PAUL J. FORD & COMPANY

Report Date:	April 8, 2019
Client:	ARE Telecom Incorporated 1043 Grand Ave #213 St. Paul, MN 55105 Attn: Dion Johnson (651) 724-1322 djohnson@aretelecom.com
Structure:	85-ft Monopole
Site Name:	Captain New Mexico
Site Address:	Lincoln National Forest
City, County, State:	Captain, Lincoln County, MNM
Latitude, Longitude:	33.606117, -105.360417
PJF Project:	A00019-0067.005.7205

Paul J. Ford and Company is pleased to submit this "**Structural Analysis Report**" to determine the pole stress level.

Analysis Criteria:

Reference Standard:	2015 New Mexico Commercial Code/2015 International Building Code with the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1.
Ultimate Wind Speed:	115 mph 3-second gust wind speed without ice
Nominal Wind Speed:	89 mph 3-second gust wind speed without ice
Ice Wind Speed:	30 mph 3-second gust wind speed with 0" ice
Service Wind Speed:	60 mph (Serviceability) without ice
IBC Site Criteria:	Risk Category II, Topographic Category 5, Exposure Category C

Proposed Appurtenance Loads:

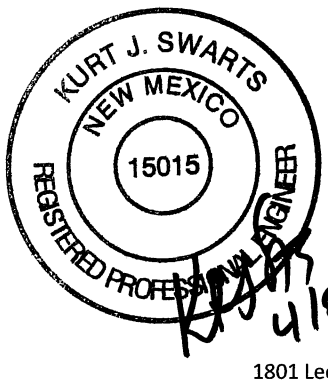
The structure was analyzed with the addition of the proposed appurtenance loads shown in Table 1 of this report.

Summary of Analysis Results:

Existing Structure:	Pass
Existing Foundation:	Pass

We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and ARE Telecom Incorporated. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully Submitted by:
Paul J. Ford and Company



4/8/19

Kurt J. Swarts, P.E.
Project Manager
kswarts@pauljford.com

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1) INTRODUCTION

This tower is a 85-ft Monopole tower designed by ARE Telecom.

2) ANALYSIS CRITERIA

TIA-222 Revision: TIA-222-G
Risk Category: II
Wind Speed: 89.1 mph
Exposure Category: C
Topographic Factor: 5
Ice Thickness: 0 in
Wind Speed with Ice: 30 mph
Service Wind Speed: 60 mph

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
81.0	81.0	6	ace	XXQLH-654L8H8-IVT w/ Mount Pipe	6 2 1	1-5/8 7/8 3/8	-
		3	nokia	AirScale Dual RRH 4T4R B12/14 320W AHLBA			
		3	sitePro1	12.5-Ft V-Frame Sector Mounts [VFA12-RRU]			
74.0	74.0	1	commscope	MD-S6 ICE SHIELD	-	-	
69.0	69.0	1	radiowaves	SHP6-5.9	2	3/8	
		1	commscope	RM-DM-6 DUAL RING MOUNT			
		2	pole mounts	2-IN SCHEDULE 40 X 10-FT STIFF ARM PIPES			
68.0	68.0	2	nokia	MPT-XP-HQAM			
67.0	67.0	1	commscope	MD-S6 ICE SHIELD	-	-	
62.0	62.0	1	commscope	UHX6-59-D3A/L	2	3/8	
		1	commscope	RM-DM-6 DUAL RING MOUNT			
		2	pole mounts	2-IN SCHEDULE 40 X 10-FT STIFF ARM PIPES			
61.0	61.0	4	nokia	MPT-XP-HQAM			

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Source	Reference	Date
POLE AND AFS-1700 DRAWING	ARE TELECOM	25_9m afs1700 DRAWING REVB	3/18/2019
GEOTECHNICAL REPORT	TERRACON	68085099	11/6/2008

3.1) Analysis Method

tnxTower (version 8.0.5.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures will be built in accordance with the manufacturer's specifications.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1.
3) This analysis review has been performed on the wind load resisting system of the pole and foundation. Analysis of the hydraulic jacking system was not part of the scope of servcies.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 3 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	85 - 66.58	Pole	TP19.5x12.1x0.25	1	-7	1142	47.7	Pass
L2	66.58 - 37.05	Pole	TP31.4x19.5x0.314	2	-11	2302	68.6	Pass
L3	37.05 - 13.48	Pole	TP40.9x31.4x0.375	3	-16	3512	60.0	Pass
L4	13.48 - 7.58	Pole	TP42.7x40.9x0.375	4	-18	3623	62.1	Pass
							Summary	
						Pole (L2)	68.6	Pass
						Rating =	68.6	Pass

Table 4 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	7.6	80.1	Pass
1	Base Plate	7.6	57.0	Pass
1	Base Foundation	0	98.5	Pass
1	Base Foundation Soil Interaction	0	67.1	Pass

Structure Rating (max from all components) =	98.5%

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

4.1) Recommendations

The monopole and its foundation have sufficient capacity to carry the proposed loading configuration.

STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING STRUCTURES BY PAUL J. FORD AND COMPANY

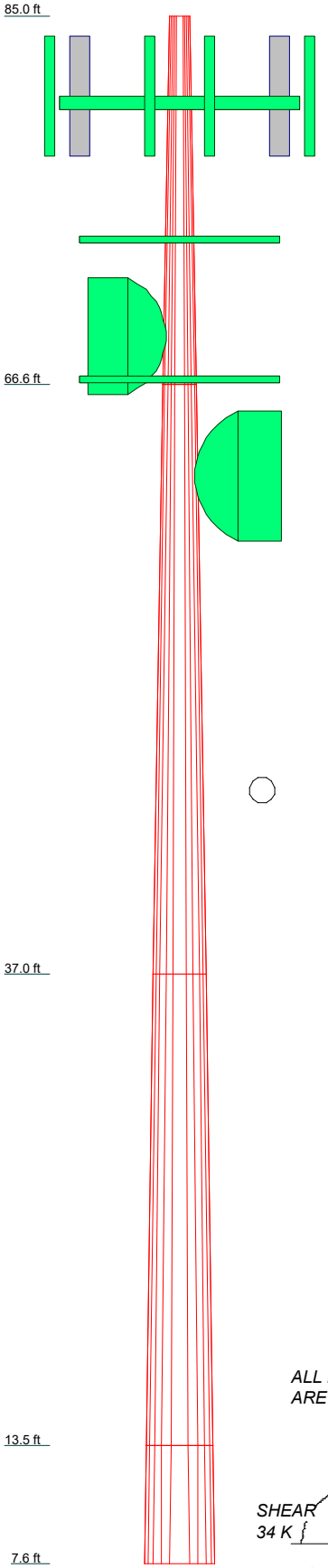
1) The monopole has been analyzed according to the minimum basic design wind velocity recommended by the Telecommunications Industry Association Standard ANSI/TIA-222-G . If the owner or local or state agencies require a higher design wind velocity, Paul J. Ford and Company should be made aware of this requirement.

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

APPENDIX A

TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	18.42	12	0.250	12.100	19.500	A572-65	0.8
2	29.53	18	0.314	19.500	31.400		2.5
3	23.57	18	0.375	31.400	40.900		3.4
4	5.90	18	0.375	40.900	42.700		1.0
							7.7



ALL REACTIONS ARE FACTORED

AXIAL 18 K

SHEAR 34 K

MOMENT 1939 kip-ft

TORQUE 4 kip-ft

REACTIONS - 89 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) XXQLH-654L8H8-IVT w/ Mount Pipe	81	12.5-Ft V-Frame Sector Mounts [SitePro1 VFA12-RRU]	81
(2) XXQLH-654L8H8-IVT w/ Mount Pipe	81	MD-S6 Ice Shield	74
(2) XXQLH-654L8H8-IVT w/ Mount Pipe	81	RM-DM-6 DUAL RING MOUNT	69
AirScale Dual RRH 4T4R B12/14 320W AHLBA	81	(2) 10' x 2" Sch 40 Pipe Mount	69
AirScale Dual RRH 4T4R B12/14 320W AHLBA	81	SHP6-5.9	69
AirScale Dual RRH 4T4R B12/14 320W AHLBA	81	(2) MPT-XP-HQAM	68
		MD-S6 Ice Shield	67
		RM-DM-6 DUAL RING MOUNT	62
		(2) 10' x 2" Sch 40 Pipe Mount	62
		UHX6-59-D3A/L	62
		(4) MPT-XP-HQAM	61

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Lincoln County, New Mexico.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 89 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 5 with Crest Height of 2853.00 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-80S-6 electrodes.
11. Feedlines are to be installed inside of pole and not exposed to wind.
12. TOWER RATING: 68.6%

Paul J. Ford and Company
250 East Broad st., Suite 600
Columbus, OH 43215
Phone: (614) 221-6679
FAX:

Job: ***80-Ft Pole: Capitan,NM***			
Project: ***00019-0067.004.7000***			
Client: ARE Telecom	Drawn by: kswarts	App'd:	
Code: TIA-222-G	Date: 04/08/19	Scale: NTS	
Path: G:\TOWER\000_Misc\2019\00019-0067 - Captain NM\00019-0067.005\TNX\00019-0067.005.7205.dri		Dwg No. E-1	

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 Lincoln County, New Mexico.
ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
Basic wind speed of 89 mph.
Structure Class II.
Exposure Category C.
Topographic Category 5.
Crest Height 2853.00 ft.
SEAW RSM-03 procedures for wind speed-up calculations are used.
Topographic Feature: Continuous Ridge.
Slope Distance L: 12672.00 ft.
Distance from Crest x: 0.00 ft.
Deflections calculated using a wind speed of 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-80S-6 electrodes..
Feedlines are to be installed inside of pole and not exposed to wind..
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, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	85.00-66.58	18.42	0.00	12	12.100	19.500	0.250	1.000	A572-65 (65 ksi)
L2	66.58-37.05	29.53	0.00	18	19.500	31.400	0.314	1.256	A572-65 (65 ksi)
L3	37.05-13.48	23.57	0.00	18	31.400	40.900	0.375	1.500	A572-65 (65 ksi)
L4	13.48-7.58	5.90		18	40.900	42.700	0.375	1.500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	12.439	9.539	170.977	4.242	6.268	27.279	346.445	4.695	2.573	10.291
	20.100	15.496	732.949	6.891	10.101	72.562	1485.154	7.627	4.556	18.224
L2	19.752	19.121	889.257	6.811	9.906	89.770	1779.684	9.563	2.879	9.17
	31.836	30.981	3782.410	11.036	15.951	237.124	7569.796	15.494	4.974	15.84
L3	31.827	36.928	4490.669	11.014	15.951	281.525	8987.246	18.467	4.866	12.977
	41.473	48.235	10007.940	14.386	20.777	481.679	20029.050	24.122	6.538	17.436
L4	41.473	48.235	10007.940	14.386	20.777	481.679	20029.050	24.122	6.538	17.436
	43.301	50.377	11401.619	15.025	21.692	525.624	22818.241	25.193	6.855	18.281

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 85.00-66.58				1	1	1			
L2 66.58-37.05				1	1	1			
L3 37.05-13.48				1	1	1			
L4 13.48-7.58				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF7-50A (1 5/8" foam)	C	No	No	Inside Pole	81.00 - 7.58	6	No Ice	0.00	0.92
6-8AWG 3 PAIR(7/8")	C	No	No	Inside Pole	81.00 - 7.58	2	No Ice	0.00	0.68
FB-L98B-002-100000(3/8")	C	No	No	Inside Pole	81.00 - 7.58	1	No Ice	0.00	0.06
FB-L98B-002-100000(3/8")	C	No	No	Inside Pole	69.00 - 7.58	2	No Ice	0.00	0.06
FB-L98B-002-100000(3/8")	C	No	No	Inside Pole	62.00 - 7.58	2	No Ice	0.00	0.06

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	85.00-66.58	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0
L2	66.58-37.05	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0
L3	37.05-13.48	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0
L4	13.48-7.58	A	0.000	0.000	0.000	0.000	0
		B	0.000	0.000	0.000	0.000	0
		C	0.000	0.000	0.000	0.000	0

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	85.00-66.58	0.000	0.000	0.000	0.000
L2	66.58-37.05	0.000	0.000	0.000	0.000
L3	37.05-13.48	0.000	0.000	0.000	0.000
L4	13.48-7.58	0.000	0.000	0.000	0.000

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

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) XXQLH-654L8H8-IVT w/ Mount Pipe	A	From Leg	4.000 0 0	0.000	81.00	No Ice	17.38	10.10	0
(2) XXQLH-654L8H8-IVT w/ Mount Pipe	B	From Leg	4.000 0 0	0.000	81.00	No Ice	17.38	10.10	0
(2) XXQLH-654L8H8-IVT w/ Mount Pipe	C	From Leg	4.000 0 0	0.000	81.00	No Ice	17.38	10.10	0
AirScale Dual RRH 4T4R B12/14 320W AHLBA	A	From Leg	4.000 0 0	0.000	81.00	No Ice	3.68	2.31	0
AirScale Dual RRH 4T4R B12/14 320W AHLBA	B	From Leg	4.000 0 0	0.000	81.00	No Ice	3.68	2.31	0
AirScale Dual RRH 4T4R B12/14 320W AHLBA	C	From Leg	4.000 0 0	0.000	81.00	No Ice	3.68	2.31	0

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
12.5-Ft V-Frame Sector Mounts [SitePro1 VFA12-RRU]	C	None		0.000	81.00	No Ice	28.37	28.37	3
***									
MD-S6 Ice Shield	C	None		0.000	74.00	No Ice	11.67	5.60	0
(2) MPT-XP-HQAM	C	None		0.000	68.00	No Ice	0.71	0.53	0
RM-DM-6 DUAL RING MOUNT	C	None		0.000	69.00	No Ice	7.00	7.00	0
(2) 10' x 2" Sch 40 Pipe Mount	C	None		0.000	69.00	No Ice	2.38	2.38	0
***									
MD-S6 Ice Shield	B	None		0.000	67.00	No Ice	11.67	5.60	0
(4) MPT-XP-HQAM	B	None		0.000	61.00	No Ice	0.71	0.53	0
RM-DM-6 DUAL RING MOUNT	B	None		0.000	62.00	No Ice	7.00	7.00	0
(2) 10' x 2" Sch 40 Pipe Mount	B	None		0.000	62.00	No Ice	2.38	2.38	0

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
SHP6-5.9	C	Paraboloid w/Shroud (HP)	From Leg	0.000 0 0	9.000		69.00	5.83	No Ice	26.73	0
****											
UHX6-59-D3A/L	B	Paraboloid w/Shroud (HP)	From Leg	0.000 0 0	45.000		62.00	6.46	No Ice	32.76	0

222-G Verification Constants

Constant	Value
Wind Importance Factor Without Ice	1
Wind Importance Factor With Ice Factor	1
Ice Importance Factor	1
K_d	0.95
Z_g	900
α	9.5
K_{zmin}	0.85
K_e	1
K_t	1
f	1

222-G Section Verification ArRr By Element

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
L1 85.00-66.58	1	TP19.5x12.1x0.25	215.274	72.564		1	1	24.973	24.973	24.973	24.973
							Sum:	24.973	24.973	24.973	24.973
L2 66.58-37.05	2	TP31.4x19.5x0.314	328.947	110.881		1	1	63.475	63.475	63.475	63.475
							Sum:	63.475	63.475	63.475	63.475
L3 37.05-13.48	3	TP40.9x31.4x0.375	435.527	146.807		1	1	71.986	71.986	71.986	71.986
							Sum:	71.986	71.986	71.986	71.986
L4 13.48-7.58	4	TP42.7x40.9x0.375	479.431	161.606		1	1	20.840	20.840	20.840	20.840
							Sum:	20.840	20.840	20.840	20.840

222-G Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
L1 85.00-66.58	75.07		1.191	1	2.671		61.32		1	24.973
L2 66.58-37.05	50.66		1.097	1	2.696		56.96		1	63.475
L3 37.05-13.48	24.75		0.943	1	2.722		49.46		1	71.986
L4 13.48-7.58	10.51		0.85	1	2.736		44.80		1	20.840

222-G Section Verification Tables - Service

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
L1 85.00-66.58	75.07		1.191	1	2.671		24.93		1	24.973
L2 66.58-37.05	50.66		1.097	1	2.696		23.16		1	63.475
L3 37.05-13.48	24.75		0.943	1	2.722		20.11		1	71.986
L4 13.48-7.58	10.51		0.85	1	2.736		18.22		1	20.840

