accessed: Tue Sep 07 2021

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 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

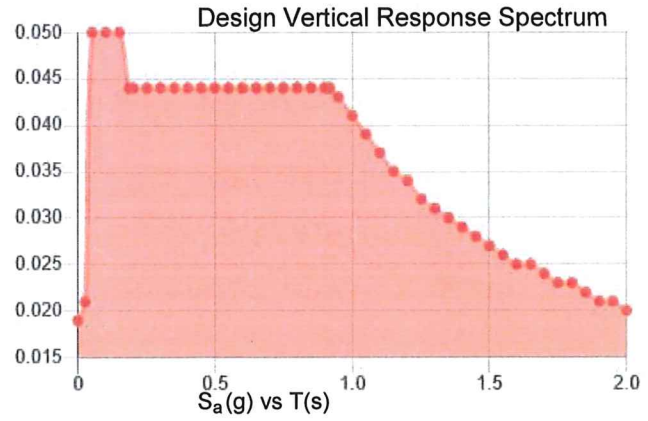
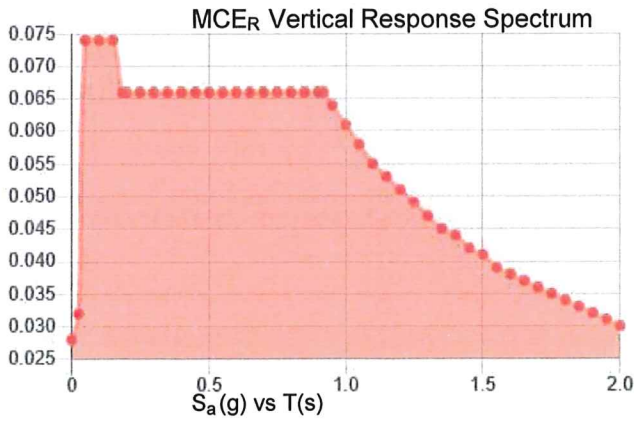
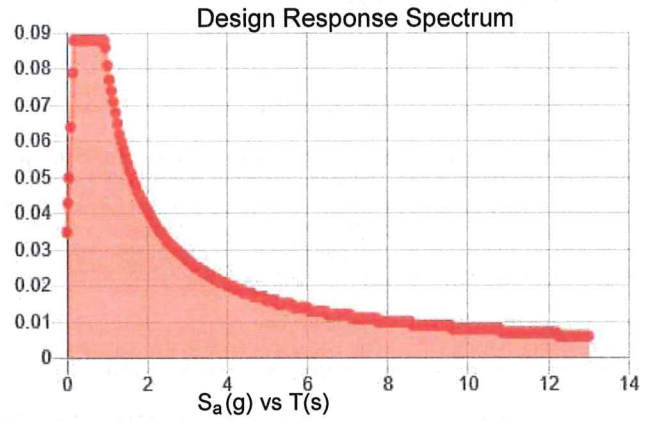
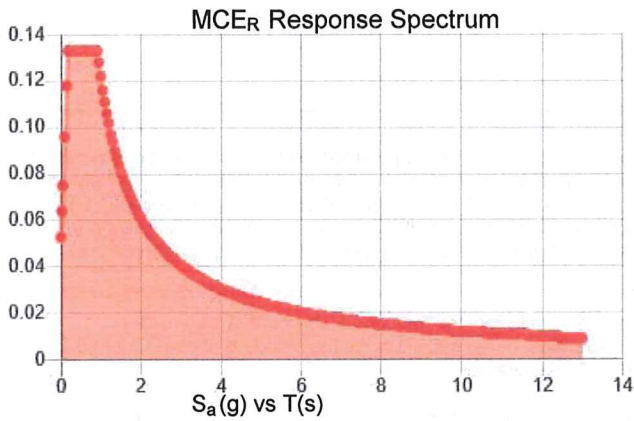
Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	0.083	S_{D1} :	0.081
S_1 :	0.051	T_L :	12
F_a :	1.6	PGA :	0.041
F_v :	2.4	PGA _M :	0.065
S_{MS} :	0.133	F_{PGA} :	1.6
S_{M1} :	0.122	I_e :	1
S_{DS} :	0.088	C_v :	0.7

Seismic Design Category B



Data Accessed:

Tue Sep 07 2021

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

Ice

Results:

Ice Thickness: 1.50 in.
Concurrent Temperature: -5 F
Gust Speed: 40 mph

Data Source: Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8

Date Accessed: Tue Sep 07 2021

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 500-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.

