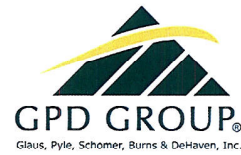




Nexlink Global Services
 800 Marshall Phelps Rd, #2A
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 (860) 640-4833



Jason Cheronis
 520 S. Main Street, Suite 2531
 Akron, OH 44311
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GPD# 2012801.10
 April 24, 2012

RIGOROUS STRUCTURAL ANALYSIS REPORT

AT&T DESIGNATION: **Site USID:** **4340**
 Site FA: **10096382**
 Site Name: **NORTH PORTLAND**
 AT&T Project: **MOD LTE W3 012312**

ANALYSIS CRITERIA: **Codes:** **TIA-222-G, 2009 IBC & ASCE 7-05**
 100-mph 3-second gust with 0" ice
 40-mph 3-second gust with 1" ice

SITE DATA: **1340 Riverside Street, Portland, ME 04103, Cumberland County**
 Latitude 43° 42' 59.831" N, Longitude 70° 18' 18.936" W
 Market: New England
 177.5' PiROD Monopole

Mr. Mark Roberts,

GPD is pleased to submit this Structural Analysis Report to determine the structural integrity of the aforementioned tower. The purpose of the analysis is to determine the suitability of the tower with the existing and proposed loading configuration detailed in the analysis report.

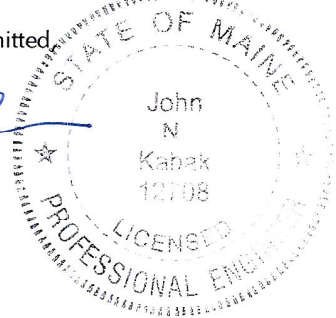
Analysis Results

Tower Stress Level with Proposed Equipment:	82.1%	Pass
Foundation Ratio with Proposed Equipment:	58.1%	Pass

We at GPD appreciate the opportunity of providing our continuing professional services to you and NexLink. If you have any questions or need further assistance on this or any other projects please do not hesitate to call.

Respectfully submitted,

John Kabak, P.E.
 Maine #: 12708



SUMMARY & RESULTS

The purpose of this analysis was to verify whether the existing structure is capable of carrying the proposed loading configuration as specified by AT&T to NexLink. This report was commissioned by Mr. Mark Roberts of NexLink.

The proposed coax shall be installed internal to the monopole for the results of this analysis to be valid.

TOWER SUMMARY AND RESULTS

Member	Capacity	Results
Monopole	82.1%	Pass
Anchor Rods	48.2%	Pass
Base Plate	67.3%	Pass
Flange Bolts	79.1%	Pass
Flange Plates	75.7%	Pass
Foundation	58.1%	Pass

ANALYSIS METHOD

tnxTower (Version 6.0.4.0), a commercially available software program, was used to create a three-dimensional model of the tower and calculate primary member stresses for various dead, live, wind, and ice load cases. Selected output from the analysis is included in Appendix B. The following table details the information provided to complete this structural analysis. This analysis is solely based on this information and is being completed without the benefit of a detailed site visit.

DOCUMENTS PROVIDED

Document	Remarks	Source
Equipment Modification Form	AT&T Internal Loading Document, uploaded 4/5/2012	Siterra
RF Data Sheet	Not Provided	N/A
Construction Drawings	Not Provided	N/A
Tower Design	PiROD File #: A-113355, dated 3/5/97	Siterra
Foundation Design	PiROD File #: A-113355, dated 3/5/97	Siterra
Geotechnical Report	Halaey & Aldrich File #: 80593-001, dated 2/28/97	Siterra
Previous Structural Analysis	GPD Project #: 2008147.07, dated 8/15/08	Siterra

ASSUMPTIONS

This structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the tower. This analysis is from information supplied, and therefore, its results are based on and are as accurate as that supplied data. GPD has made no independent determination, nor is it required to, of its accuracy. The following assumptions were made for this structural analysis.

1. The tower member sizes and shapes are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and as stated in the materials section.
2. The antenna configuration is as supplied and/or as modeled in the analysis. It is assumed to be complete and accurate. All antennas, mounts, coax and waveguides are assumed to be properly installed and supported as per manufacturer requirements.
3. Some assumptions are made regarding antennas and mount sizes and their projected areas based on best interpretation of data supplied and of best knowledge of antenna type and industry practice.
4. All mounts, if applicable, are considered adequate to support the loading. No actual analysis of the mount(s) is performed. This analysis is limited to analyzing the tower only.
5. The soil parameters are as per data supplied or as assumed and stated in the calculations.
6. Foundations are properly designed and constructed to resist the original design loads indicated in the documents provided.
7. The tower and structures have been properly maintained in accordance with TIA Standards and/or with manufacturer's specifications.
8. All welds and connections are assumed to develop at least the member capacity unless determined otherwise and explicitly stated in this report.
9. Loading interpreted from photos is accurate to $\pm 5'$ AGL, antenna size accurate to ± 3.3 sf, and coax equal to the number of existing antennas without reserve.
10. All existing loading was obtained from GPD (Project #: 2008147.07, dated 8/15/08), site photos, the provided Equipment Modification Form and is assumed to be accurate.
11. All proposed coax shall be installed inside internal to the monopole.
12. The proposed RRU's were assumed to be installed 2' below the proposed antenna centerline elevation.
13. The existing/proposed loading elevations listed within the Equipment Modification Form were found to vary from the loading elevations listed in the previous analysis as well as site photos. The existing/proposed loading has been modeled based on the elevations observed in site photos.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and GPD Group should be allowed to review any new information to determine its effect on the structural integrity of the tower.