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 85.00-66.58	75.07	1.191	61.32	24.973	A	0.000	24.973	24.973	100.00	0.000	0.000
					B	0.000	24.973		100.00	0.000	0.000
					C	0.000	24.973		100.00	0.000	0.000
L2 66.58-37.05	50.66	1.097	56.96	63.475	A	0.000	63.475	63.475	100.00	0.000	0.000
					B	0.000	63.475		100.00	0.000	0.000
					C	0.000	63.475		100.00	0.000	0.000
L3 37.05-13.48	24.75	0.943	49.46	71.986	A	0.000	71.986	71.986	100.00	0.000	0.000
					B	0.000	71.986		100.00	0.000	0.000
					C	0.000	71.986		100.00	0.000	0.000
L4 13.48-7.58	10.51	0.85	44.80	20.840	A	0.000	20.840	20.840	100.00	0.000	0.000
					B	0.000	20.840		100.00	0.000	0.000
					C	0.000	20.840		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 85.00-66.58	75.07	1.191	24.93	24.973	A	0.000	24.973	24.973	100.00	0.000	0.000
					B	0.000	24.973		100.00	0.000	0.000
					C	0.000	24.973		100.00	0.000	0.000
L2 66.58-37.05	50.66	1.097	23.16	63.475	A	0.000	63.475	63.475	100.00	0.000	0.000
					B	0.000	63.475		100.00	0.000	0.000
					C	0.000	63.475		100.00	0.000	0.000
L3 37.05-13.48	24.75	0.943	20.11	71.986	A	0.000	71.986	71.986	100.00	0.000	0.000
					B	0.000	71.986		100.00	0.000	0.000
					C	0.000	71.986		100.00	0.000	0.000
L4 13.48-7.58	10.51	0.85	18.22	20.840	A	0.000	20.840	20.840	100.00	0.000	0.000
					B	0.000	20.840		100.00	0.000	0.000
					C	0.000	20.840		100.00	0.000	0.000

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	Dead+Wind 0 deg - Service
27	Dead+Wind 30 deg - Service
28	Dead+Wind 60 deg - Service
29	Dead+Wind 90 deg - Service
30	Dead+Wind 120 deg - Service
31	Dead+Wind 150 deg - Service
32	Dead+Wind 180 deg - Service
33	Dead+Wind 210 deg - Service
34	Dead+Wind 240 deg - Service
35	Dead+Wind 270 deg - Service
36	Dead+Wind 300 deg - Service
37	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	85 - 66.58	9.91	27	1.186	0.006
L2	66.58 - 37.05	5.56	27	0.994	0.006
L3	37.05 - 13.48	1.20	27	0.409	0.001
L4	13.48 - 7.58	0.05	27	0.073	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
81.00	(2) XXQLH-654L8H8-IVT w/ Mount Pipe	27	8.92	1.153	0.007	10054
74.00	MD-S6 Ice Shield	27	7.22	1.087	0.007	4570
69.00	SHP6-5.9	27	6.08	1.028	0.007	3166
68.00	(2) MPT-XP-HQAM	27	5.86	1.014	0.007	3016
67.00	MD-S6 Ice Shield	27	5.65	1.000	0.007	2906
62.00	UHX6-59-D3A/L	27	4.65	0.918	0.006	2798
61.00	(4) MPT-XP-HQAM	27	4.46	0.900	0.006	2814

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	85 - 66.58	39.06	4	4.679	0.023
L2	66.58 - 37.05	21.92	4	3.922	0.023
L3	37.05 - 13.48	4.74	4	1.613	0.006
L4	13.48 - 7.58	0.18	4	0.289	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
81.00	(2) XXQLH-654L8H8-IVT w/ Mount Pipe	4	35.14	4.549	0.028	2575
74.00	MD-S6 Ice Shield	4	28.45	4.291	0.029	1170
69.00	SHP6-5.9	4	23.97	4.057	0.028	810
68.00	(2) MPT-XP-HQAM	4	23.11	4.003	0.028	771
67.00	MD-S6 Ice Shield	4	22.27	3.946	0.027	743
62.00	UHX6-59-D3A/L	4	18.33	3.622	0.025	714
61.00	(4) MPT-XP-HQAM	4	17.59	3.549	0.024	718

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	85 - 66.58 (1)	TP19.5x12.1x0.25	18.42	0.00	0.0	15.496	-7	1142	0.006
L2	66.58 - 37.05 (2)	TP31.4x19.5x0.314	29.53	0.00	0.0	30.981	-11	2302	0.005
L3	37.05 - 13.48 (3)	TP40.9x31.4x0.375	23.57	0.00	0.0	48.235	-16	3512	0.005
L4	13.48 - 7.58 (4)	TP42.7x40.9x0.375	5.90	0.00	0.0	50.377	-18	3623	0.005

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	85 - 66.58 (1)	TP19.5x12.1x0.25	209	446	0.470	0	446	0.000
L2	66.58 - 37.05 (2)	TP31.4x19.5x0.314	998	1468	0.680	0	1468	0.000
L3	37.05 - 13.48 (3)	TP40.9x31.4x0.375	1739	2922	0.595	0	2922	0.000
L4	13.48 - 7.58 (4)	TP42.7x40.9x0.375	1939	3150	0.616	0	3150	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	85 - 66.58 (1)	TP19.5x12.1x0.25	21	571	0.037	1	908	0.001
L2	66.58 - 37.05 (2)	TP31.4x19.5x0.314	30	1151	0.026	3	2944	0.001
L3	37.05 - 13.48 (3)	TP40.9x31.4x0.375	33	1756	0.019	3	5860	0.000
L4	13.48 - 7.58 (4)	TP42.7x40.9x0.375	34	1811	0.019	3	6316	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	85 - 66.58 (1)	0.006	0.470	0.000	0.037	0.001	0.477 ✔	1.000	4.8.2 ✔
L2	66.58 - 37.05 (2)	0.005	0.680	0.000	0.026	0.001	0.686 ✔	1.000	4.8.2 ✔
L3	37.05 - 13.48 (3)	0.005	0.595	0.000	0.019	0.000	0.600 ✔	1.000	4.8.2 ✔
L4	13.48 - 7.58 (4)	0.005	0.616	0.000	0.019	0.000	0.621 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	85 - 66.58	Pole	TP19.5x12.1x0.25	1	-7	1142	47.7	Pass
L2	66.58 - 37.05	Pole	TP31.4x19.5x0.314	2	-11	2302	68.6	Pass
L3	37.05 - 13.48	Pole	TP40.9x31.4x0.375	3	-16	3512	60.0	Pass
L4	13.48 - 7.58	Pole	TP42.7x40.9x0.375	4	-18	3623	62.1	Pass
							Summary	
						Pole (L2)	68.6	Pass
						RATING =	**68.6**	**Pass**

APPENDIX B

ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#:
Site Name:
App #:

Reactions		
Mu	209	ft-kips
Axial, Pu:	7	kips
Shear, Vu:	21	kips
Elevation:	66.6	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
64.31

Pole Manufacturer:	Other

If No stiffeners, Criteria:	TIA G	<-Only Applcable to Unstiffened Cases

Bolt Data			
Qty:	16		
Diameter (in.):	1.375	Bolt Fu:	105
Bolt Material:	A325	Bolt Fy:	81
N/A:	75	<-- Disregard	
N/A:	55	<-- Disregard	
Circle (in.):	24.61		

Plate Data		
Diam:	28.54	in
Thick, t:	1.57	in
Grade (Fy):	50	ksi
Strength, Fu:	65	ksi
Single-Rod B-eff:	3.92	in

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	19.5	in
Thick:	0.25	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn, **B1**:	91.35	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	91.33	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	25.04	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	1.744	in	
Min PL "treq" for actual **T w/ Pry**:	0.717	in	
Min PL "t1" for actual **T w/o Pry**:	0.913	in	
T allowable with Prying:	84.16	kips	0≤α'≤1 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	25.04	kips	
Prying Bolt Stress Ratio=(Tu+q)/(B):	27.4%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	15.5	ksi	TIA G
Allowable Plate Stress:	45.0	ksi	φ*Fy
Compression Plate Stress Ratio:	34.5%	**Pass**	Comp. Y.L. Length:
No Prying			15.01
Tension Side Stress Ratio, (treq/t)^2:	20.8%	**Pass**	

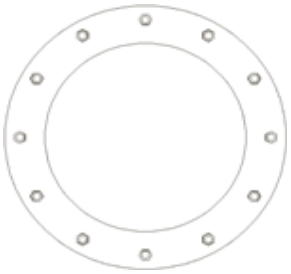
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#:
Site Name:
App #:

Reactions		
Mu	998	ft-kips
Axial, Pu:	11	kips
Shear, Vu:	30	kips
Elevation:	37.1	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
64.31

Pole Manufacturer:	Other

If No stiffeners, Criteria:	TIA G	<-Only Applcable to Unstiffened Cases

Bolt Data			
Qty:	22		
Diameter (in.):	1.375	Bolt Fu:	105
Bolt Material:	A325	Bolt Fy:	81
N/A:	75	<-- Disregard	
N/A:	55	<-- Disregard	
Circle (in.):	36.61		

Plate Data		
Diam:	40.55	in
Thick, t:	1.57	in
Grade (Fy):	50	ksi
Strength, Fu:	65	ksi
Single-Rod B-eff:	4.59	in

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	31.4	in
Thick:	0.314	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn, **B1**:	91.35	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	91.33	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	58.98	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	1.633	in	
Min PL "treq" for actual **T w/ Pry**:	1.013	in	
Min PL "t1" for actual **T w/o Pry**:	1.313	in	
T allowable with Prying:	88.42	kips	0≤α'≤1 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	58.98	kips	
Prying Bolt Stress Ratio=(Tu+q)/(B):	64.6%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	33.7	ksi	TIA G
Allowable Plate Stress:	45.0	ksi	φ*Fy
Compression Plate Stress Ratio:	74.9%	**Pass**	Comp. Y.L. Length:
No Prying			18.82
Tension Side Stress Ratio, (treq/t)^2:	41.6%	**Pass**	

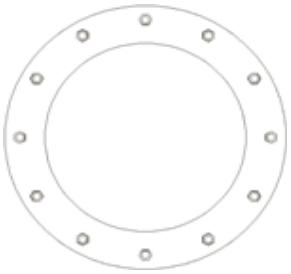
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#:
Site Name:
App #:

Reactions		
Mu	1739	ft-kips
Axial, Pu:	16	kips
Shear, Vu:	33	kips
Elevation:	13.5	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
64.31

Pole Manufacturer:	Other

If No stiffeners, Criteria:	TIA G	<-Only Applcable to Unstiffened Cases

Bolt Data				
Qty:	36			
Diameter (in.):	1.375	Bolt Fu:	105	
Bolt Material:	A325	Bolt Fy:	81	
N/A:	75	<-- Disregard		
N/A:	55	<-- Disregard		
Circle (in.):	47.05			

Plate Data		
Diam:	50.98	in
Thick, t:	1.97	in
Grade (Fy):	50	ksi
Strength, Fu:	65	ksi
Single-Rod B-eff:	3.65	in

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	40.9	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn, **B1**:	91.35	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	91.34	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	48.84	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	2.043	in	
Min PL "treq" for actual **T w/ Pry**:	1.182	in	
Min PL "t1" for actual **T w/o Pry**:	1.494	in	
T allowable with Prying:	88.31	kips	0≤α'≤1 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	48.84	kips	
Prying Bolt Stress Ratio=(Tu+q)/(B):	53.5%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	26.3	ksi	TIA G
Allowable Plate Stress:	45.0	ksi	φ*Fy
Compression Plate Stress Ratio:	58.4%	**Pass**	Comp. Y.L. Length:
No Prying			23.26
Tension Side Stress Ratio, (treq/t)^2:	36.0%	**Pass**	

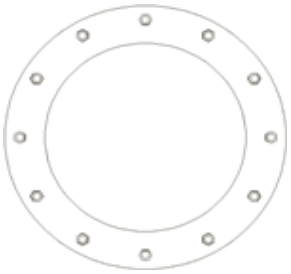
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev G

Assumption: Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

BU#:	
Site Name:	
App #:	
Pole Manufacturer:	*Other*

Reactions		
Mu:	1939	ft-kips
Axial, Pu:	18	kips
Shear, Vu:	34	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

If No stiffeners, Criteria: AISC LRFD <-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	36	
Diam:	1.375	in
Rod Material:	Other	
Strength (Fu):	75	ksi
Yield (Fy):	55	ksi
Bolt Circle:	48.43	in

Anchor Rod Results

Max Rod (Cu+ Vu/ń):	55.8 Kips	Rigid
Allowable Axial, Φ*Fu*Anet:	69.6 Kips	AISC LRFD
Anchor Rod Stress Ratio:	80.1% **Pass**	φ*Tn

Plate Data		
Diam:	52.36	in
Thick:	1.97	in
Grade:	50	ksi
Single-Rod B-eff:	3.81	in

Base Plate Results Flexural Check

Base Plate Stress:	25.6 ksi	Rigid
Allowable Plate Stress:	45.0 ksi	AISC LRFD
Base Plate Stress Ratio:	57.0% **Pass**	φ*Fy
		Y.L. Length: 22.85

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

n/a

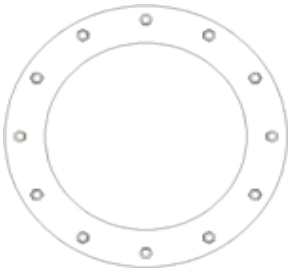
Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Diam:	42.7	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Moment Capacity of Round Ballast Foundation

PJF job no. AFS-1700

Assumption: Foundation is bearing at or near the ground surface
Uniform bearing stress distribution assumed under foundation when ultimate bearing capacity reached

Foundation Load Check Summary

Pole overturning moment =	1939	ft-kips (at pole base plate)
Pole base shear load =	34	kips
Pole axial load =	18	kips (Load assumed to be centered on cross-section and to have 1.2 load factor)
Base plate to bottom of foundation =	7.58	feet
Foundation axial load reduction factor =	0.9	(Use 1.0 if F-Standard / Working Load analysis)
Foundation steel weight =	26.5	kips (see steel weight calcs spreadsheet)
Foundation diameter =	23.13	feet
Foundation ID =	3.6	ft (Shaft OD plus portion of foundation base without bottom plate)
Ballast unit weight =	110	pcf
Ballast depth=	6.85	ft
Foundation ballast total weight =	241.8	kips
Foundation bottom plate thickness =	0.197	inches
Foundation bottom plate yield strength =	50	ksi
Max plate width, a =	36.3	inches (Larger of two plate dims)
Max plate height, b =	11.8	inches (Smaller of two plate dims)
Bottom plate support condition =	F	Fixed or Simply Supported (SS)
Width / Height Ratio =	3.08	
β =	0.5	From Roark and Young, Table 26.1, 1a (SS) or 8a (Fixed)

Bearing Check

Reduction factor, ϕ =	0.75	
Ult soil bearing cap =	8000	psf
Overturning moment at base of foundation, Mu =	2196.7	ft-kips (at pole base plate)
Moment Capacity, ϕMn =	3440.2	ft-kips (Based on soil bearing area; calculations below)
% Capacity =	63.9%	OK

Overturning / Stability Check

Reduction factor =	1.00	(Use 0.67 if F-Standard / Working Load analysis; use 1.0 if G-Standard / LRFD)
Axial load resisting overturning =	283.3	kips (Unfactored)
Overturning moment at base of foundation =	2196.7	ft-kips (at pole base plate)
Moment resisting overturning at foundation toe =	3275.9	ft-kips
% Capacity =	67.1%	OK

Bottom Plate Bending Check

Shape factor adjustment =	1.5	(Use 1 if F-Standard / Working Load analysis; use 1.5 if G-Standard / LRFD)
Adjust for ballast overburden pressure?	Y	(Y or N)
Max foundation bearing stress =	26.6	psi (Adjusted using bearing % Capacity)
Max plate bending stress =	26.2	ksi (Adjusted using bearing % Capacity)
Maximum plate bending capacity =	45.0	ksi
% Capacity =	58.2%	OK

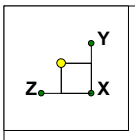
Shape factor adjustment is based on assumption that Roark & Young work uses plate section modulus