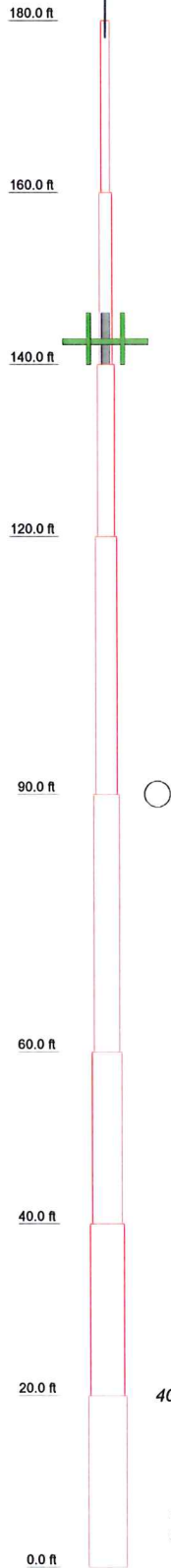
The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated 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.

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APPENDIX B
TNX TOWER OUTPUT

Section	1								
Size	P12x.375								
Length (ft)	20.00								
Grade									
Weight (K)	1.0								
	2								
Size	P18x.375								
Length (ft)	20.00								
Grade									
Weight (K)	1.5								
	3								
Size	P24x3/8								
Length (ft)	20.00								
Grade									
Weight (K)	2.0								
	4								
Size	P30x3/8								
Length (ft)	30.00								
Grade									
Weight (K)	3.7								
	5								
Size	P36x3/8								
Length (ft)	30.00								
Grade									
Weight (K)	4.5								
	6								
Size	P42x3/8								
Length (ft)	20.00								
Grade									
Weight (K)	3.5								
	7								
Size	P48x3/8								
Length (ft)	20.00								
Grade									
Weight (K)	4.0								
	8								
Size	P54x3/8								
Length (ft)	20.00								
Grade									
Weight (K)	4.5								
Grade									
Weight (K)	24.8								



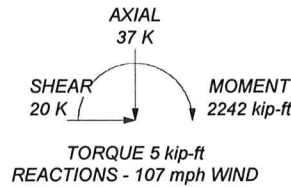
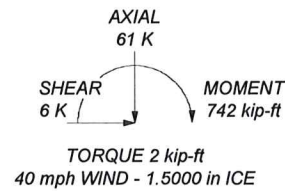
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-42	42 ksi	63 ksi			

TOWER DESIGN NOTES

1. Tower is located in Racine County, Wisconsin.
2. Tower designed for Exposure D to the TIA-222-H Standard.
3. Tower designed for a 107 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 40 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 96.5%