DISCLAIMER OF WARRANTIES

GPD GROUP has not performed a recent site visit to the tower to verify the member sizes or antenna/coax loading. If the existing conditions are not as represented on the tower elevation contained in this report, we should be contacted immediately to evaluate the significance of the discrepancy. This is not a condition assessment of the tower or foundation. This report does not replace a full tower inspection. The tower and foundations are assumed to have been properly fabricated, erected, maintained, in good condition, twist free, and plumb.

The engineering services rendered by GPD GROUP in connection with this Rigorous Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. All tower components have been assumed to only resist dead loads when no other loads are applied. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

GPD GROUP does not analyze the fabrication of the structure (including welding). It is not possible to have all the very detailed information needed to perform a thorough analysis of every structural sub-component and connection of an existing tower. GPD GROUP provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc. The purpose of this report is to assess the feasibility of adding appurtenances usually accompanied by transmission lines to the structure.

It is the owner's responsibility to determine the amount of ice accumulation in excess of the specified code recommended amount, if any, that should be considered in the structural analysis.

The attached sketches are a schematic representation of the analyzed tower. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions, proper fit, and clearance in the field. Any mentions of structural modifications are reasonable estimates and should not be used as a precise construction document. Precise modification drawings are obtainable from GPD GROUP, but are beyond the scope of this report.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

GPD GROUP makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD GROUP will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of GPD GROUP pursuant to this report will be limited to the total fee received for preparation of this report.

APPENDIX A

Tower Analysis Summary Form

APPENDIX B

tnxTower Output File

tnxTower GPD Group 520 S. Main St., Suite 2531 Akron, OH 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job	ME5015 (4340) NORTH PORTLAND	Page	1 of 4
	Project	2012801.10	Date	14:17:48 04/24/12
	Client	Nexlink Global Communications	Designed by	cburton

Tower Input Data

There is a pole section.

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

The following design criteria apply:

Tower is located in Cumberland County, Maine.

Basic wind speed of 100 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 1.0000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

<ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile √ Include Bolts In Member Capacity √ Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination 	<ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area √ Use Clear Spans For KL/r Retension Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. Autocalc Torque Arm Areas SR Members Have Cut Ends Sort Capacity Reports By Component Triangulate Diamond Inner Bracing 	<ul style="list-style-type: none"> Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules √ Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression √ All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feedline Torque Include Angle Block Shear Check
		Poles
		<ul style="list-style-type: none"> √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets

tnxTower GPD Group 520 S. Main St., Suite 2531 Akron, OH 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job	ME5015 (4340) NORTH PORTLAND	Page	2 of 4
	Project	2012801.10	Date	14:17:48 04/24/12
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Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _{AA}		Weight
						ft ² /ft	plf	
LDF7-50A(1-5/8")	C	No	Inside Pole	177.50 - 8.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
1/2" DC/Fiber	C	No	Inside Pole	177.50 - 8.00	3	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
LDF7-50A(1-5/8")	C	No	Inside Pole	160.00 - 8.00	15	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
EW90	C	No	Inside Pole	125.00 - 8.00	2	No Ice	0.00	0.32
						1/2" Ice	0.00	0.32
						1" Ice	0.00	0.32

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C _{AA}		Weight K	
			Horz Lateral ft	Vert ft			Front ft ²	Side ft ²		
13' Rotatable Platform	C	None			0.0000	179.00	No Ice	32.79	32.79	2.04
							1/2" Ice	44.63	44.63	2.48
							1" Ice	56.47	56.47	2.91
(2) 7770.00 w/ 6' Mount Pipe	A	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	6.22	4.35	0.06
							1/2" Ice	6.77	5.20	0.11
							1" Ice	7.30	5.92	0.16
(2) 7770.00 w/ 6' Mount Pipe	B	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	6.22	4.35	0.06
							1/2" Ice	6.77	5.20	0.11
							1" Ice	7.30	5.92	0.16
(2) 7770.00 w/ 6' Mount Pipe	C	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	6.22	4.35	0.06
							1/2" Ice	6.77	5.20	0.11
							1" Ice	7.30	5.92	0.16
(2) LGP21903 Diplexer	A	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	0.27	0.18	0.01
							1/2" Ice	0.34	0.25	0.01
							1" Ice	0.43	0.32	0.02
(2) LGP21903 Diplexer	B	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	0.27	0.18	0.01
							1/2" Ice	0.34	0.25	0.01
							1" Ice	0.43	0.32	0.02
(2) LGP21903 Diplexer	C	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	0.27	0.18	0.01
							1/2" Ice	0.34	0.25	0.01
							1" Ice	0.43	0.32	0.02
(2) LGP21401	A	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	1.29	0.23	0.01
							1/2" Ice	1.45	0.31	0.02
							1" Ice	1.61	0.40	0.03
(2) LGP21401	B	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	1.29	0.23	0.01
							1/2" Ice	1.45	0.31	0.02
							1" Ice	1.61	0.40	0.03
(2) LGP21401	C	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	1.29	0.23	0.01
							1/2" Ice	1.45	0.31	0.02
							1" Ice	1.61	0.40	0.03
P65-17-XLH-RR w/ Mount Pipe	A	From Centroid-Leg	4.00 0.00 1.00	0.0000	179.00	179.00	No Ice	11.47	8.70	0.10
							1/2" Ice	12.08	10.11	0.18
							1" Ice	12.71	11.38	0.27