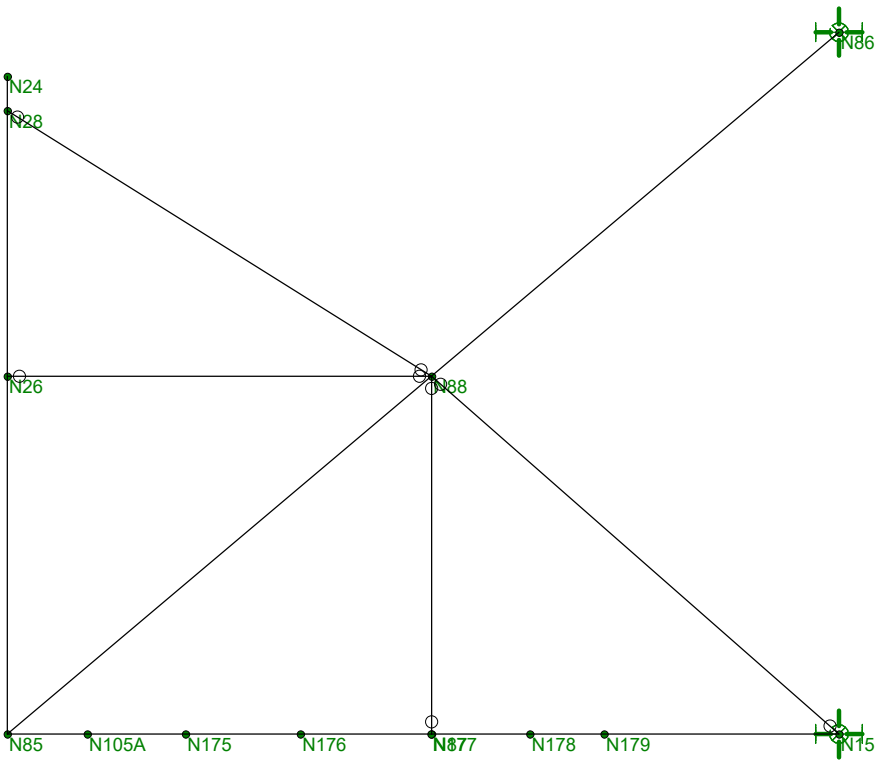
Determination of soil compression area

Load eccentricity = **8.62** feet
Difference = **0.00** (Ao Centroid location - Load eccentricity)
Outside Diameter = **23.13** ft Outside radius of found, r_o = **11.57** ft
Inside Diameter = **0.00** in Inside radius of pole, r_i = **0.00** in
Neutral axis location = **4.98** ft (Measured from max. compression fiber; **formula for annulus area assumes (c) is < 1/2 x OD**)
Therefore c= **4.98** feet and a = β_1 x c = **4.98** feet
$Alpha_O$ = **0.965** radians
A_O = **66.5** square feet Centroid of A_O = **8.62** feet above center of section

Area of Annulus = A_O - A_I = **66.5** square feet Net area of annulus = **66.5** square feet

Centroid of annulus located **20.18** feet from maximum tension side of foundation





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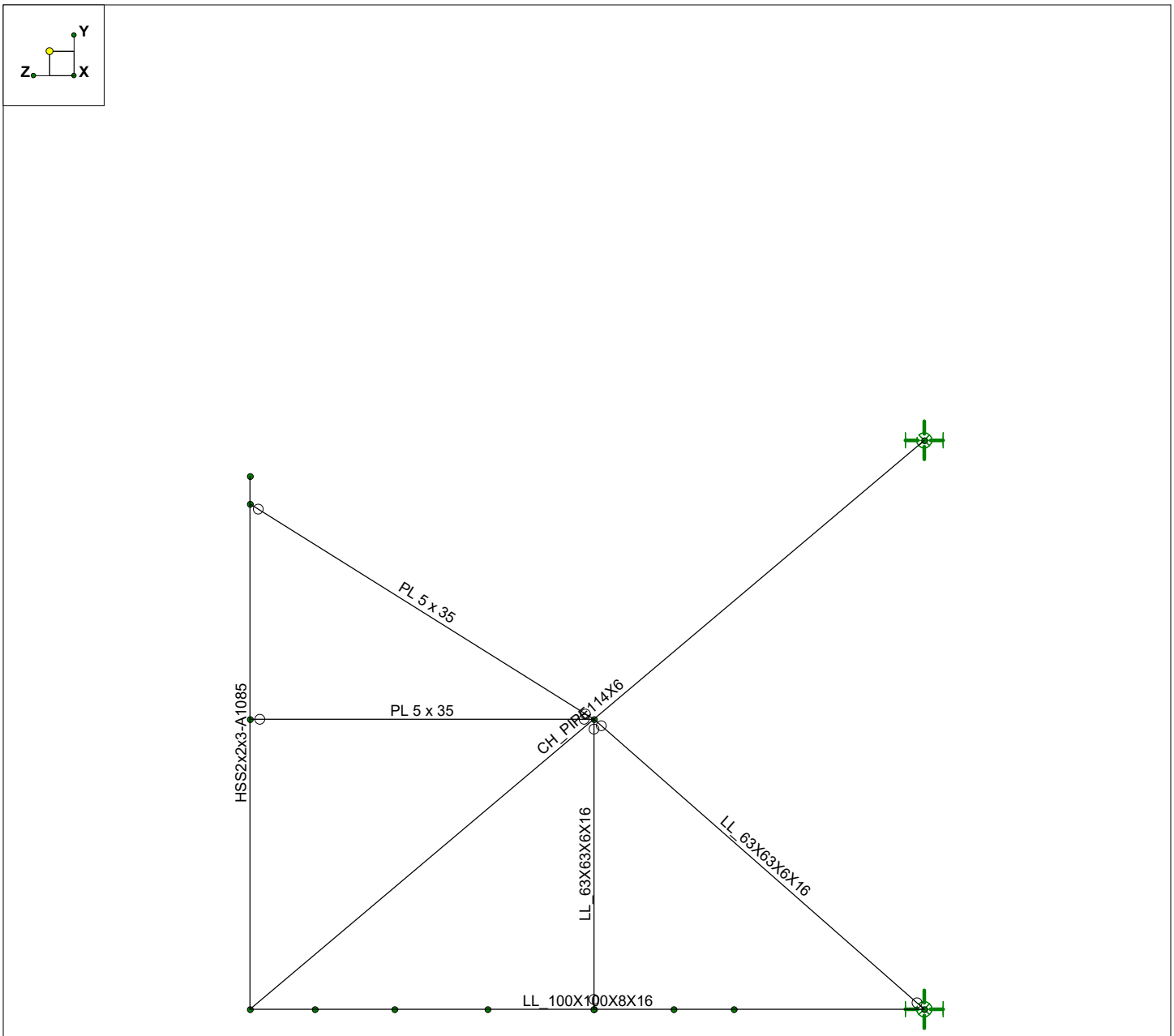

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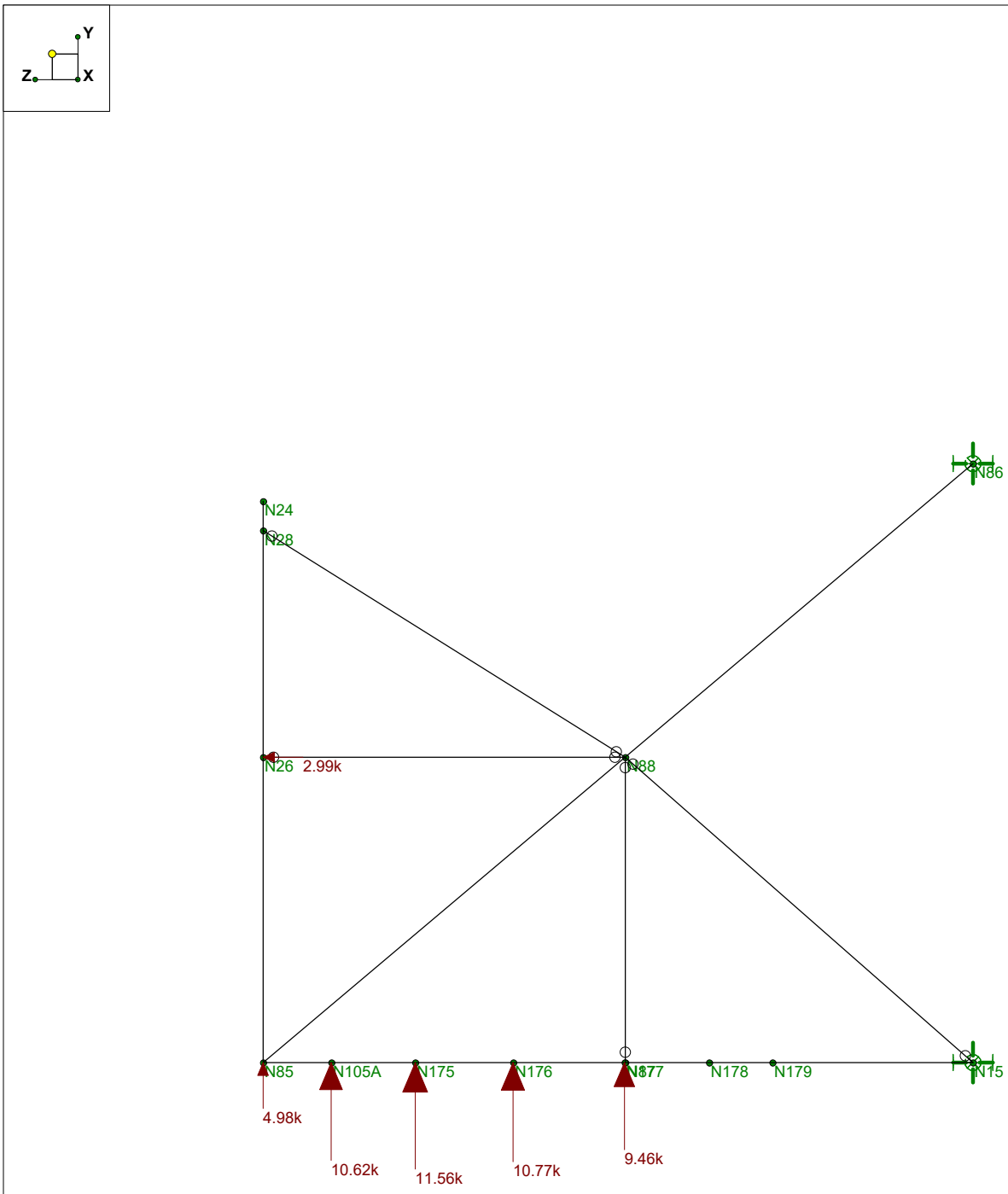

Loads: BLC 1, BLC1

Paul J. Ford and Company		SK - 3
		Apr 8, 2019 at 12:54 PM
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(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (mm^2)	92903.412
Merge Tolerance (mm)	3.048
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (mm/sec^2)	9814.58
Wall Mesh Size (mm)	304.801
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 13th(360-05): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building

Number of Shear Regions	4
Region Spacing Increment (mm)	101.6
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (mm)	Not Entered
Add Base Weight?	Yes
Ct X	.049
Ct Z	.049
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Joint Loads and Enforced Displacements (BLC 1 : BLC1)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/...
1	N85	L	Y	4.98
2	N105A	L	Y	10.62
3	N175	L	Y	11.56
4	N176	L	Y	10.77
5	N177	L	Y	9.46
6	N178	L	Y	0
7	N26	L	Z	2.99

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(de...	Section/Shape	Type	Design List	Material	Design Rules
1	P14	N85	N86			CH PIPE114X6	None	None	A500 Gr.42	Typical
2	LL14	N15	N85		180	LL_100X100X8X16	None	None	Q345-B	Typical
3	M55	N87	N88			LL_63X63X6X16	None	None	Q345-B	Typical
4	M56	N15	N88			LL_63X63X6X16	None	None	Q345-B	Typical
5	M17	N85	N24		180	HSS2x2x3-A1085	None	None	A500 Gr.46	Typical
6	M6	N26	N88			PL 5 x 35	None	None	Q345-B	Typical
7	M7	N28	N88			PL 5 x 35	None	None	Q345-B	Typical

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.4	58	1.3
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2
7	Q235-B	29000	11154	.3	.65	.49	34	1.5	58	1.2

Hot Rolled Steel Properties (Continued)

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
8	Q345-B	29000	11154	.3	.65	.49	50	1.5	65	1.2

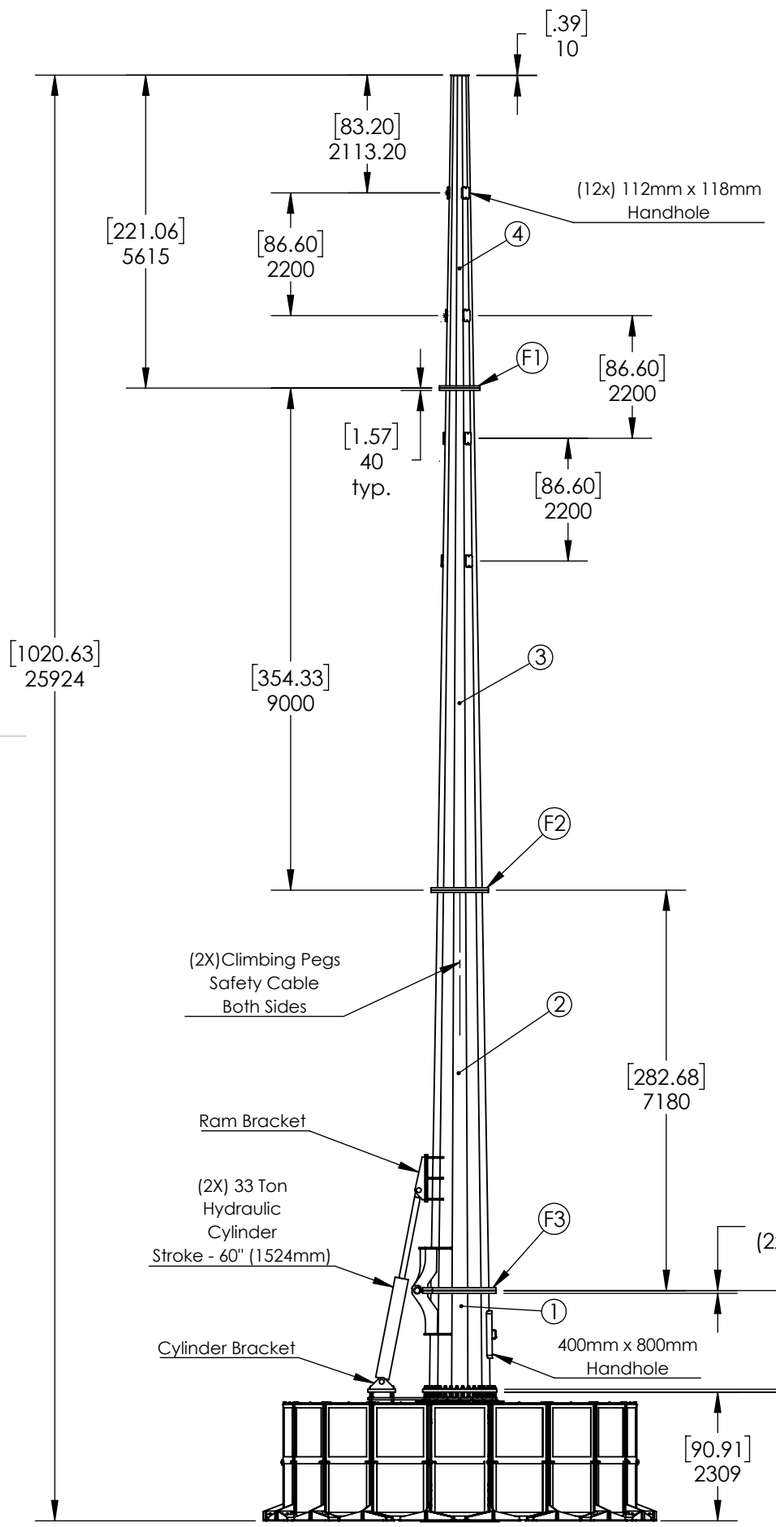
Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	P14	1	34.546	1.822	0	0	0	7.771
2			2	34.546	1.822	0	0	0	2.811
3			3	34.546	1.822	0	0	0	-2.149
4			4	52.86	-.582	0	0	0	-.824
5			5	52.86	-.582	0	0	0	.759
6	1	LL14	1	-24.966	-2.755	0	0	0	-2.695
7			2	-24.966	-2.755	0	0	0	3.038
8			3	-24.956	14.054	0	0	0	7.453
9			4	-24.956	3.453	0	0	0	-12.716
10			5	0	0	0	0	0	0
11	1	M55	1	26.546	0	0	0	0	0
12			2	26.546	0	0	0	0	0
13			3	26.546	0	0	0	0	0
14			4	26.546	0	0	0	0	0
15			5	26.546	0	0	0	0	0
16	1	M56	1	-25.05	0	0	0	0	0
17			2	-25.05	0	0	0	0	0
18			3	-25.05	0	0	0	0	0
19			4	-25.05	0	0	0	0	0
20			5	-25.05	0	0	0	0	0
21	1	M17	1	-.027	0	-.296	0	.925	0
22			2	-.027	0	-.296	0	.438	0
23			3	-.027	0	-.296	0	-.049	0
24			4	-.032	0	.051	0	-.066	0
25			5	0	0	0	0	0	0
26	1	M6	1	-3.336	0	0	0	0	0
27			2	-3.336	0	0	0	0	0
28			3	-3.336	0	0	0	0	0
29			4	-3.336	0	0	0	0	0
30			5	-3.336	0	0	0	0	0
31	1	M7	1	.06	0	0	0	0	0
32			2	.06	0	0	0	0	0
33			3	.06	0	0	0	0	0
34			4	.06	0	0	0	0	0
35			5	.06	0	0	0	0	0

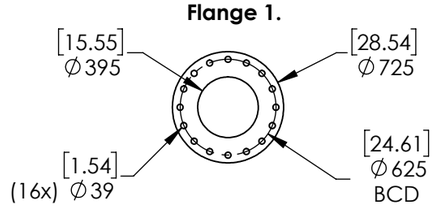
Member AISC 13th(360-05): LRFD Steel Code Checks (By Combination)

	LC	Member	Shape	UC Max	Loc[mm]	Shear...	Loc[...	Dir	phi*Pnc[k]	phi*Pnt[k]	phi*M...	phi*M...	Cb	Eqn
1	1	P14	CH_PIPE114...	.973	0	.051	0		75.106	119.289	13.466	13.466	2.4...	H1-1a
2	1	LL14	LL_100X100...	.984	1241.892	.275	229...	y	129.022	218.178	23.425	9.418	1	H1-1b
3	1	M55	LL_63X63X6...	.330	0	.000	0	y	80.501	101.695	7.796	4.416	1	H1-1a
4	1	M56	LL_63X63X6...	.246	0	.000	0	y	59.437	101.695	7.796	4.416	1	H1-1a
5	1	M17	HSS2x2x3-A...	.319	0	.022	0	z	23.736	52.578	2.901	2.901	1	H1-1b
6	1	M6	PL 5 x 35	- L/r > 300 for tensio...										
7	1	M7	PL 5 x 35	- KL/r > 200 for comp...										