ALL REACTIONS
ARE FACTORED



Mission 1 Communications

592 West Perry Road
Ligonier, IN 46767
Phone: (800) 377-2929
FAX: (800) 377-2929

Job: **US Cellular - Wind Lake, WI**

Project: **Pirod MP54 x 180' (A-111933)**

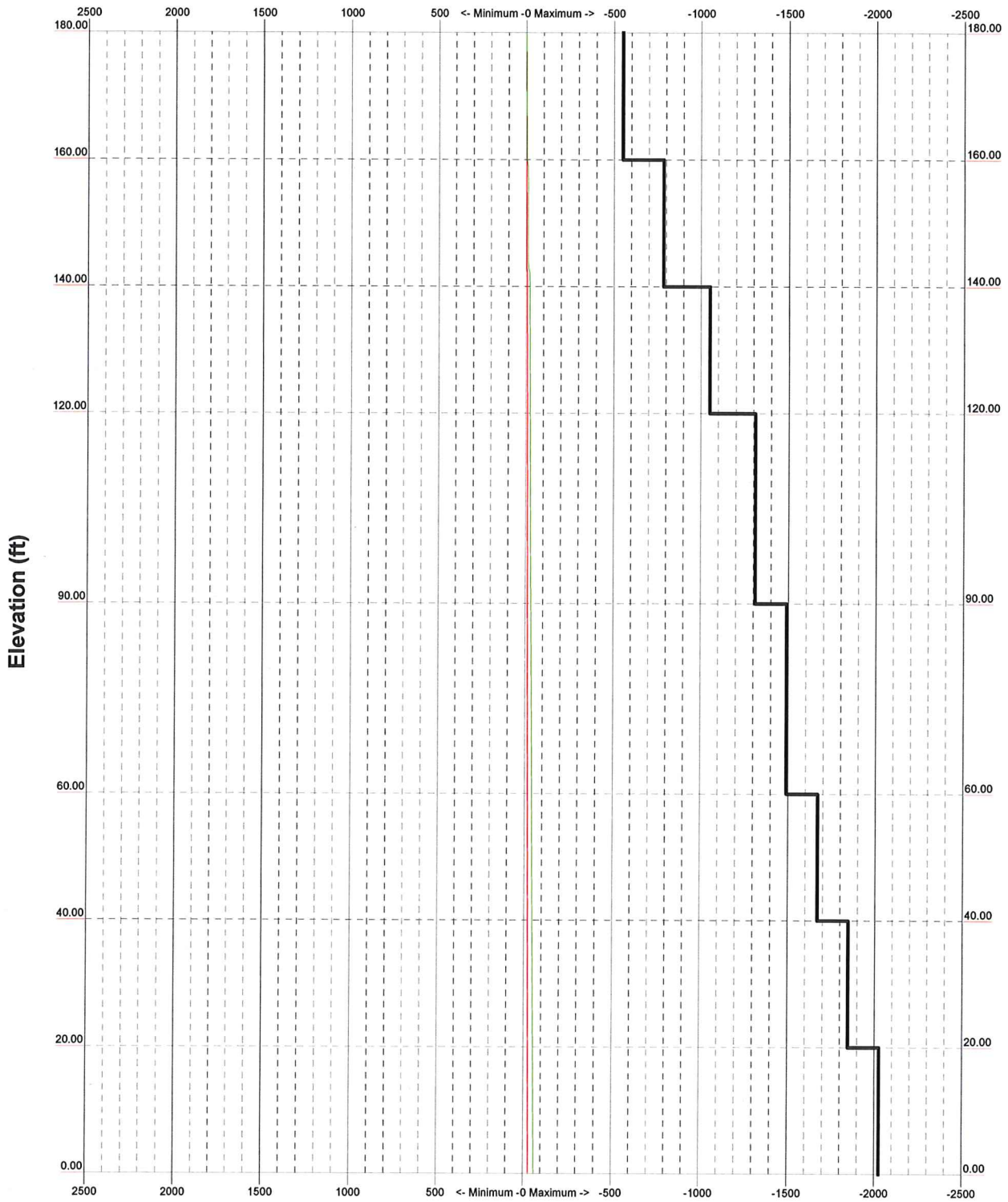