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA}		Weight	
			Horz	Lateral			Front	Side		
			ft	ft	°	ft	ft ²	ft ²	K	
SBNH-1D6565C w/ 5' Mount Pipe	B	From	4.00		0.0000	179.00	No Ice	11.45	8.88	0.08
		Centroid-	0.00				1/2" Ice	12.06	9.78	0.16
		Leg	1.00				1" Ice	12.69	10.70	0.25
AM-X-CD-14-65-00T w/ Mount Pipe	C	From	4.00		0.0000	179.00	No Ice	6.91	5.63	0.09
		Centroid-	0.00				1/2" Ice	7.60	6.54	0.15
		Leg	1.00				1" Ice	8.25	7.36	0.22
(2) RBS 6601	A	From	4.00		0.0000	179.00	No Ice	0.55	0.40	0.02
		Centroid-	0.00				1/2" Ice	0.70	0.52	0.03
		Leg	-1.00				1" Ice	0.86	0.64	0.05
(2) RBS 6601	B	From	4.00		0.0000	179.00	No Ice	0.55	0.40	0.02
		Centroid-	0.00				1/2" Ice	0.70	0.52	0.03
		Leg	-1.00				1" Ice	0.86	0.64	0.05
(2) RBS 6601	C	From	4.00		0.0000	179.00	No Ice	0.55	0.40	0.02
		Centroid-	0.00				1/2" Ice	0.70	0.52	0.03
		Leg	-1.00				1" Ice	0.86	0.64	0.05
DC6-48-60-18-8F	C	From Leg	1.00		0.0000	179.00	No Ice	2.22	2.22	0.02
			0.00				1/2" Ice	2.44	2.44	0.04
			-1.00				1" Ice	2.66	2.66	0.06
15' LP Platform	C	None			0.0000	160.00	No Ice	18.85	18.85	1.50
							1/2" Ice	24.30	24.30	1.80
							1" Ice	29.75	29.75	2.09
(4) DB846G90A-XY w/ Mount Pipe	A	From	4.00		0.0000	160.00	No Ice	5.23	7.53	0.04
		Centroid-	0.00				1/2" Ice	5.78	8.72	0.09
		Leg	0.00				1" Ice	6.30	9.62	0.16
(4) DB846G90A-XY w/ Mount Pipe	B	From	4.00		0.0000	160.00	No Ice	5.23	7.53	0.04
		Centroid-	0.00				1/2" Ice	5.78	8.72	0.09
		Leg	0.00				1" Ice	6.30	9.62	0.16
(4) DB846G90A-XY w/ Mount Pipe	C	From	4.00		0.0000	160.00	No Ice	5.23	7.53	0.04
		Centroid-	0.00				1/2" Ice	5.78	8.72	0.09
		Leg	0.00				1" Ice	6.30	9.62	0.16
932DG65T2E-M w/Mount Pipe	A	From	4.00		0.0000	160.00	No Ice	4.15	3.50	0.04
		Centroid-	0.00				1/2" Ice	4.79	4.54	0.07
		Leg	0.00				1" Ice	5.35	5.30	0.11
932DG65T2E-M w/Mount Pipe	B	From	4.00		0.0000	160.00	No Ice	4.15	3.50	0.04
		Centroid-	0.00				1/2" Ice	4.79	4.54	0.07
		Leg	0.00				1" Ice	5.35	5.30	0.11
932DG65T2E-M w/Mount Pipe	C	From	4.00		0.0000	160.00	No Ice	4.15	3.50	0.04
		Centroid-	0.00				1/2" Ice	4.79	4.54	0.07
		Leg	0.00				1" Ice	5.35	5.30	0.11
3" x 5' Mount Pipe	A	From Face	0.50		0.0000	125.00	No Ice	1.36	1.36	0.03
			0.00				1/2" Ice	1.67	1.67	0.04
			0.00				1" Ice	1.98	1.98	0.05
3" x 5' Mount Pipe	B	From Leg	0.50		0.0000	125.00	No Ice	1.36	1.36	0.03
			0.00				1/2" Ice	1.67	1.67	0.04
			0.00				1" Ice	1.98	1.98	0.05

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	Client	Nexlink Global Communications	Designed by	cburton