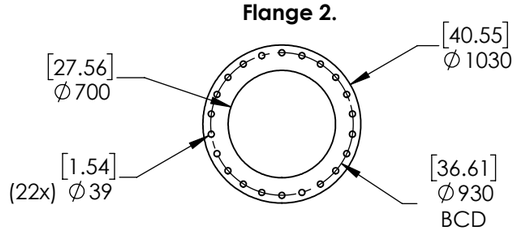
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	initial release	3/18/19	MGC
B	Revised pole dia., RA web thickness & increased bolt dia.	4/4/19	MGC



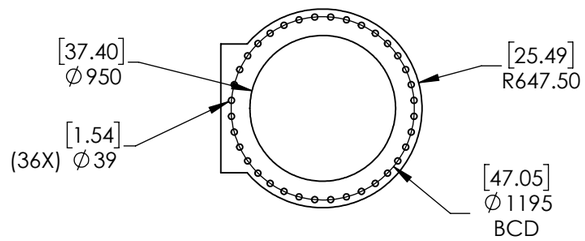
Flange 1.



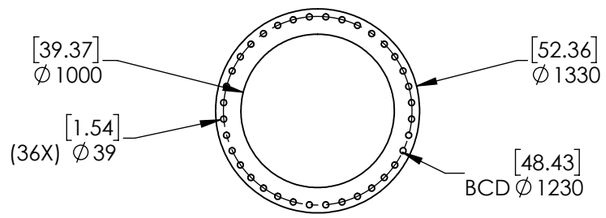
Flange 2.



Flange 3.



Baseplate



Notes 1:

1. See manual for instruction on operating and maintaining the hydraulic raising/ lowering system.

1. Load Data (Turbine Only)

	50 yr Extreme Load	DEL "Fatigue"	Fatigue (2x10^6 Cycles)
Fx (kN)			
Fy (kN)			
Fz (kN)			
My (kN-m)			
Mx (kN-m)			
Mz (kN-m)			

2. Survival Wind Speed: 39.8 m/s (89 mph); (3 sec gust)
   - Structure Class - II
   - Exposure Category - C
   - Topographic Category - 5 - Crest Height 2853ft
3. Design and Welding Codes:
   - TIA-222-G
   - Eurocode 3, 1-9
   - AWS D1.1
   - IEC 61400-2
4. Material
   - Pole: ASTM A572 GR65 (or equivalent - Q420B)
   - Baseplate: ASTM A572 GR50 (or equivalent - Q345B)
   - Flange/ Plate: ASTM A572 GR50 (or equivalent - Q345B)
   - Standard Structural Members: A36 (or equivalent - Q235B)
5. Deflection: < 2% @ 27m/s (60 mph)
6. Pole has 12 sides (Section #4) and 18 sides (Sections #1 to #3)
7. Finish: Hot dip Galvanizing per ASTM A123
8. Anchor Bolts: (44x) M33x3.5 x 300mm Full Thread - (3X) Nut, (4X) Washer
   Flange Bolts: (74x) M33x3.5 x 150mm - (1X) Nut, (2X) Washer
   - Grade 8.8
   - (Optional Grade) ASTM F1554 GR55 or A325
9. Pole Section Details

Pole Section	#1	#2	#3	#4
Thickness (mm)/ (in)	10/ 0.375	10/ 0.375	8/ 0.314	6/ 0.25
Length (m)/ (ft)	1.720/ 5.64	7.09/ 23.26	8.92/ 29.27	5.56/ 18.26
Top Dia. (mm)/ (in)	1042/ 41	800/ 31.5	497/ 19.6	307/ 12.1
Bottom Dia. (mm)/ (in)	1084/ 42.7	1039/ 40.9	798/ 31.4	495/ 19.5
Min Slip (mm)/ (in)		NA	NA	NA
Weight (kg)/ (lbs)	1130/ 2486	2390/ 5258	1390/ 3058	440/ 968

10. Charpy V-Impact Requirements

Material	Charpy-V Notch Test	
	Min Impact Energy (J)	Test Temperature (°C)
ASTM A572 GR65	34	-30
ASTM A572 GR50	21	-29
Q460B	42	20
Q345B	34	20
Q235B	27	20

US Patent # 9428877
China Patent # ZL201490000869.X

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do not manually update

ARE Telecom & Wind
1043 Grand Ave., #213
St Paul, MN 55105
(651) 330 1263
www.aretelecom.com

Steel Weight
Pole 5750kg (12650lbs)
AFS1700 9245kg (20339lbs)
Does not include fasteners

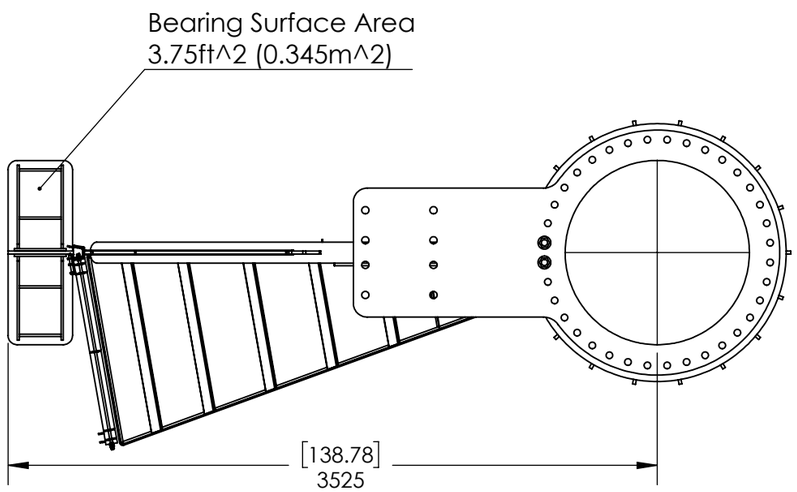
MATERIAL See Notes
FINISH See Notes
DO NOT SCALE DRAWING

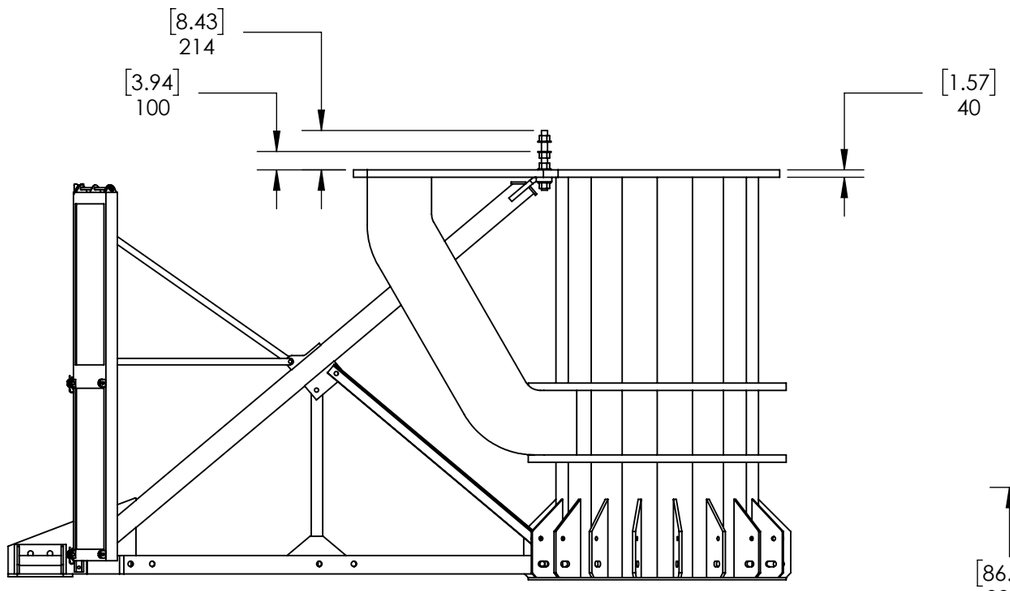
APPROVALS		DATE
DRAWN	MGC	3/18/19
CHECKED		
RESP ENG		
MFG ENG		
QUAL ENG		

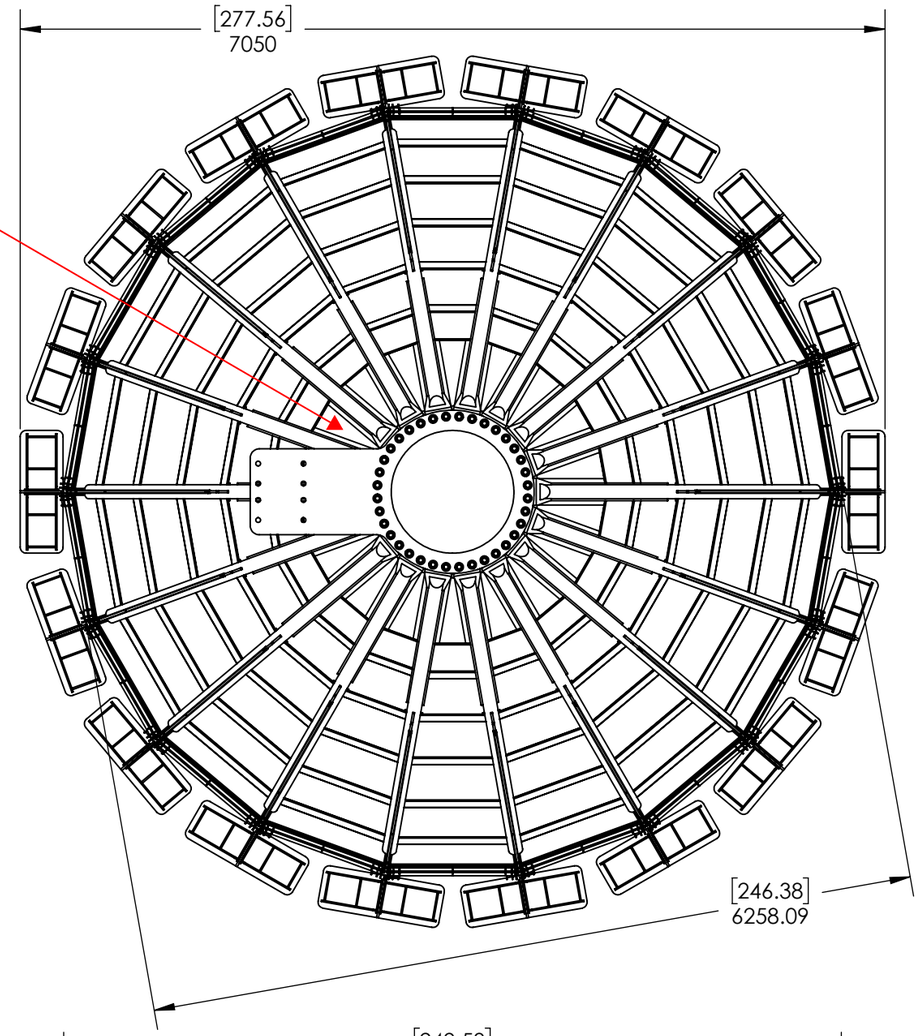
25.9m Hyd Pole AFS1700

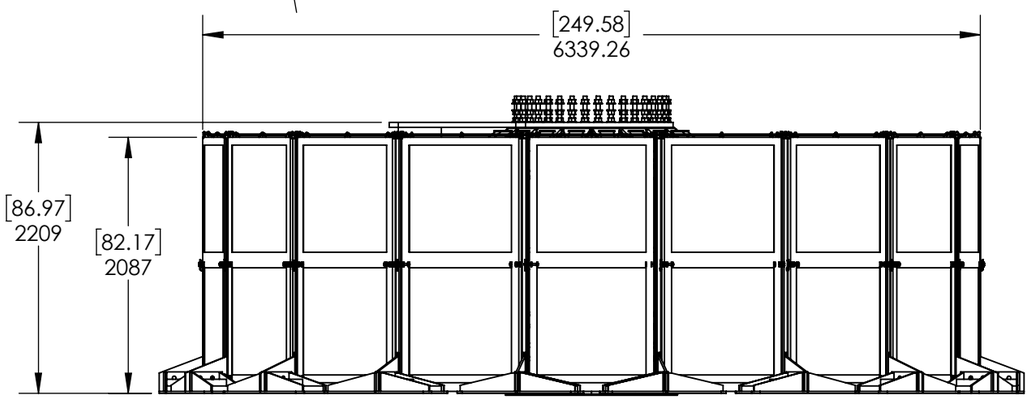
CAD file :
Details and dimensions not shown on this drawing can be found in CAD file

scale NA | rev. B | size NA | sheet 1 of 8









Notes 2:

- Ballast Volume = 60 cu-m (78.5 cu-yds, 2120 cu-ft)
- Unit Weight
  - cu-ft = 45.45 kg (100 lbs)
  - cu-yd = 1227.3 kg (2700 lbs)
  - cu-m = 1605.5 kg (3532 lbs)
- The foundation design is based upon an ultimate bearing pressure of 8000 pounds per square ft (PSF)

ARE
1043 Grand Ave., #213
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AFS1700