Client: **Pyramid Network Services** Drawn by: **jkaiser** App'd:

Code: **TIA-222-H** Date: **09/15/21** Scale: **NTS**

Path: Dwg No. **E-1**

TIA-222-H - 107 mph/40 mph 1.5000 in Ice Exposure D

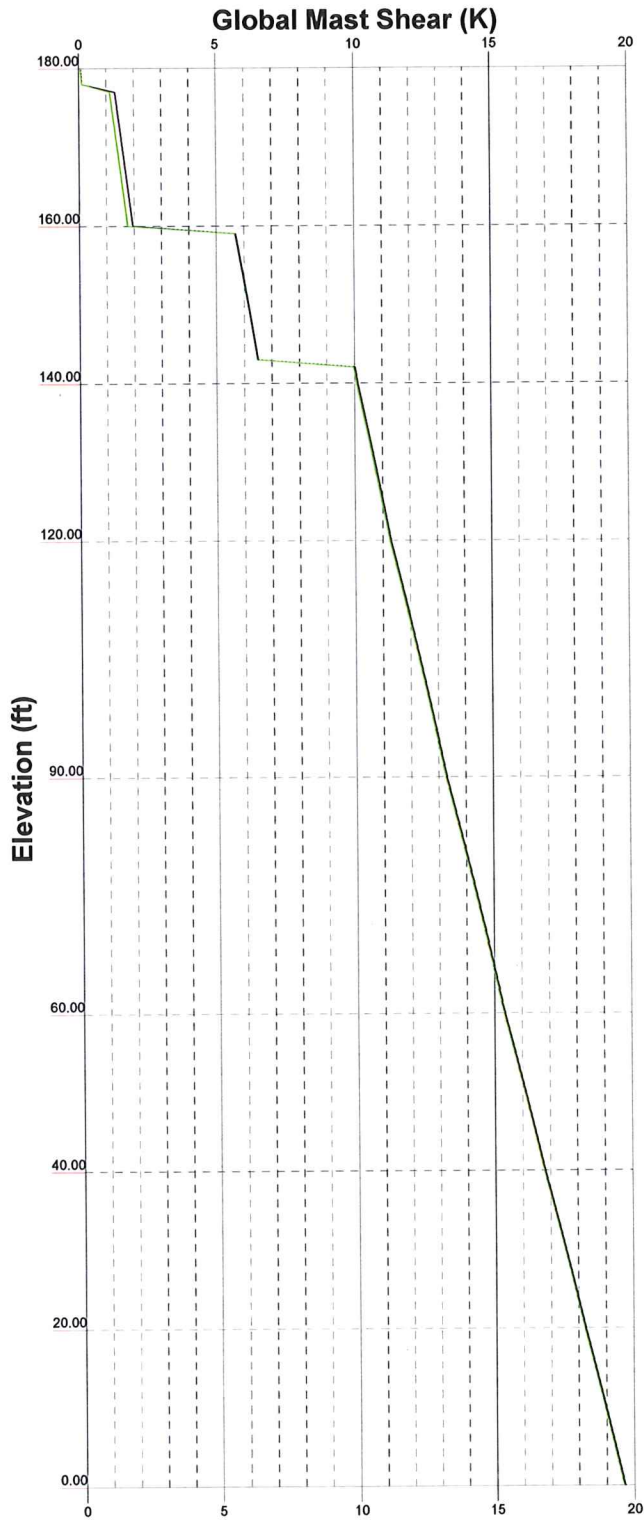
Leg Capacity ——— Leg Compression (K)