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				Horz Lateral	Vert						
				ft	°	°	ft	ft	ft ²	K	
4' Dish	A	Paraboloid w/Radome	From Face	1.00	0.0000	125.00	4.00	No Ice	12.57	0.08	
				0.00	0.00				1/2" Ice	13.10	0.09
				0.00	0.00				1" Ice	13.62	0.10
4' Dish	B	Paraboloid w/Radome	From Leg	1.00	0.0000	125.00	4.00	No Ice	12.57	0.08	
				0.00	0.00				1/2" Ice	13.10	0.09
				0.00	0.00				1" Ice	13.62	0.10

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
179.00	13' Rotatable Platform	49	15.315	0.7831	0.0010	58663
160.00	15' LP Platform	49	12.496	0.7448	0.0006	17265
125.00	4' Dish	49	7.547	0.5865	0.0003	11168

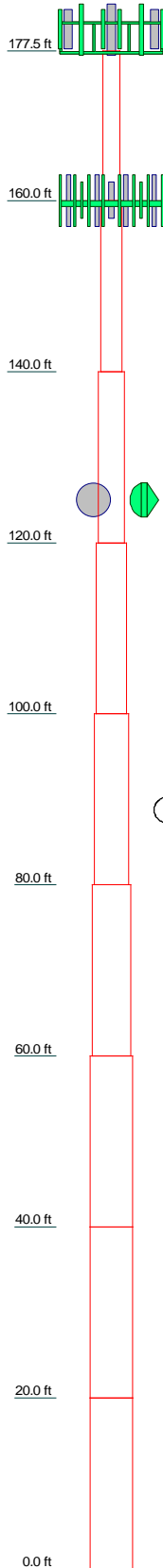
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	177.5 - 160	Pole	P24x3/8	1	-5.22	1052.07	22.9	Pass
L2	160 - 140	Pole	P30x3/8	2	-10.77	1311.06	45.9	Pass
L3	140 - 120	Pole	P36x3/8	3	-14.97	1490.10	57.9	Pass
L4	120 - 100	Pole	P42x3/8	4	-19.61	1668.87	65.7	Pass
L5	100 - 80	Pole	P48x3/8	5	-24.84	1847.49	70.6	Pass
L6	80 - 60	Pole	P54x3/8	6	-30.68	2026.00	73.9	Pass
L7	60 - 40	Pole	P60x3/8	7	-37.13	2204.43	76.2	Pass
L8	40 - 20	Pole	P60x1/2	8	-45.50	3125.69	68.6	Pass
L9	20 - 0	Pole	P60x1/2	9	-53.74	3125.69	82.1	Pass
Summary								
Pole (L9)							82.1	Pass
RATING =							82.1	Pass

APPENDIX C

Tower Elevation Drawing

Section	Size	Length (ft)	Grade	Weight (K)
1	P24x3/8	17.50	A53-B-42	1.7
2	P30x3/8	20.00		2.4
3	P36x3/8	20.00		2.9
4	P42x3/8	20.00		3.3
5	P48x3/8	20.00		3.8
6	P54x3/8	20.00		4.3
7	P60x3/8	20.00		4.8
8	P60x1/2	20.00		6.4
9	P60x1/2	20.00		6.4
				35.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
13' Rotatable Platform	179	(2) RBS 6601	179
(2) 7770.00 w/ 6' Mount Pipe	179	(2) RBS 6601	179
(2) 7770.00 w/ 6' Mount Pipe	179	DC6-48-60-18-8F	179
(2) 7770.00 w/ 6' Mount Pipe	179	15' LP Platform	160
(2) LGP21903 Diplexer	179	(4) DB846G90A-XY w/ Mount Pipe	160
(2) LGP21903 Diplexer	179	(4) DB846G90A-XY w/ Mount Pipe	160
(2) LGP21903 Diplexer	179	(4) DB846G90A-XY w/ Mount Pipe	160
(2) LGP21401	179	932DG65T2E-M w/Mount Pipe	160
(2) LGP21401	179	932DG65T2E-M w/Mount Pipe	160
(2) LGP21401	179	932DG65T2E-M w/Mount Pipe	160
P65-17-XLH-RR w/ Mount Pipe	179	3' x 5' Mount Pipe	125
SBNH-1D6565C w/ 5' Mount Pipe	179	3' x 5' Mount Pipe	125
AM-X-CD-14-65-00T w/ Mount Pipe	179	4' Dish	125
(2) RBS 6601	179	4' Dish	125

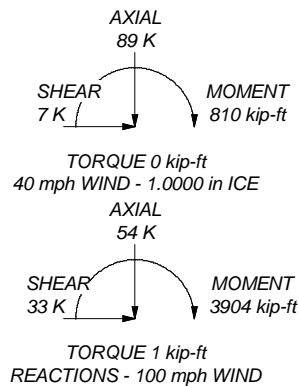
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Cumberland County, Maine.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 100 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 1.00 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: 82.1%

ALL REACTIONS
ARE FACTORED



GPD Group
 520 S. Main St., Suite 2531
 Akron, OH 44311
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Job: **ME5015 (4340) NORTH PORTLAND**
 Project: **2012801.10**
 Client: Nexlink Global Communications
 Code: TIA-222-G
 Path: Q:\2012\2012801\10\mxd\4340 North Portland.dwg
 Drawn by: cburton
 Date: 04/24/12
 App'd:
 Scale: NTS
 Dwg No: E-1