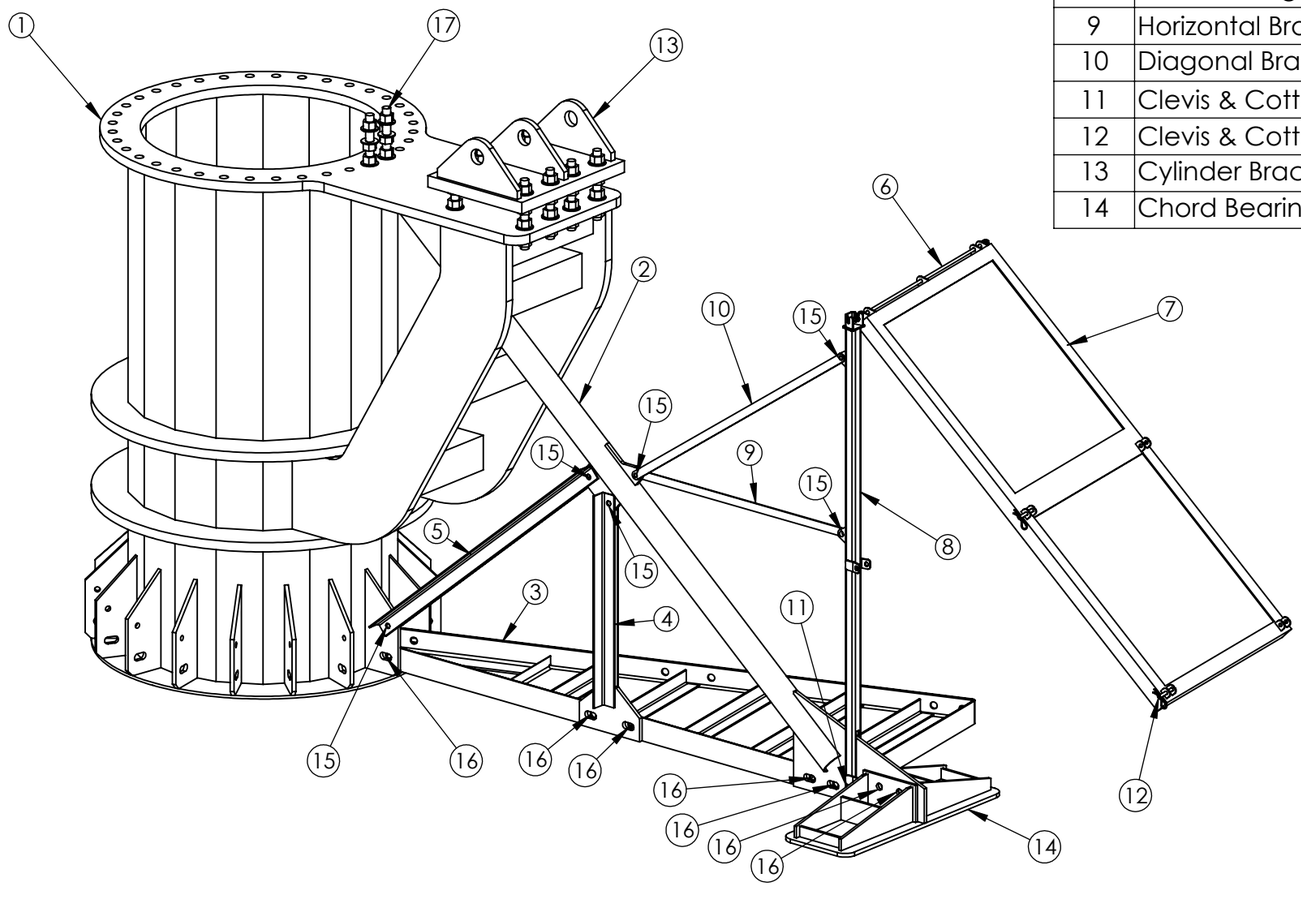
Part #

scale NA | rev. A-1 | size NA | sheet 2 of 8

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	initial release	8/23/17	MGC
B	Revised RA web thickness & bolt dia.	4/4/19	MGC

Notes 3:

1. All plate material shall shall have a minimum yield strength of 345 MPa (50 ksi)
2. Tube shall be 114mm x 6mm GR. Q345 (4.5" x 0.25" ASTM A500 Gr B)
3. All right angles shall be Q345 (ASTM A572 Gr 50) or equivalent
4. All welding shall conform to the minimum requirements of AWS D1.1
5. All welding shall be done by welders qualified under AWS specifications, using E80XX, low hydrogen electrodes
6. All components shall Hot Dip Galvanized in accordance with ASTM A123
7. Debur all sharp edges



AFS1700 Bill of Materials

#	DESCRIPTION	QTY.	Weight (kg/ lbs)
1	Kingpost	1	2014/ 4431
2	Upper Chord round 114mm x 6mm (4.5" x 0.25")	18	81/ 178
3	Ballast Tray	18	121/ 266
4	Vertical Web w/ Gusset Plate Assembly	18	15.5/ 34
5	Diagonal Web	36	7.5/ 16.5
6	M12 (1/2-13) Hinge Rod w/ (4x) Nuts and Washers	18	1.3/ 3
7	Sidewall (hinged)	18	80/ 176
8	Vertical Hinge Post	18	15/ 33
9	Horizontal Brace	18	3.5/ 8
10	Diagonal Brace	18	3.9/ 9
11	Clevis & Cotter 12mm x 75mm (1/2" x 3")	18	0.1/ 0.22
12	Clevis & Cotter 12mm x 115mm (1/2" x 4.5")	72	0.14/ 0.31
13	Cylinder Bracket	1	193/ 345
14	Chord Bearing Plate	18	76/ 167

AFS 1700 Bolts, Nuts & Washers (other equivalent grades acceptable)

#	Unit	Bolt Size	Length	Width Across Flats	Thread Length	Grade	Coating	Nut Qty.	Washer Qty.	Bolt Qty.
15	Metric	M20x2.5	65mm	30mm	Full Thread	8.8	Hot Dip Galv.	108	216	108
15	Imperial	3/4-10	2.5"	1 1/8"	Full Thread	A325	Hot Dip Galv.	108	216	108
16	Metric	M24x3	75mm	36mm	Full Thread	8.8	Hot Dip Galv.	126	252	126
16	Imperial	1-8	3"	1-1/2"	Full Thread	A325	Hot Dip Galv.	126	252	126
17	Metric	M33x3.5	300mm	50mm	300mm	8.8	Hot Dip Galv.	176	176	44
17	Imperial	1 1/4-7	12"	2"	12"	A325	Hot Dip Galv.	176	176	44

US Patent # 9428877
China Patent # ZL201490000869.X

CAD-generated drawing do not manually update

Does not include anchor bolts, templates or flange bolts

APPROVALS		DATE
DRAWN	MGC	3/19/19
CHECKED		
RESP ENG		
MFG ENG		
QUAL ENG		

MATERIAL See Notes
FINISH See Notes
DO NOT SCALE DRAWING

ARE Telecom & Wind
413 Wacouta St. Suite #440
St Paul, MN 55101 (651) 330 1263

AFS-1700 BOM

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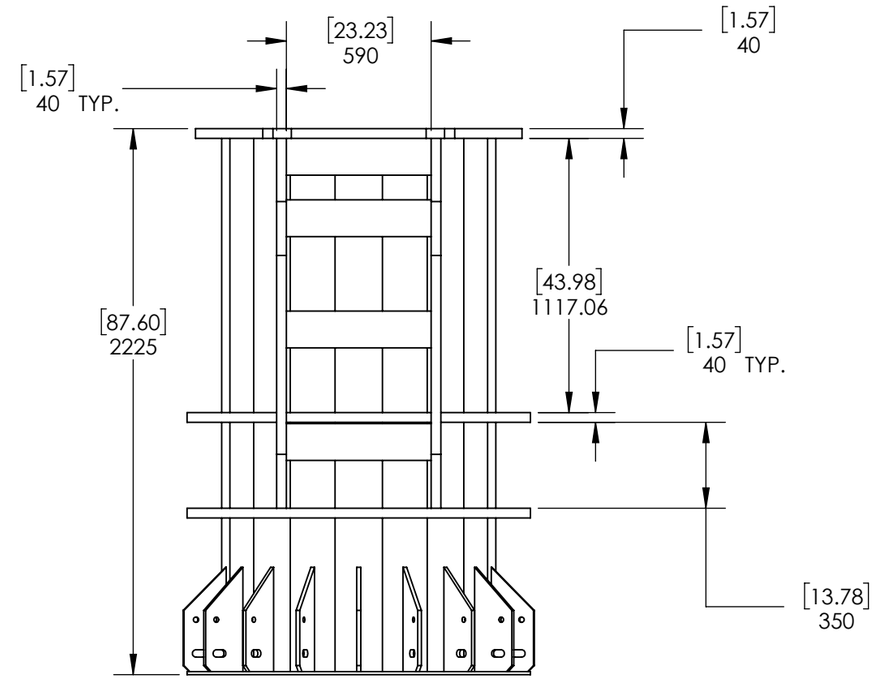
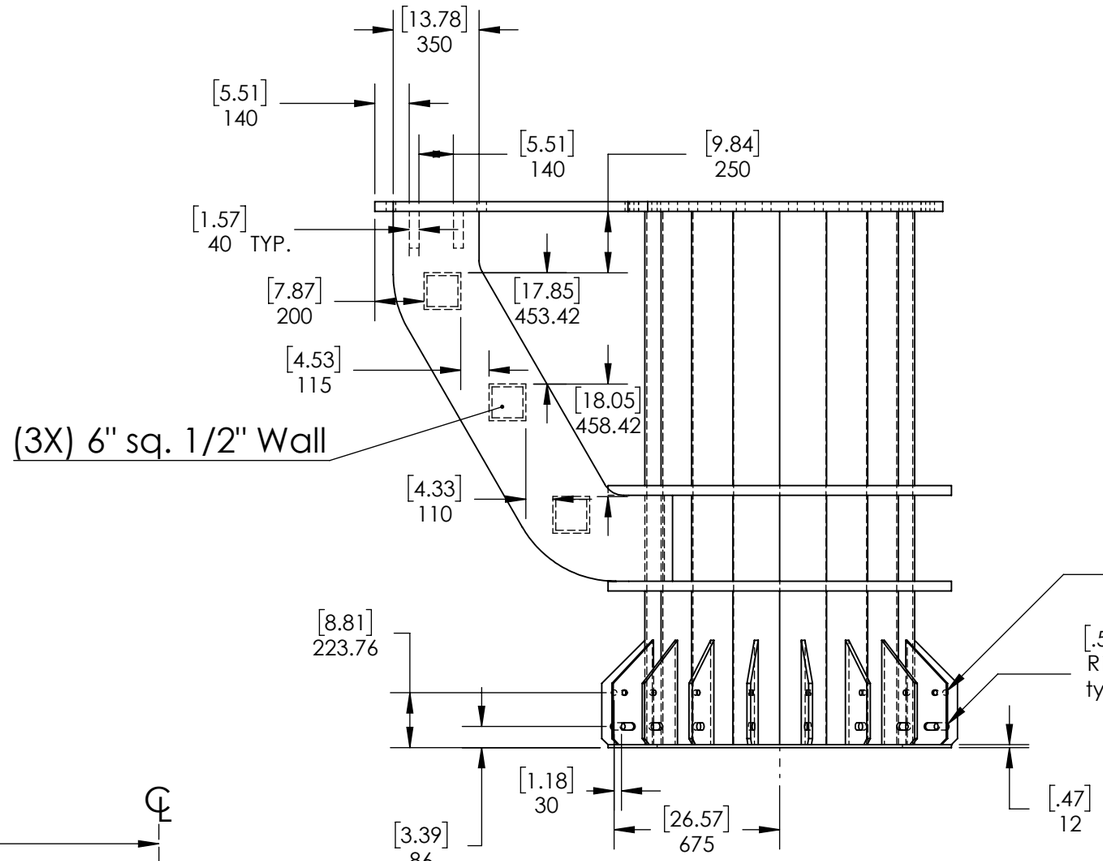
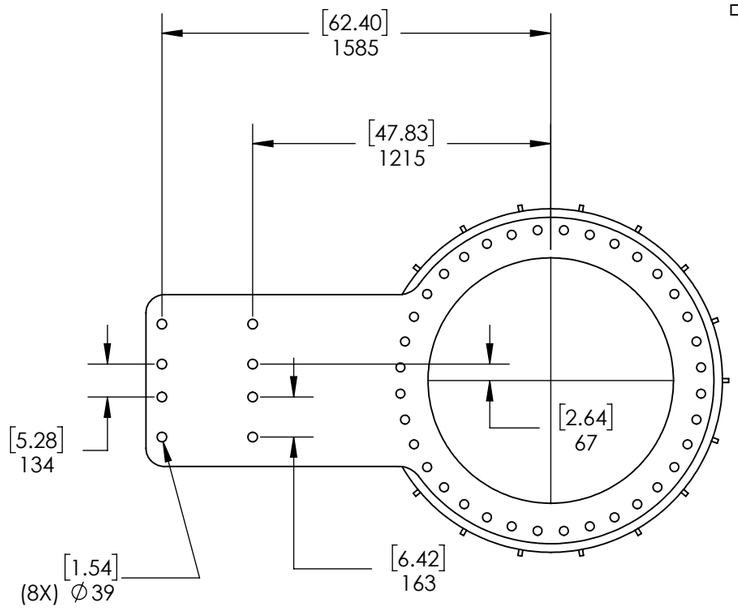
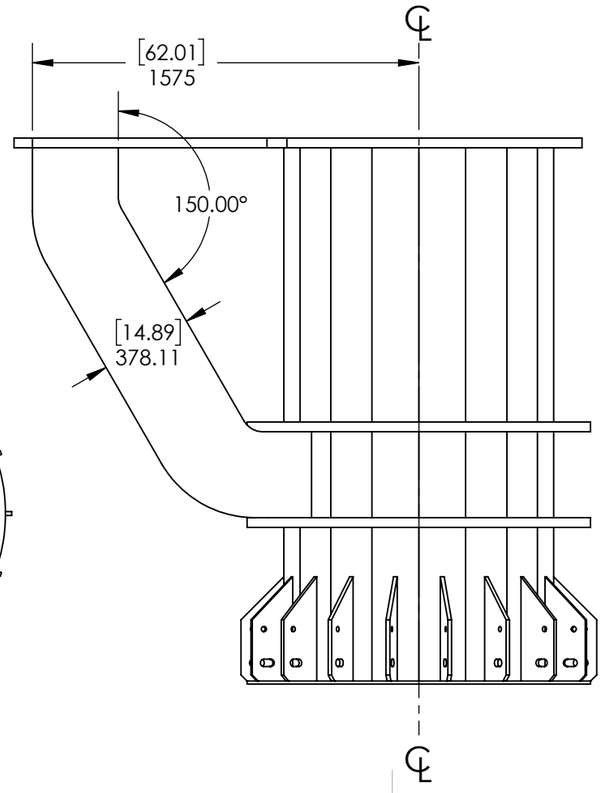
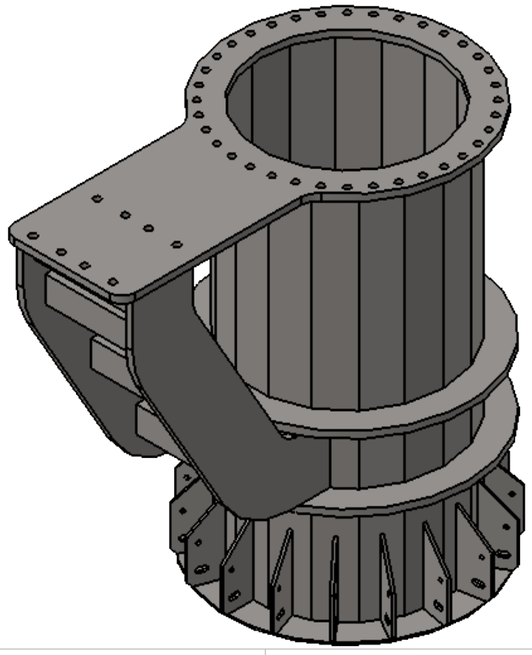
scale NA | rev. B | size NA | 3 of 8