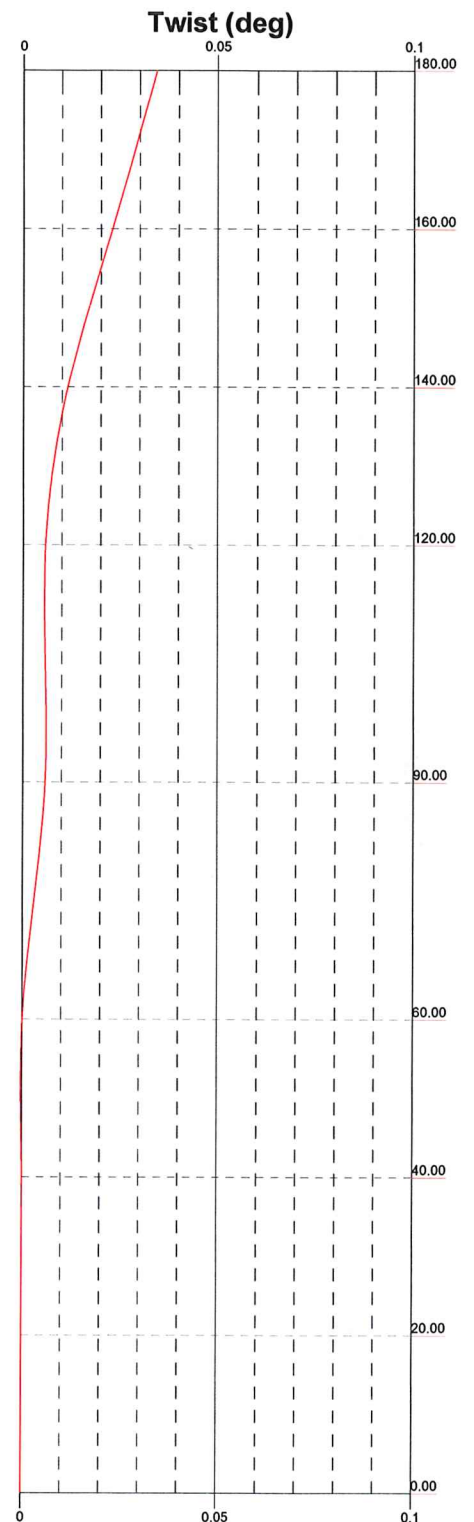
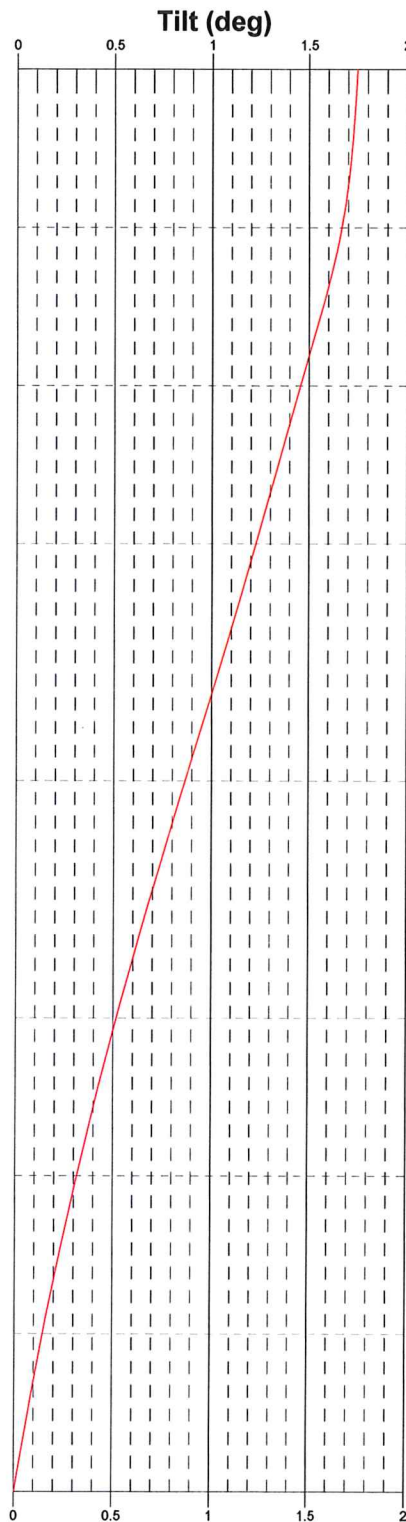
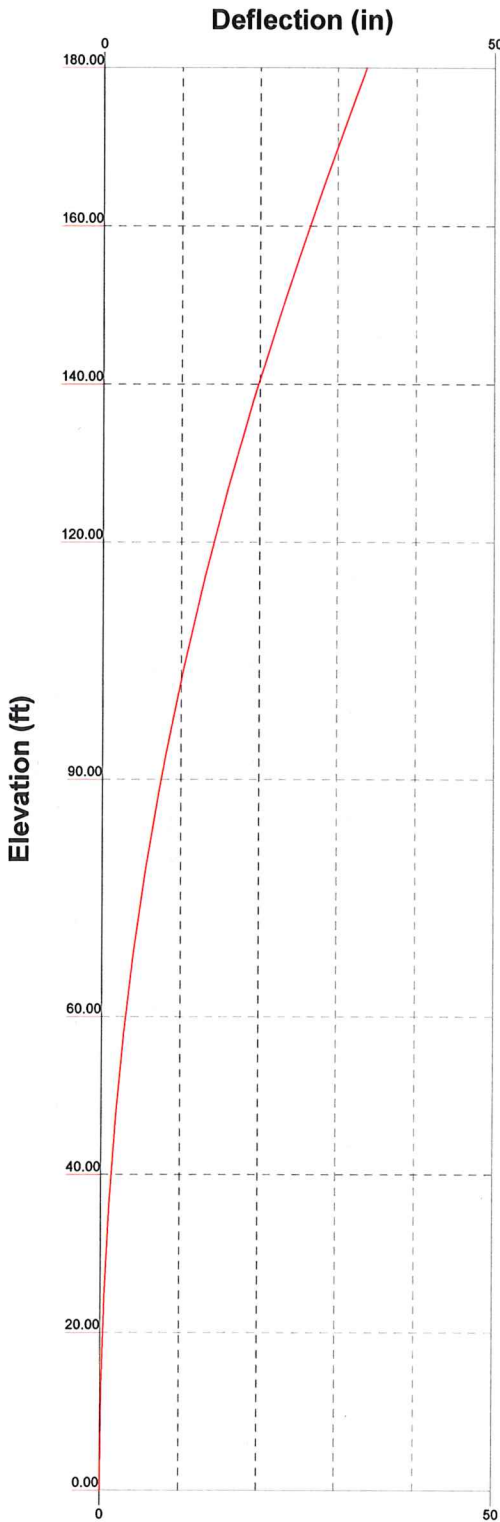
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	<p>Client: Pyramid Network Services</p>		<p>Drawn by: jkaiser</p>	<p>App'd:</p>
	<p>Code: TIA-222-H</p>		<p>Date: 09/15/21</p>	<p>Scale: NTS</p>
	<p>Path:</p>		<p>Dwg No. E-3</p>	