Coax Internal To Pole:

(12) 1-5/8" Coax to 180'

(3) 1/2" DC/Fiber Cables to 180' (Proposed)

(15) 1-5/8" Coax to 160'

(2) EW90 Elliptical Coax to 125'

COAX PLACEMENT

NOT TO SCALE

SHEET
1 OF 1

ME5015 (4340) NORTH PORTLAND
Nexlink Global Services

JOB NO.
2012801.10
DATE
4/24/12

GPD GROUP

ENGINEERS • ARCHITECTS • PLANNERS

520 South Main Street • Suite 2531 • Akron Ohio 44311-1010 • Tel: 330-572-2100 • Fax: 330-572-2101

APPENDIX D

Base Plate & Anchor Rod Analysis



**Anchor Rod and Base Plate Stresses, TIA-222-G-1
ME5015 (4340) NORTH PORTLAND
2012801.10**

Overturing Moment =	3904.00	k*ft
Axial Force =	54.00	k
Shear Force =	33.00	k

Acceptable Stress Ratio =	105.0%
---------------------------	--------

Anchor Rods		
<i>(Section 4.9.9, TIA-222-G-1)</i>		
Number of Rods =	52	
ϕ =	0.8	
Rod Ultimate Strength (F_u) =	150	ksi
Base Plate Detail Type* =	d	
Rod Circle =	67	in
Rod Diameter =	1.25	in
Net Tensile Area =	0.97	in ²
Max Tension on Rod =	52.74	kips
Max Compression on Rod =	54.82	kips
P_u =	54.82	kips
V_u =	0.63	kips
η =	0.50	
ϕR_{nt} =	116.28	kips
Anchor Rod Capacity =	48.2%	OK

Base Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
ϕ =	0.9	
Outside Diameter =	70	in
Plate Thickness =	1.25	in
b =	3.30	in
L_e =	4.50	in
Z =	2.34	in ³
M_u =	46.64	k-in
ϕM_n =	75.94	k-in
BP Capacity =	61.4%	OK

***This analysis assumes the clear distance from the top of the concrete to the bottom of the leveling nut is less than the diameter of the anchor rod. Notify GPD Group immediately if existing field conditions do not meet this assumption.**

Pole		
Pole Diameter =	60	in
Number of Sides =	Round	
Thickness =	0.5	in
Pole Yield Strength =	42	ksi

Stiffeners		
Configuration =	Every Rod	
Thickness =	0.75	in
Width =	4.5	in
Notch =	0.5	in
Height =	8	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.375	in
Horiz. Weld Type =	Fillet	
Fillet Size =	0.375	in
Weld Strength =	70	ksi
Stiffener Vertical Force =	37.54	kips
Vert. Weld Capacity =	39.9%	kips
Horiz. Weld Capacity =	60.3%	kips
Stiffener Capacity =	67.3%	kips
Controlling Capacity =	67.3%	OK

APPENDIX E

Flange Plate Analysis



Existing Flange Connection @ 20'
ME5015 (4340) NORTH PORTLAND
 2012801.10

O.T. Moment =	3260.26	k'ft
Axial =	45.5	kips
Shear =	31.28	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	32
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1.7677 in
Bolt Circle =	50 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	105 ksi
A_b =	2.454183 in ²
A_n =	1.9 in ²
ϕR_{nv} =	86.97 kips
ϕR_{nt} =	149.63 kips
V_{ub} =	0.98 kips
T_{ub} =	96.32 kips
<i>Prying Action Check</i>	
N/A for stiffened flange	
Max Comp. on Bolt =	99.17 kips
Shear Capacity =	1.1%
Tensile Capacity =	64.4%
Interaction Capacity =	41.5%
Bolt Capacity =	64.4% OK

Pole Information	
Shaft Diam. (Upper) =	60 in
Thickness (Upper) =	0.5 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	60 in
Thickness (Lower) =	0.5 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Hole Diameter =	43 in
ϕ_t =	0.9
b =	4.28 in
L_e =	7.00 in
Z =	2.34 in ³
M_u =	63.11 k-in
ϕM_n =	75.9375 k-in
UP Capacity =	83.1% OK

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	43 in
b =	4.28 in
L_e =	7.00 in
Z =	2.34 in ³
M_u =	63.11 k-in
ϕM_n =	75.9375 k-in
LP Capacity =	83.1% OK

Upper Stiffeners	
Configuration =	Every Bolt
Thickness =	0.625 in
Width =	7 in
Notch =	0.5 in
Height =	10 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi
Stiffener Vertical Force =	49.16 kips
Vert. Weld Capacity =	45.3% kips
Horiz. Weld Capacity =	50.0% kips
Stiffener Capacity =	89.7% kips
Controlling Capacity =	89.7% OK