ARE
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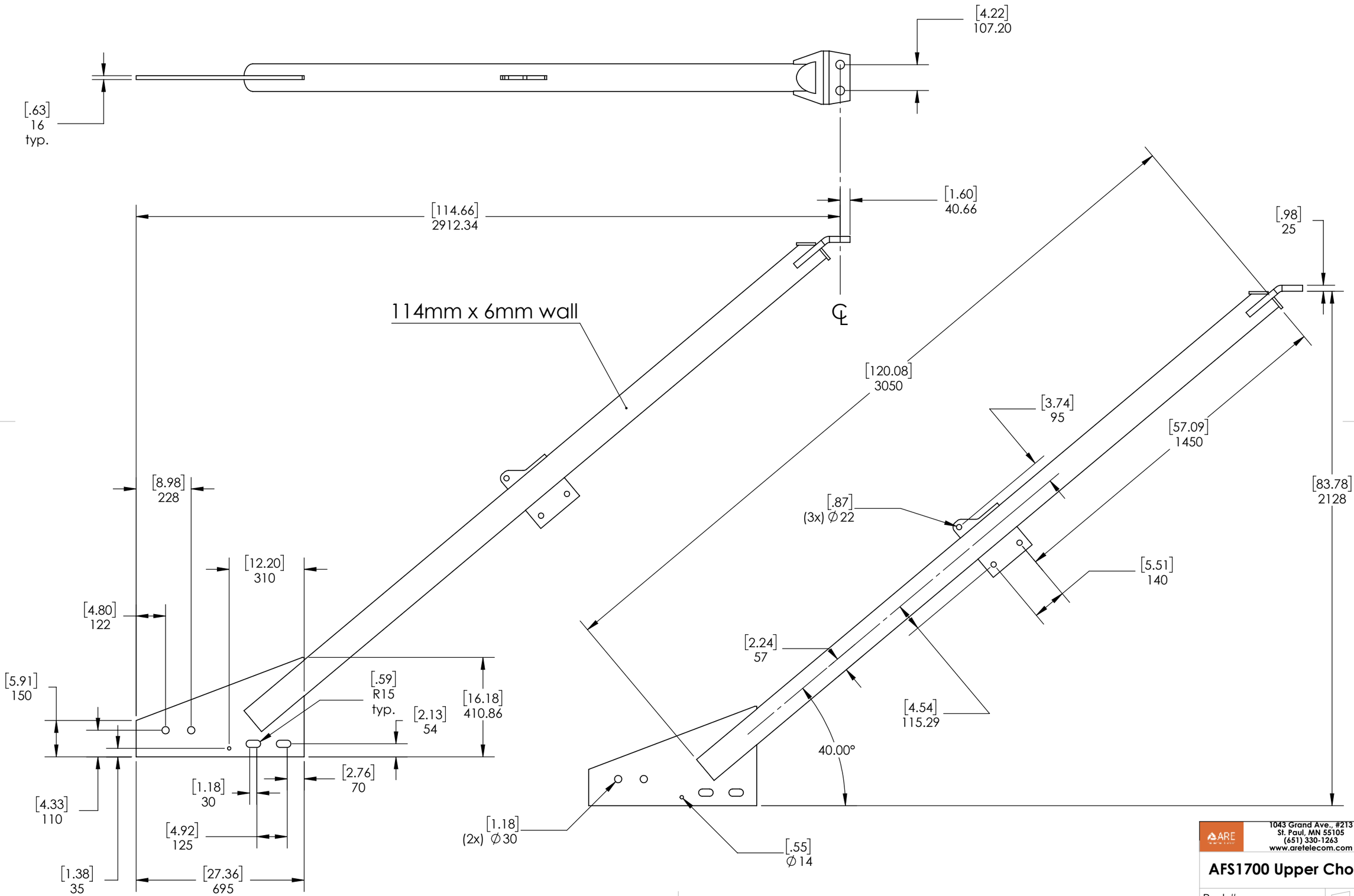
AFS1700 Kingpost

Part #

scale NA | rev. A | size NA | sheet 4 of 8



ARE
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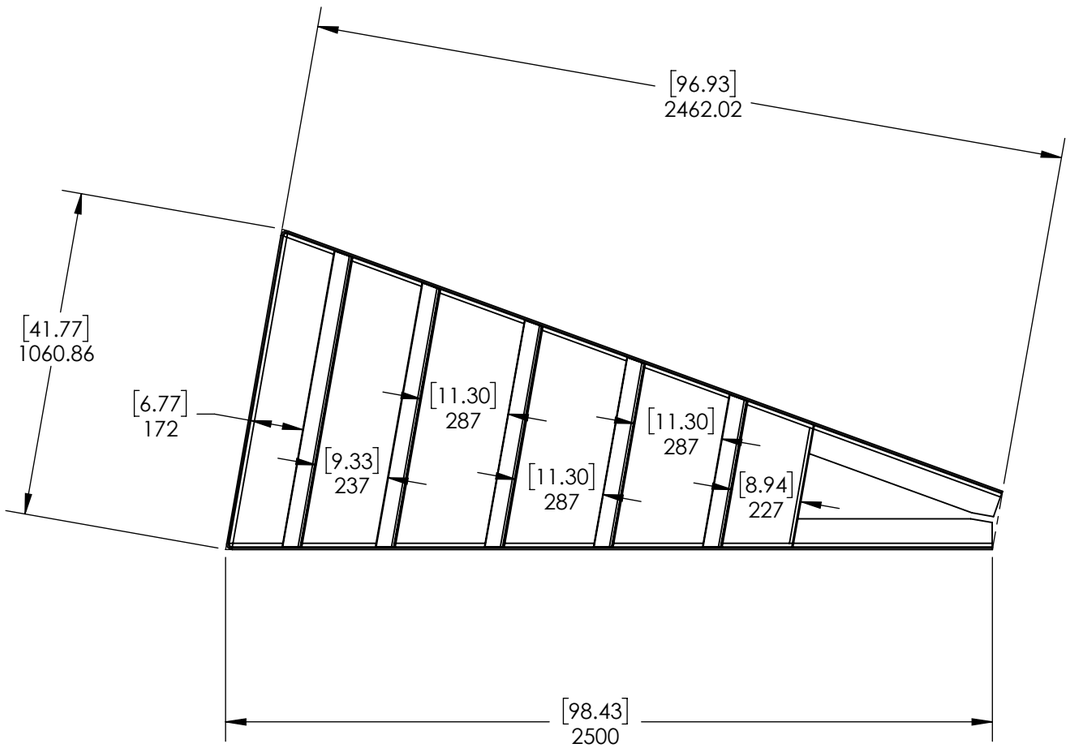
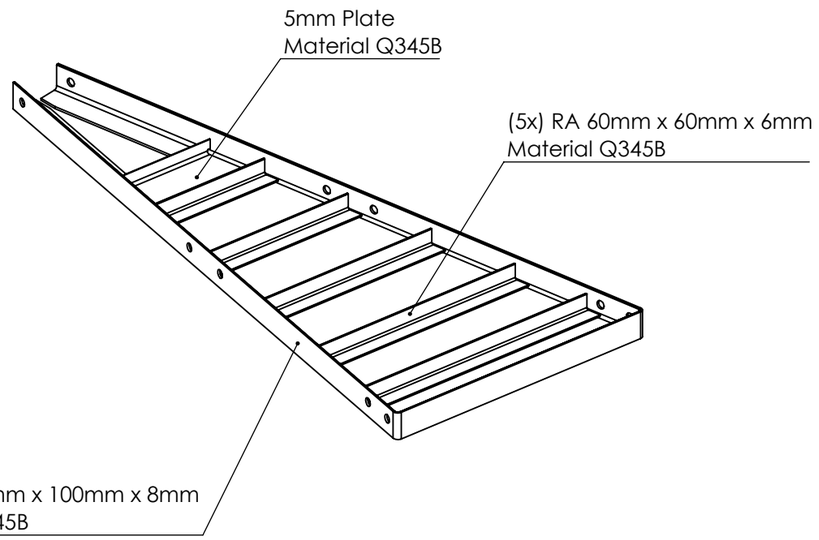
www.aretelecom.com

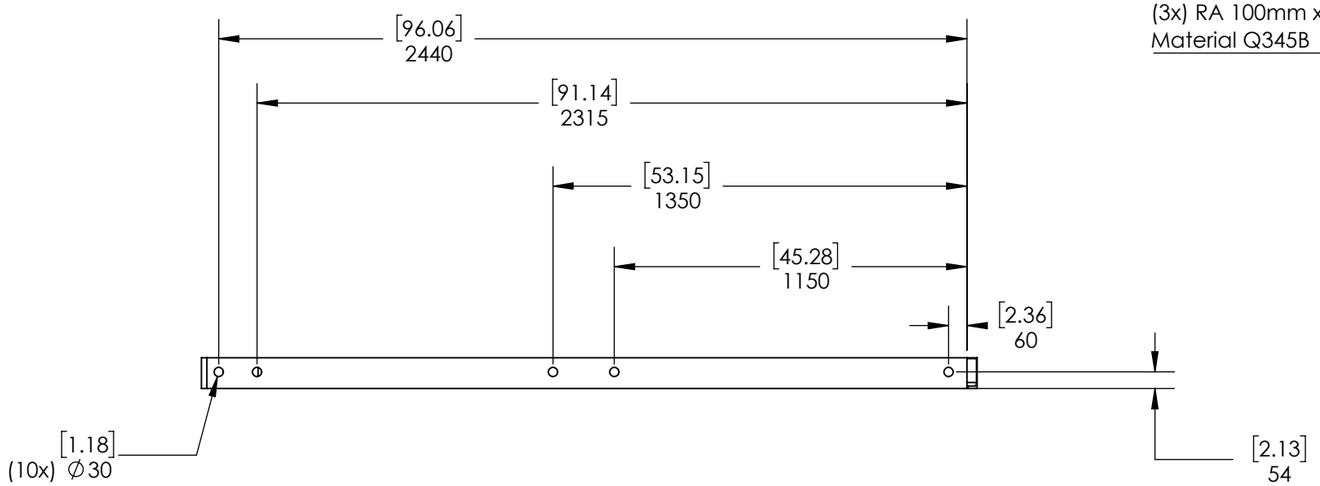
AFS1700 Upper Chord

Part #

scale NA | rev. A | size NA | sheet 5 of 8







ARE
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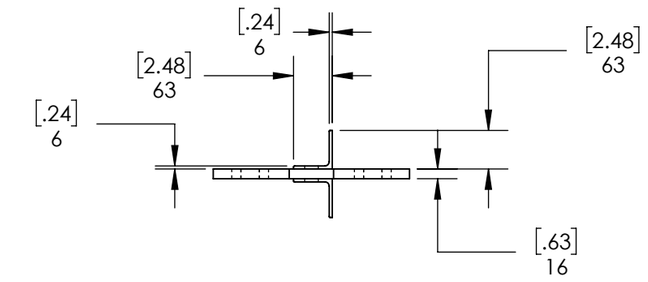
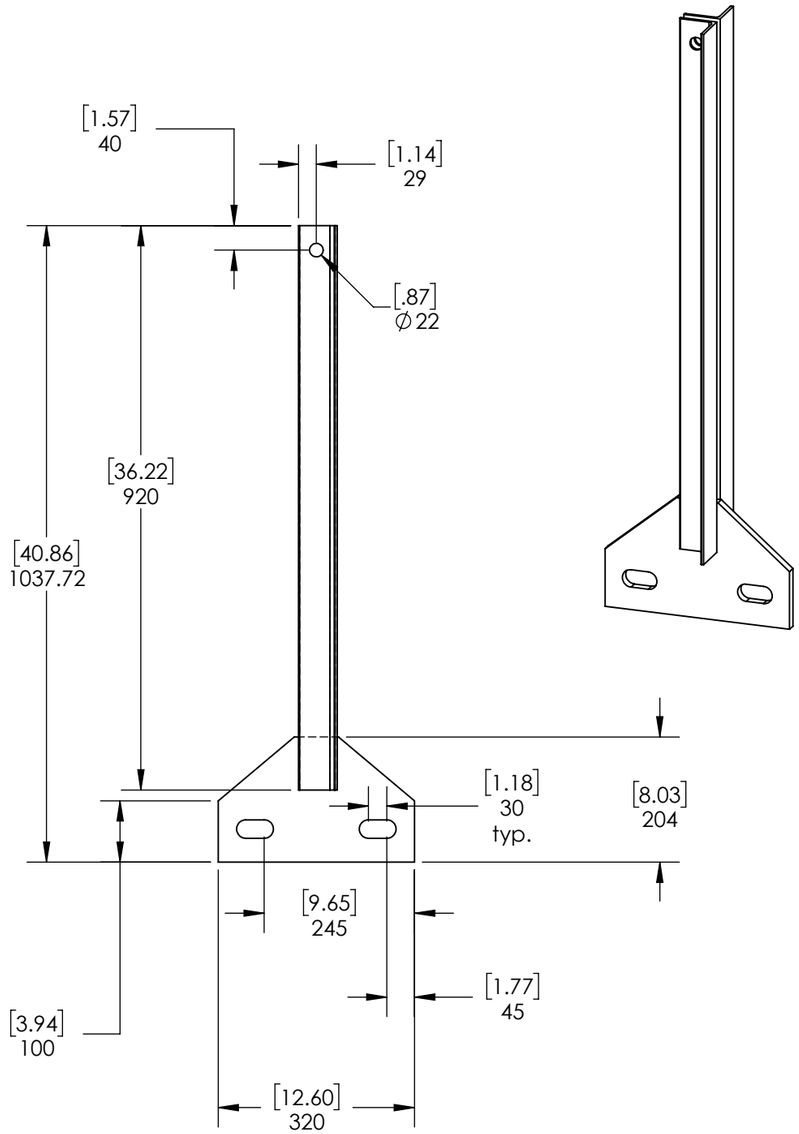
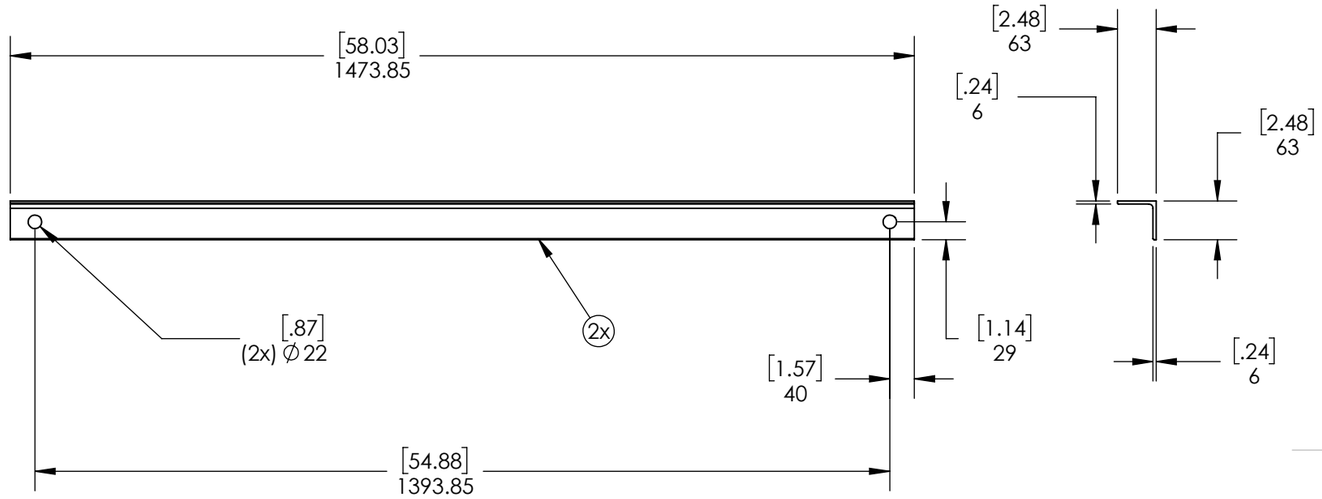
AFS1700 Ballast Tray

Part #

scale NA | rev. A | size NA | sheet 6 of 8







All material shall be Q345B

ARE
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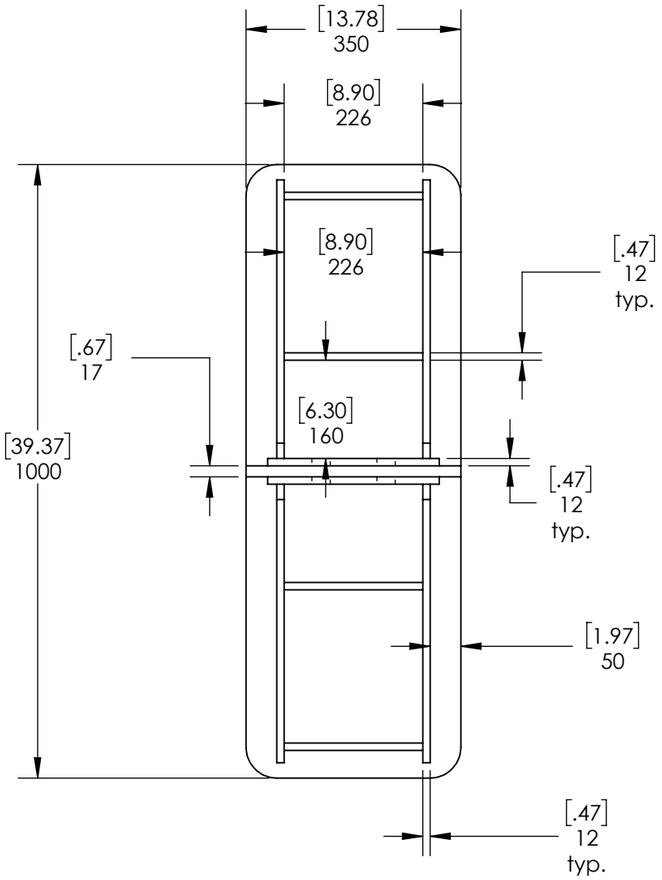
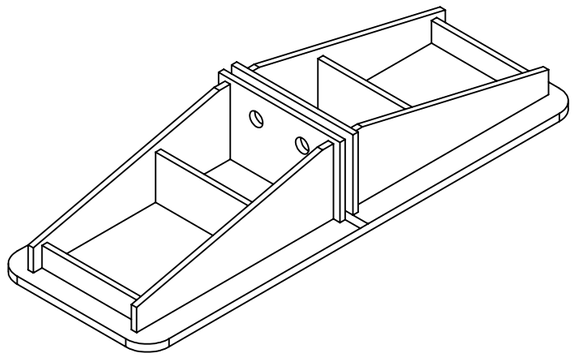
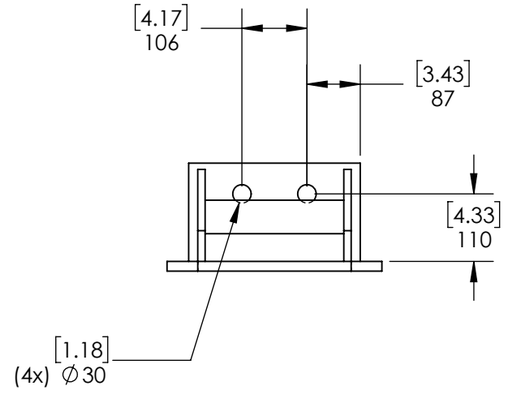
AFS1700 Vert./ Diag. Web