Vx Vz

Mx Mz



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	<p></p>		<p>App'd: _____ Scale: NTS Dwg No: E-4</p>	

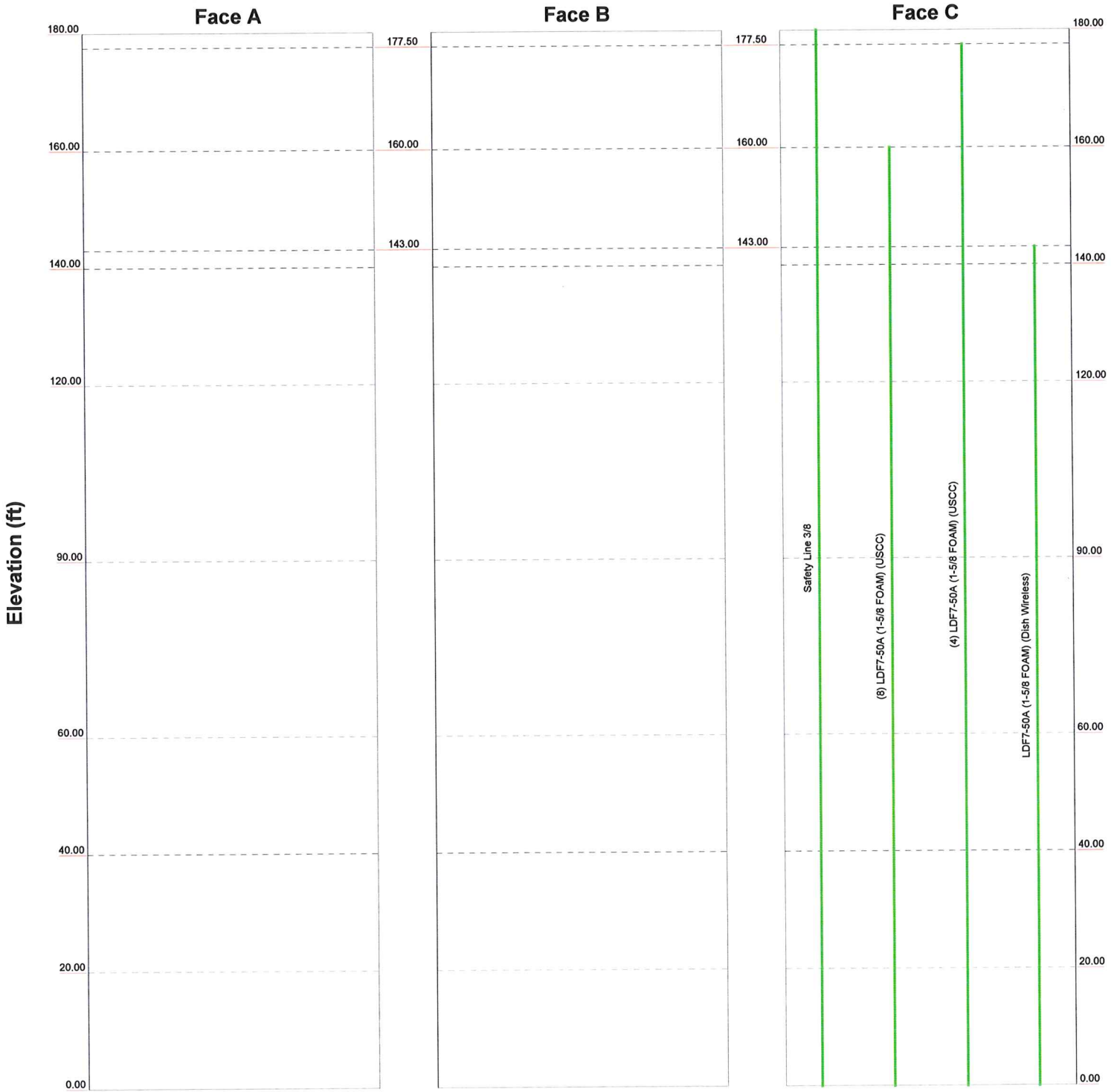


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	<p>Path:</p>			<p>Dwg No. E-5</p>
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Feed Line Distribution Chart

0' - 180'

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



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	592 West Perry Road		Project: Pyrod MP54 x 180' (A-111933)		
	Ligonier, IN 46767		Client: Pyramid Network Services	Drawn by: jkaiser	App'd:
	Phone: (800) 377-2929		Code: TIA-222-H	Date: 09/15/21	Scale: NTS
	FAX: (800) 377-2929		Path:	Dwg No. E-7	