Lower Stiffeners	
Configuration =	Every Bolt
Thickness =	0.625 in
Width =	7 in
Notch =	0.5 in
Height =	10 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi
Stiffener Vertical Force =	49.16 kips
Vert. Weld Capacity =	45.3% kips
Horiz. Weld Capacity =	50.0% kips
Stiffener Capacity =	89.7% kips
Controlling Capacity =	89.7% OK



Existing Flange Connection @ 40'
ME5015 (4340) NORTH PORTLAND
 2012801.10

O.T. Moment =	2657.75	k'ft
Axial =	37.13	kips
Shear =	28.95	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	32
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1.7677 in
Bolt Circle =	50 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	105 ksi
A_b =	2.454183 in ²
A_n =	1.9 in ²
ϕR_{nv} =	86.97 kips
ϕR_{nt} =	149.63 kips
V_{ub} =	0.90 kips
T_{ub} =	78.52 kips
<i>Prying Action Check</i>	
N/A for stiffened flange	
Max Comp. on Bolt =	80.84 kips
Shear Capacity =	1.0%
Tensile Capacity =	52.5%
Interaction Capacity =	27.6%
Bolt Capacity =	52.5% OK

Pole Information	
Shaft Diam. (Upper) =	60 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	60 in
Thickness (Lower) =	0.5 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Hole Diameter =	43 in
ϕ_t =	0.9
b =	4.28 in
L_e =	7.00 in
Z =	2.34 in ³
M_u =	51.45 k-in
ϕM_n =	75.9375 k-in
UP Capacity =	67.8% OK

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	43 in
b =	4.28 in
L_e =	7.00 in
Z =	2.34 in ³
M_u =	51.45 k-in
ϕM_n =	75.9375 k-in
LP Capacity =	67.8% OK

Upper Stiffeners	
Configuration =	Every Bolt
Thickness =	0.625 in
Width =	7 in
Notch =	0.5 in
Height =	10 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi
Stiffener Vertical Force =	45.48 kips
Vert. Weld Capacity =	42.0% kips
Horiz. Weld Capacity =	46.2% kips
Stiffener Capacity =	83.0% kips
Controlling Capacity =	83.0% OK

Lower Stiffeners	
Configuration =	Every Bolt
Thickness =	0.625 in
Width =	7 in
Notch =	0.5 in
Height =	10 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi
Stiffener Vertical Force =	40.07 kips
Vert. Weld Capacity =	37.0% kips
Horiz. Weld Capacity =	40.7% kips
Stiffener Capacity =	73.1% kips
Controlling Capacity =	73.1% OK



**Existing Flange Connection @
ME5015 (4340) NORTH PORTLAND
2012801.10**

60'

O.T. Moment =	2105.31	k*ft
Axial =	30.68	kips
Shear =	26.28	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	48
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1 in
Bolt Circle =	57 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	120 ksi
A_b =	0.785398 in ²
A_n =	0.606 in ²
ϕR_{nv} =	31.81 kips
ϕR_{nt} =	54.54 kips
V_{ub} =	0.55 kips
T_{ub} =	36.29 kips
<i>Prying Action Check</i>	
N/A, top flange thickness > t _c	
Max Comp. on Bolt =	37.57 kips
Shear Capacity =	1.7%
Tensile Capacity =	66.5%
Interaction Capacity =	44.3%
Bolt Capacity =	66.5% OK

Pole Information	
Shaft Diam. (Upper) =	54 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	60 in
Thickness (Lower) =	0.375 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Outer Diameter =	60 in
ϕ_t =	0.9
b =	3.11 in
Le =	3.00 in
Z =	2.34 in ³
M_u =	50.44 k-in
ϕM_n =	75.9375 k-in
UP Capacity =	66.4% OK

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	54 in
b =	3.11 in
Le =	2.00 in
Z =	2.34 in ³
M_u =	56.99 k-in
ϕM_n =	75.9375 k-in
LP Capacity =	75.1% OK

Upper Stiffeners	
Configuration =	Every Bolt
Thickness =	0.625 in
Width =	3 in
Notch =	0.5 in
Height =	5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi
Stiffener Vertical Force =	21.47 kips
Vert. Weld Capacity =	39.3% kips
Horiz. Weld Capacity =	56.1% kips
Stiffener Capacity =	74.7% kips
Controlling Capacity =	74.7% OK

Lower Stiffeners	
Configuration =	Every Bolt
Thickness =	0.625 in
Width =	2 in
Notch =	0.5 in
Height =	3.5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi
Stiffener Vertical Force =	13.87 kips
Vert. Weld Capacity =	37.6% kips
Horiz. Weld Capacity =	60.5% kips
Stiffener Capacity =	68.4% kips
Controlling Capacity =	68.4% OK



**Existing Flange Connection @
ME5015 (4340) NORTH PORTLAND
2012801.10**

80'

O.T. Moment =	1606.06	k*ft
Axial =	24.84	kips
Shear =	23.63	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	36
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1 in
Bolt Circle =	51 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	120 ksi
A_b =	0.785398 in ²
A_n =	0.606 in ²
ϕR_{nv} =	31.81 kips
ϕR_{nt} =	54.54 kips
V_{ub} =	0.66 kips
T_{ub} =	41.29 kips
<i>Prying Action Check</i>	
N/A, top flange thickness > tc	
Max Comp. on Bolt =	42.67 kips
Shear Capacity =	2.1%
Tensile Capacity =	75.7%
Interaction Capacity =	57.4%
Bolt Capacity =	75.7% OK