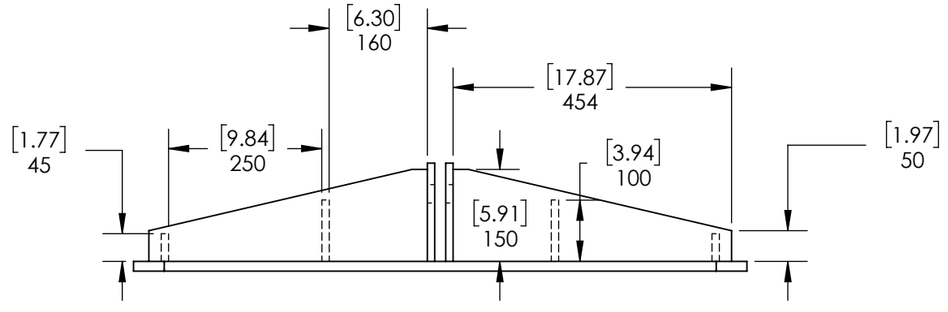
Part #

scale NA | rev. B | size NA | sheet 7 of 8









Material is Q345B

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AFS1700 Chord BearingPlate

Part #

scale NA | rev. A | size NA | sheet 8 of 8

NEW 85'-0" MONOPOLE

CAPTAIN NEW MEXICO

LINCOLN NATIONAL FOREST
CAPTAIN, NEW MEXICO 88316
LINCOLN COUNTY
LAT: 33° 36' 22.0" ; LONG: -105° 21' 37.6"

PJF PAUL J. FORD & COMPANY
250 E Broad St, Ste 600- Columbus, OH 43215
Phone 614.221.6679 www.pauljford.com

ARE TELECOM INCORPARATED
1043 GRAND AVE #213 ST. PAUL, MN 55105
PH: (651) 724-1322

PROJECT CONTACTS

STRUCTURE OWNER:
ARE TELECOM INCORPARATED
MOD PM: DION JOHNSON AT DION.JOHNSON@CROWNCASTLE.COM
PH: (651) 724-1322

ENGINEER OF RECORD:
PJFMOD@PAULJFORD.COM

SHEET INDEX	
SHEET NUMBER	DESCRIPTION
T-1	TITLE SHEET
N-1	GENERAL NOTES
S-1	NEW MONOPOLE PROFILE
S-2	FLANGE DETAILS
S-3	AFS1700 FOUNDATION DETAILS

TOWER MANUFACTURER: ARE TELECOM
TOWER MANUFACTURER #:

WIND DESIGN DATA	
REFERENCE STANDARD	ANSI/TIA-222-G-2-2009
LOCAL CODE	2015 NEW MEXICO COMMERCAIL CODE (2015 IBC)
ULTIMATE WIND SPEED (3-SECOND GUST)	115 MPH
CONVERTED NOMINAL WIND SPEED (3-SECOND GUST)	89 MPH
ICE THICKNESS	0.0 IN
ICE WIND SPEED	30 MPH
SERVICE WIND SPEED	60 MPH
STRUCTURE CLASS	II
EXPOSURE CATEGORY	C
Kzt	2.747

KURT J. SWARTS
NEW MEXICO
15015
REGISTERED PROFESSIONAL ENGINEER
4/16/19

REV	DATE	DESCRIPTION

CAPTAIN NEW MEXICO
CAPTAIN, NEW MEXICO
NEW 85'-0" MONOPOLE

PROJECT No:	A00019-0067.005.7205
DRAWN BY:	IM
DESIGNED BY:	KJS
CHECKED BY:	RWH
DATE:	4-5-2019

TITLE SHEET

T-1

V1.0 00019-0067.005.DWG

GENERAL NOTES:

1. ALL INFORMATION SHOWN IS TO BE COORDINATED BY THE CONTRACTOR AND OWNER. IF INFORMATION IS CONFLICTING, THE STRICTER PROVISION SHALL GOVERN. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF ARE TELECOM AND PAUL J. FORD AND COMPANY SO THAT ANY CHANGES AND/OR ADJUSTMENTS, IF NECESSARY, CAN BE MADE TO THE DESIGN AND DRAWINGS.
2. ALL COMPLETE JOINT PENETRATION GROOVE WELDS CONTAINED IN JOINTS AND SPLICES SHALL BE TESTED 100 PERCENT EITHER BY ULTRASONIC TESTING OR BY RADIOGRAPHY PRIOR TO AND AFTER GALVANIZING.
3. FIELD WELDING IS NOT PERMITTED UNLESS APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.
4. CONTINUOUS INSPECTION IS ALWAYS REQUIRED DURING THE PERFORMANCE OF THE WORK UNLESS OTHERWISE SPECIFIED.
5. HOT-DIP GALVANIZE ALL STEEL MEMBERS, ALL STEEL ACCESSORIES, BOLTS, WASHERS, ETC. PER ASTM A123 OR ASTM A153 AS APPROPRIATE.
6. ANY SUPPORT SERVICES PERFORMED BY THE ENGINEER DURING CONSTRUCTION SHALL BE DISTINGUISHED FROM CONTINUOUS AND DETAILED INSPECTION SERVICES, WHICH ARE FURNISHED BY OTHERS. THESE SUPPORT SERVICES PERFORMED BY THE ENGINEER ARE SOLELY FOR THE PURPOSE OF ASSISTING IN QUALITY CONTROL AND IN ACHIEVING CONFORMANCE WITH CONTRACT DOCUMENTS. THEY DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
7. TOWER SHALL BE GROUNDED AS PRESCRIBED IN SECTION 10.0 OF THE ANSI/TIA-222-G.

SPECIAL INSPECTION / STRUCTURAL OBSERVATION / SEISMIC TESTING:

1. CONTRACTORS RESPONSIBLE FOR THE CONSTRUCTION OF A WIND OR SEISMIC FORCE RESISTING SYSTEM/COMPONENT LISTED IN THE "STATEMENTS OF SPECIAL INSPECTION" SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE OWNER PRIOR TO THE COMMENCEMENT OF WORK ON SUCH SYSTEM OR COMPONENT PER SECT 1704.4 OF THE 2015 IBC.
2. SPECIAL INSPECTION FOR STEEL, CONCRETE, SOILS AND PIER SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 1704 OF THE 2015 IBC.
3. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE SPECIAL INSPECTOR OR INSPECTION AGENCY (AND OR THE INSPECTING GEOTECHNICAL ENGINEER) PRIOR TO PERFORMING ANY WORK THAT REQUIRES SPECIAL INSPECTION. WORK REQUIRING SPECIAL INSPECTION THAT IS INSTALLED OR COVERED WITHOUT THE APPROVAL OF THE SPECIAL INSPECTOR IS SUBJECT TO REMOVAL.
4. SPECIAL INSPECTION IS NOT A SUBSTITUTION FOR INSPECTION BY A CITY INSPECTOR.
5. THE SPECIAL INSPECTOR SHALL BE APPROVED BY THE LOCAL JURISDICTION TO PERFORM THE TYPES OF INSPECTION REQUIRED.
6. A CERTIFICATE OF SATISFACTORY COMPLETION OF WORK REQUIRING SPECIAL INSPECTION MUST BE COMPLETED AND SUBMITTED TO THE INSPECTION SERVICES DIVISION. ALL TESTING AND INSPECTIONS SHALL BE DONE BY AN APPROVED SPECIAL INSPECTOR.
7. A CERTIFICATE OF COMPLIANCE FOR OFF-SITE FABRICATION MUST BE COMPLETED AND SUBMITTED TO THE INSPECTION SERVICES DIVISION PRIOR TO ERECTION OF PREFABRICATED COMPONENTS.

ERECTION NOTES:

1. THE CONTRACTOR SHALL ORIENT THE ANTENNA MOUNT AS REQUIRED BY THE OWNER/CARRIER.
2. GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS ANY ABRASIONS, CUTS, FIELD DRILLING, AND FIELD WELDING SHALL BE TOUCHED UP WITH TWO COATS OF ZRC-BRAND (OR APPROVED EQUIVALENT) ZINC-RICH COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE: WET 3 MILS; DRY 1.5 MILS APPLY PER ZRC (MANUFACTURER) RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.
3. UNLESS NOTED OTHERWISE, TIGHTEN ALL ANCHOR NUTS TO AISC SNUG TIGHT REQUIREMENTS. THE SNUG TIGHT CONDITION IS DEFINED AS THE TIGHTNESS THAT EXISTS WHEN ALL PLIES IN A JOINT ARE IN FIRM CONTACT, THIS MAY BE ATTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A MAN USING AN ORDINARY SPUD WRENCH.

TABLE 1704.3
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	IBC REFERENCE
1. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLT, NUTS AND WASHERS:				
a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	-	X	AISC 360, SECTION A3.3 AND APPLICABLE ASTM MATERIAL STANDARDS	-
b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED	-	X	-	-
2. INSPECTION OF HIGH-STRENGTH BOLTING:				
a. BEARING-TYPE CONNECTIONS	-	X	AISC 360, SECTION M2.5	1704.3.3
b. SLIP-CRITICAL CONNECTIONS	-	-		

NOTE: STEEL INSPECTION ITEMS 63 TO 96 NOT REQUIRED

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ARE TELECOM INCORPARATED
1043 GRAND AVE #213 ST. PAUL, MN 55105
PH: (651) 724-1322

CAPTAIN NEW MEXICO
CAPTAIN, NEW MEXICO
NEW 85'-0" MONOPOLE

KURT J. SWARTS
NEW MEXICO
15015
REGISTERED PROFESSIONAL ENGINEER
4/10/19

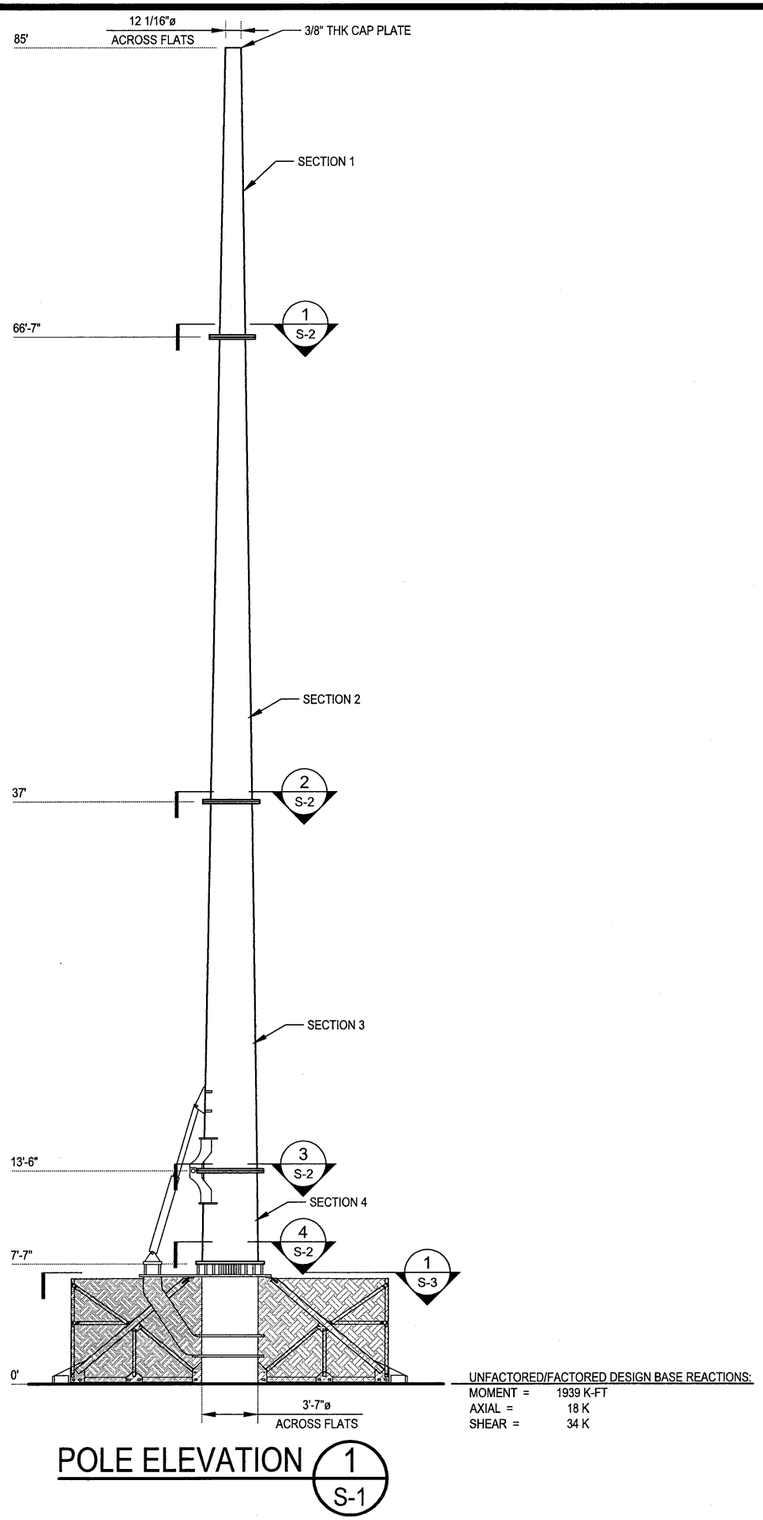
REV	DATE	DESCRIPTION

PROJECT No:	A00019-0067.005.7205
DRAWN BY:	IM
DESIGNED BY:	KJS
CHECKED BY:	RWH
DATE:	4-5-2019

GENERAL NOTES

N-1

V1.0 00019-0067.005.DWG



POLE ELEVATION 1 / S-1

UNFACTORED/FACTORED DESIGN BASE REACTIONS:

MOMENT =	1939 K-FT
AXIAL =	18 K
SHEAR =	34 K

MANUFACTURER POLE SPECIFICATIONS

TAPER	0.372 IN/FT
BASE PLATE STEEL	ASTM A572 GRADE 50 (50 KSI)
ANCHOR RODS	1 3/8"ø F1554 G55
FLANGE PLATE STEEL	ASTM A572 GRADE 50 (50 KSI)
FLANGE BOLTS	ASTM A325

SHAFT SECTION DATA

SHAFT SECTION	SECTION LENGTH (FT)	PLATE THICKNESS (IN)	LAP SPLICE (FT)	DIAMETER ACROSS FLATS (IN)		POLE GRADE (ksi)	POLE SHAPE
				@ TOP	@ BOTTOM		
1	18.42	0.250		12.100	19.500	65	12-SIDED
2	29.53	0.313		19.600	31.400	65	18-SIDED
3	23.57	0.375		31.500	40.900	65	18-SIDED
4	5.90	0.375		41.000	42.700	65	18-SIDED

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

ANTENNA LIST

ELEVATION (FT)	DISCRETE LOADING		FEEDLINE INFORMATION*	
	QTY	DESCRIPTION	QTY	NOMINAL SIZE (IN)
81	6	ACE XXQLH-654L8H8-IVT	6	1 5/8
81	3	NOKIA AirScale Dual RRH 4T4R B12/14 320W AHLBA	2	7/8
81	3	12.5-FT V-FRAME SECTOR MOUNTS [SITEPRO1 VFA12-RRU]	1	3/8
74	1	COMMSCOPE MD-S6 ICE SHIELD	-	-
69	1	RADIOWAVES SHP6-5.9 DISH	2	3/8
69	1	COMMSCOPE RM-DM-6 DUAL RING MOUNT	-	-
69	2	2-IN SCHEDULE 40 X 10-FT STIFF ARM PIPES	-	-
68	2	NOKIA MPT-XP-HQAM	-	-
67	1	COMMSCOPE MD-S6 ICE SHIELD	-	-
62	1	COMMSCOPE UHX6-59-D3A/L DISH	2	3/8
62	1	COMMSCOPE RM-DM-6 DUAL RING MOUNT	-	-
62	1	2-IN SCHEDULE 40 X 10-FT STIFF ARM PIPES	-	-
51	4	NOKIA MPT-XP-HQAM	-	-

* ANTENNA FEED LINES RUN INSIDE OF POLE

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PH: (651) 724-1322

CAPTAIN NEW MEXICO
CAPTAIN, NEW MEXICO
NEW 85'-0" MONOPOLE

PROJECT No:	A00019-0067.005.7205
DRAWN BY:	IM
DESIGNED BY:	KJS
CHECKED BY:	RWH
DATE:	4-5-2019

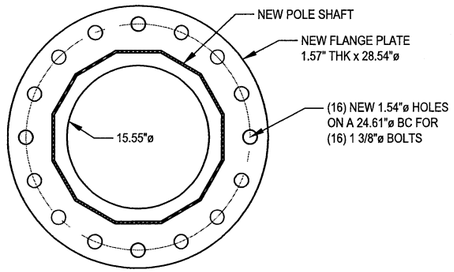
MONOPOLE PROFILE

S-1

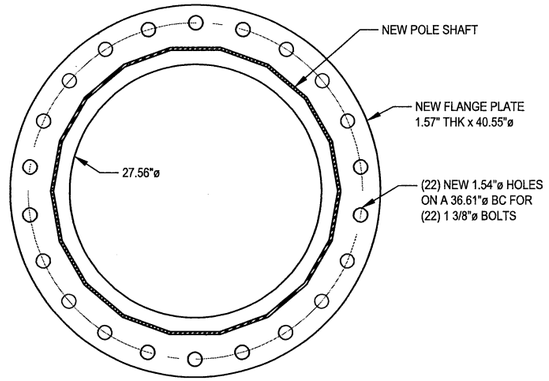
KURT J. SWARTS
NEW MEXICO
15015
REGISTERED PROFESSIONAL ENGINEER
4/18/19

REV	DATE	DESCRIPTION

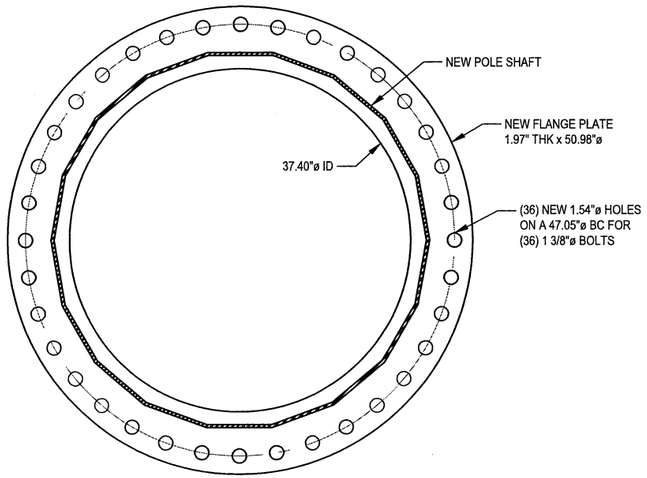
V1.0 00019-0067.005.DWG



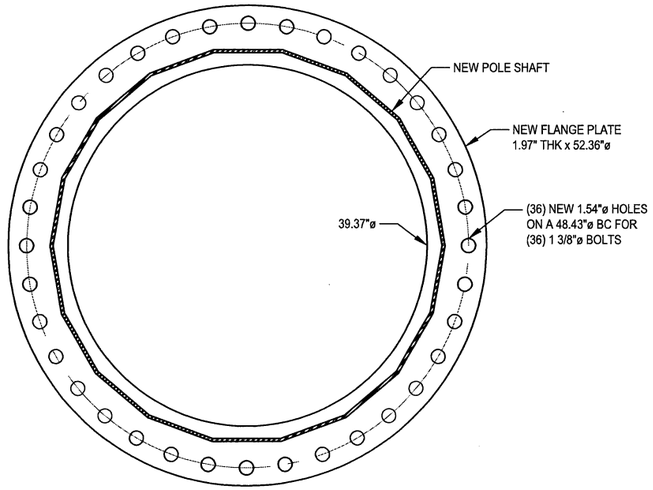
FLANGE SECTION 1 / S-2



FLANGE SECTION 2 / S-2



FLANGE SECTION 3 / S-2



FLANGE SECTION 4 / S-2

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PH: (651)724-1322

CAPTAIN NEW MEXICO
CAPTAIN, NEW MEXICO
NEW 85'-0" MONOPOLE

PROJECT No:	A00019-0067.005.7205
DRAWN BY:	IM
DESIGNED BY:	KJS
CHECKED BY:	RWH
DATE:	4-5-2019

FLANGE DETAILS

S-2

KURT J. SWARTS
NEW MEXICO
15015
REGISTERED PROFESSIONAL ENGINEER
4/8/19

REV	DATE	DESCRIPTION

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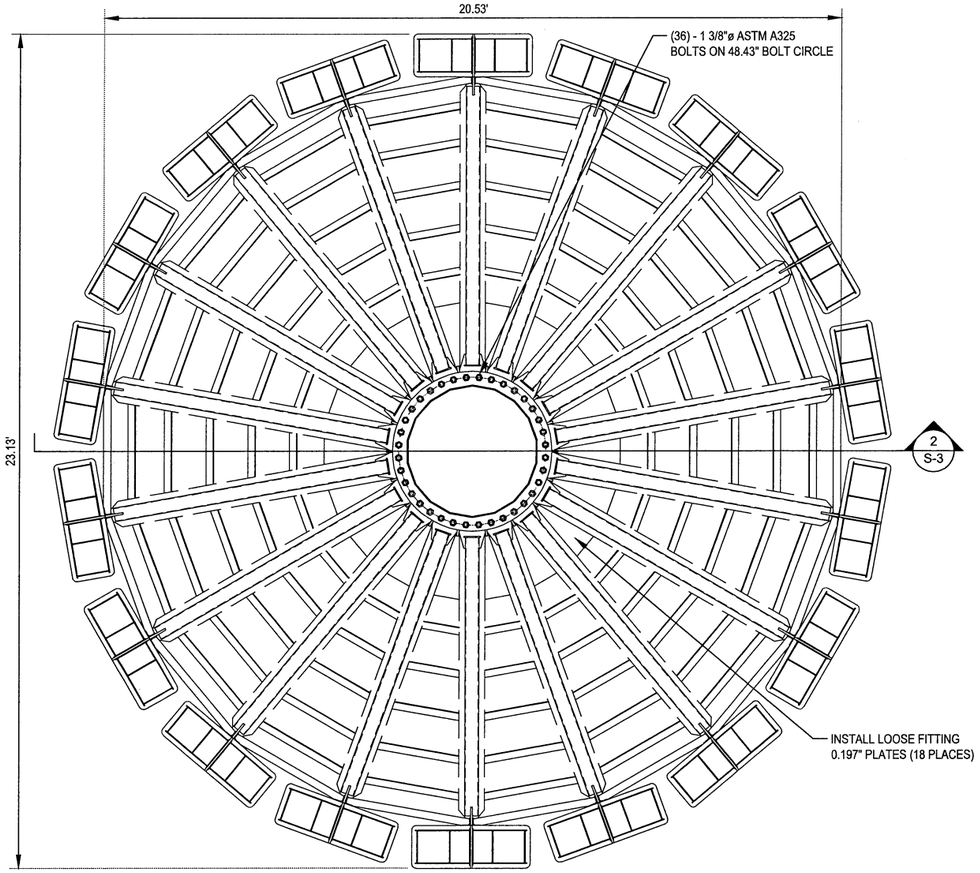
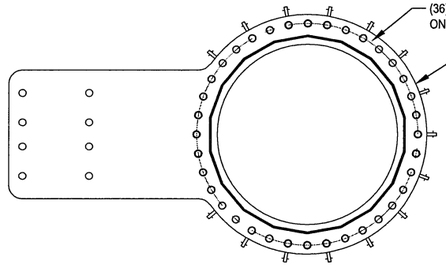


PLAN VIEW 1 S-3

MEMBER SCHEDULE			
MEMBER	DESCRIPTION	MATERIAL SPECIFICATION *	LENGTH
A	43.00" DF x 0.315 THK WALL PIPE POLE SHAFT	Q345B	85.56"
B	4.48"ø x 0.236 THK WALL PIPE	ASTM A500 GR 42	120.1"
C	HSS 2 x 2 x 3/16	ASTM A500 GR 46	82.2"
D	0.2" THK X 1.38" PLATE	Q345B	60.0"
E	0.2" THK X 1.38" PLATE	Q345B	50.9"
F	LL 2.48 X 2.48 x 0.236	Q345B	58.0"
G	LL 2.48 X 2.48 x 0.236	Q345B	36.2"
H	LL 3.93 X 3.93 X 0.315	Q345B	96.9"
I	LL 3.93 X 3.93 X 0.315	Q345B	41.8"
J	L 2.36 X 2.36 X 0.236	Q345B	VARIES
K	0.197" THK BEARING PLATES	Q345B	-
L	FOOT PLATE WELDMENTS	Q345B	-
* MATERIAL EQUIVALENTS	Q345B = ASTM A572 GR 50 (Fy = 50)		

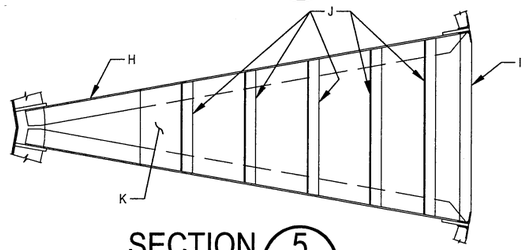
ALL STRUCTURAL BOLTS SHALL CONFORM TO ASTM A325 BOLTS, OR EQUIVALENT. ALL WELDS SHALL BE DONE USING E80XX LOW HYDORGEN ELECTRODES.. CONSULT ARE FABRICATION DRAWINGS FOR BOLT QUANTITIES AND SIZES.

SECTION 2 S-3



SECTION 3 S-3

SECTION 4 S-3



SECTION 5 S-3

AMERICAN RESOURCE & ENERGY: CAPTAIN, NM

GENERAL NOTES

1.1. CONTRACTOR SHALL REFER TO AMERICAN RESOURCE & ENERGY'S (ARE) "ASSEMBLED FOUNDATION SYSTEMS (1700-AFS) TELECOM-SMALL WIND (ABOVE AND BELOW GRADE)" ASSEMBLY AND INSTALALTION INSTRUCTIONS.

1.2. IF MATERIALS, QUANTITIES, STRENGTHS OR SIZES INDICATED BY THE DRAWINGS OR SPECIFICATIONS ARE NOT IN AGREEMENT WITH THESE NOTES, THE BETTER QUALITY AND/OR GREATER QUANTITY, STRENGTH OR SIZE INDICATED, SPECIFIED OR NOTED SHALL BE PROVIDED.

1.3. DESIGN HAS BEEN COMPLETED IN CONFORMANCE WITH THE 2015 NEW MEXICO COMMERCIAL AND THE ANSI/TIA-222-G-2005 STANDARD, "STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS", WITH ANSI/TIA-222-G-1-2007 AND ANSI/TIA-222-G-2-2009 ADDENDA.

1.4. IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THE SAFETY AND STABILITY OF THE MONOPOLE, FOUNDATION AND ITS COMPONENT PARTS DURING INSTALLATION.

1. STRUCTURAL STEEL

1.1. STRUCTURAL STEEL MATERIALS, FABRICATION, DETAILING, AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING REFERENCE STANDARDS:

1.1.1. BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC):

1.1.1.1. "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS."

1.1.1.2. SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM HIGH STRENGTH BOLTS," AS APPROVED BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS.

1.1.1.3. "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"

1.1.2. BY THE AMERICAN WELDING SOCIETY (AWS):

1.1.2.1. "STRUCTURAL WELDING CODE - STEEL D1.1."

1.1.2.2. "STANDARD SYMBOLS FOR WELDING, BRAZING, AND NONDESTRUCTIVE EXAMINATION"

1.2. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. REFER THE ARE ASSEMBLY AND INSTALLATION INSTRUCTIONS (SEE NOTE 1.1).

1.3. WELDED CONNECTIONS SHALL CONFORM TO THE LATEST REVISED CODE OF THE AMERICAN WELDING SOCIETY, AWS D1.1. ALL WELD ELECTRODES SHALL BE E80XX UNLESS NOTED OTHERWISE ON THE DRAWINGS.

1.4. ALL WELDED CONNECTIONS SHALL BE MADE BY WELDERS CERTIFIED BY AWS. CONTRACTOR SHALL SUBMIT WELDERS' CERTIFICATION AND QUALIFICATION DOCUMENTATION TO CROWN CASTLE'S TESTING AGENCY FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.

1.5. STRUCTURAL STEEL PLATES SHALL CONFORM TO ASTM A36 GRADE 36 (FY = 36 KSI MIN.) UNLESS NOTED OTHERWISE ON THE DRAWINGS.

2. FOUNDATION WORK

2.1. THE FOUNDATION DESIGN IS BASED UPON AN ULTIMATE BEARING PRESSURE OF 8000 POUNDS PER SQUARE FOOT (PSF) SUPPLIED BY GEOTECHNICAL REPORT NUMBER 68085099 BY TERRACON CONSULTING ENGINEERS & SCIENTISTS, DATED 11/6/2008.

2.2. BACKFILL / BALLAST MATERIAL SHALL HAVE A MINIMUM UNIT WEIGHT OF 110 POUNDS PER CUBIC FOOT (PCF).

3. TOUCH UP OF GALVANIZING

3.1. THE CONTRACTOR SHALL TOUCH UP ANY AND ALL AREAS OF GALVANIZING THAT ARE DAMAGED OR ABRADED DURING CONSTRUCTION. GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS ANY AND ALL ABRASIONS, CUTS, FIELD DRILLING, AND ALL FIELD WELDING SHALL BE TOUCHED UP WITH TWO (2) COATS OF ZRC COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE: WET 3.0 MILS; DRY 1.5 MILS. APPLY PER ZRC (MANUFACTURER) RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.

4. HOT-DIP GALVANIZING

4.1. REFER TO THE ARE ASSEMBLY AND INSTALLATION INSTRUCTIONS (SEE NOTE 1.1) FOR INSTRUCTIONS TO MASK ALL FAYING SERVICES PRIOR TO APPLICATION OF BITUMEN PAINT.

4.2. HOT-DIP GALVANIZE ALL STRUCTURAL STEEL MEMBERS AND ALL STEEL ACCESSORIES, BOLTS, WASHERS, ETC. PER ASTM A123 OR PER ASTM A153, AS APPROPRIATE.

4.3. PROPERLY PREPARE STEEL ITEMS FOR GALVANIZING. DRILL OR PUNCH WEEP AND/OR DRAINAGE HOLES WITH EOR APPROVAL OF LOCATIONS.

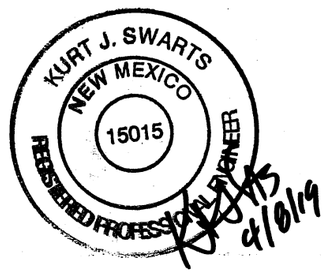
4.4. ALL GALVANIZING SHALL BE DONE AFTER FABRICATION IS COMPLETED AND PRIOR TO FIELD INSTALLATION.

POLE FACTORED REACTIONS @ 7.85'

MOMENT = 1939 FT- K

SHEAR = 34 KIPS

AXIAL = 18 KIPS



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PH: (651) 724-1322

NEW 85'-0" MONOPOLE
CAPTAIN NEW MEXICO
CAPTAIN, NEW MEXICO

PROJECT No:	A00019-0067.005.7205
DRAWN BY:	IM
DESIGNED BY:	KJS
CHECKED BY:	RWH
DATE:	4-5-2019

AFS1700 FOUNDATION DETAILS

S-3

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