Pole Information	
Shaft Diam. (Upper) =	48 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	54 in
Thickness (Lower) =	0.375 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Outer Diameter =	54 in
ϕ_t =	0.9
wcalc =	17.23 in
wmax =	25.70 in
w =	17.23 in
Z =	6.73 in ³
M_u =	171.34 k-in
ϕM_n =	218.1139 k-in
UP Capacity =	78.6% OK

Upper Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	3 in
Notch =	0.5 in
Height =	5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	48 in
Pole Inner Diameter =	53.25 in
e =	1.13 in
w =	4.65 in
Z =	1.82 in ³
M_u =	48.00 k-in
ϕM_n =	58.81282 k-in
LP Capacity =	81.6% OK

Lower Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	2 in
Notch =	0.5 in
Height =	3.5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****



**Existing Flange Connection @
ME5015 (4340) NORTH PORTLAND
2012801.10**

100'

O.T. Moment =	1158.78	k'ft
Axial =	19.61	kips
Shear =	21.05	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	32
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1 in
Bolt Circle =	45 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	120 ksi
A_b =	0.785398 in ²
A_n =	0.606 in ²
ϕR_{nv} =	31.81 kips
ϕR_{nt} =	54.54 kips
V_{ub} =	0.66 kips
T_{ub} =	38.00 kips
<i>Prying Action Check</i>	
N/A, top flange thickness > tc	
Max Comp. on Bolt =	39.23 kips
Shear Capacity =	2.1%
Tensile Capacity =	69.7%
Interaction Capacity =	48.6%
Bolt Capacity =	69.7% OK

Pole Information	
Shaft Diam. (Upper) =	42 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	48 in
Thickness (Lower) =	0.375 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Outer Diameter =	48 in
ϕ_t =	0.9
wcalc =	16.16 in
wmax =	25.56 in
w =	16.16 in
Z =	6.31 in ³
M_u =	148.58 k-in
ϕM_n =	204.468 k-in
UP Capacity =	72.7% OK

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	42 in
Pole Inner Diameter =	47.25 in
e =	1.13 in
w =	4.64 in
Z =	1.81 in ³
M_u =	44.13 k-in
ϕM_n =	58.70928 k-in
LP Capacity =	75.2% OK

Upper Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	3 in
Notch =	0.5 in
Height =	5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****

Lower Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	2 in
Notch =	0.5 in
Height =	3.5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****



**Existing Flange Connection @
ME5015 (4340) NORTH PORTLAND
2012801.10**

120'

O.T. Moment =	761.29	k*ft
Axial =	14.97	kips
Shear =	18.68	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	28
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1 in
Bolt Circle =	39 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	120 ksi
A_b =	0.785398 in ²
A_n =	0.606 in ²
ϕR_{nv} =	31.81 kips
ϕR_{nt} =	54.54 kips
V_{ub} =	0.67 kips
T_{ub} =	32.92 kips
<i>Prying Action Check</i>	
N/A, top flange thickness > tc	
Max Comp. on Bolt =	33.99 kips
Shear Capacity =	2.1%
Tensile Capacity =	60.4%
Interaction Capacity =	36.5%
Bolt Capacity =	60.4% OK

Pole Information	
Shaft Diam. (Upper) =	36 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	42 in
Thickness (Lower) =	0.375 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Outer Diameter =	42 in
ϕ_t =	0.9
wcalc =	15.00 in
wmax =	25.38 in
w =	15.00 in
Z =	5.86 in ³
M_u =	119.10 k-in
ϕM_n =	189.8438 k-in
UP Capacity =	62.7% OK

Upper Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	3 in
Notch =	0.5 in
Height =	5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	36 in
Pole Inner Diameter =	41.25 in
e =	1.13 in
w =	4.63 in
Z =	1.81 in ³
M_u =	38.24 k-in
ϕM_n =	58.57615 k-in
LP Capacity =	65.3% OK

Lower Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	2 in
Notch =	0.5 in
Height =	3.5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****



**Existing Flange Connection @
ME5015 (4340) NORTH PORTLAND
2012801.10**

140'

O.T. Moment =	427.1	k*ft
Axial =	10.77	kips
Shear =	15.32	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	24
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1 in
Bolt Circle =	33 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	120 ksi
A_b =	0.785398 in ²
A_n =	0.606 in ²
ϕR_{nv} =	31.81 kips
ϕR_{nt} =	54.54 kips
V_{ub} =	0.64 kips
T_{ub} =	25.42 kips
<i>Prying Action Check</i>	
N/A, top flange thickness > tc	
Max Comp. on Bolt =	26.32 kips
Shear Capacity =	2.0%
Tensile Capacity =	46.6%
Interaction Capacity =	21.8%
Bolt Capacity =	46.6% OK

Pole Information	
Shaft Diam. (Upper) =	30 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	36 in
Thickness (Lower) =	0.375 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Outer Diameter =	36 in
ϕ_t =	0.9
wcalc =	13.75 in
wmax =	21.04 in
w =	13.75 in
Z =	5.37 in ³
M_u =	87.20 k-in
ϕM_n =	173.9947 k-in
UP Capacity =	50.1% OK

Upper Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	3 in
Notch =	0.5 in
Height =	5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	30 in
Pole Inner Diameter =	35.25 in
e =	1.13 in
w =	4.61 in
Z =	1.80 in ³
M_u =	29.61 k-in
ϕM_n =	58.39865 k-in
LP Capacity =	50.7% OK

Lower Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	2 in
Notch =	0.5 in
Height =	3.5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****



**Existing Flange Connection @
ME5015 (4340) NORTH PORTLAND
2012801.10**

160'

O.T. Moment =	139.59	k*ft
Axial =	5.22	kips
Shear =	7.92	kips

Acceptable Stress	
Ratio =	105.0%

Flange Bolts	
# Bolts =	20
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1 in
Bolt Circle =	27 in
ϕ_b =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	120 ksi
A_b =	0.785398 in ²
A_n =	0.606 in ²
ϕR_{nv} =	31.81 kips
ϕR_{nt} =	54.54 kips
V_{ub} =	0.40 kips
T_{ub} =	12.14 kips
<i>Prying Action Check</i>	
N/A, top flange thickness > tc	
Max Comp. on Bolt =	12.66 kips
Shear Capacity =	1.2%
Tensile Capacity =	22.3%
Interaction Capacity =	5.0%
Bolt Capacity =	22.3% OK

Pole Information	
Shaft Diam. (Upper) =	24 in
Thickness (Upper) =	0.375 in
# of Sides (Upper) =	Round
F_y (Upper) =	42 ksi
Shaft Diam. (Lower) =	30 in
Thickness (Lower) =	0.375 in
# of Sides (Lower) =	Round
F_y (Lower) =	42 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	36 ksi
Plate Tensile (F_u) =	58 ksi
Plate Thickness =	1.25 in
Outer Diameter =	30 in
ϕ_t =	0.9
wcalc =	12.37 in
wmax =	20.84 in
w =	12.37 in
Z =	4.83 in ³
M_u =	39.22 k-in
ϕM_n =	156.5492 k-in
UP Capacity =	25.1% OK

Upper Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	3 in
Notch =	0.5 in
Height =	5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****

Lower Flange Plate	
Location =	Internal
Plate Strength (F_y) =	36 ksi
Plate Thickness =	1.25 in
Hole Diameter =	24 in
Pole Inner Diameter =	29.25 in
e =	1.13 in
w =	4.59 in
Z =	1.79 in ³
M_u =	14.24 k-in
ϕM_n =	58.15014 k-in
LP Capacity =	24.5% OK

Lower Stiffeners	
Configuration =	Every Other
Thickness =	0.625 in
Width =	2 in
Notch =	0.5 in
Height =	3.5 in
Stiffener Strength (F_y) =	36 ksi
Weld Info. Known? =	Yes
Vertical Weld Size =	0.375 in
Horiz. Weld Type =	Fillet
Fillet Size =	0.375 in
Weld Strength =	70 ksi

****Stiffeners ineffective - check plate unstiffened****

APPENDIX F

Foundation Analysis



Mat Foundation Analysis
ME5015 (4340) NORTH PORTLAND
2012801.10

General Info	
Code	TIA-222-G
Bearing On	Soil
Foundation Type	Mono Pad
Pier Type	Round
Reinforcing Known	Yes
Max Capacity	1.05

Tower Reactions	
Moment, M	3904 k-ft
Axial, P	54 k
Shear, V	33 k

Pad & Pier Geometry	
Pier Diameter, ϕ	7 ft
Pad Length, L	24 ft
Pad Width, W	24 ft
Pad Thickness, t	3 ft
Depth, D	12 ft
Height Above Grade, HG	0.5 ft

Pad & Pier Reinforcing	
Rebar Fy	60 ksi
Concrete Fc'	4 ksi
Clear Cover	3 in
Reinforced Top & Bottom?	Yes
Pad Reinforcing Size	# 10
Pad Quantity Per Layer	31
Pier Rebar Size	# 11
Pier Quantity of Rebar	38

Soil Properties	
Soil Type	Cohesive
Soil Unit Weight	120 pcf
Cohesion, Cu	0 ksf
Bearing Type	Gross
Ultimate Bearing	9 ksf
Water Table Depth	5 ft
Frost Depth	5.833 ft

Bearing Summary			Load Case
Qxmax	2.57	ksf	0.9D+1.6W
Qymax	2.57	ksf	0.9D+1.6W
Qmax @ 45°	3.10	ksf	0.9D+1.6W
Q _{(all) Gross}	6.75	ksf	
Controlling Capacity	45.9%	Pass	

Overturning Summary (Required FS=1.0)			Load Case
FS(ot)x	1.72	≥1.0	0.9D+1.6W
FS(ot)y	1.72	≥1.0	0.9D+1.6W
Controlling Capacity	58.1%	Pass	

