Date: **January 11, 2014**

Michael Murray
Crown Castle
5350 North 48th Street, Suite 305
Chandler, AZ 85226

Crown Castle
2000 Corporate Drive
Canonsburg, PA 15317
(724) 416-2000

Subject: **Structural Analysis Report**

Carrier Designation:	***Sprint PCS* Co-Locate**	Scenario 2.5B
	Carrier Site Number:	SL03XC146
	Carrier Site Name:	WEBER BASIN WATER
Crown Castle Designation:	**Crown Castle BU Number:**	880538
	Crown Castle Site Name:	WEBER BASIN WATER
	Crown Castle JDE Job Number:	253474
	Crown Castle Work Order Number:	699695
	Crown Castle Application Number:	206436 Rev. 0
Engineering Firm Designation:	**Crown Castle Project Number:**	699695
Site Data:	**5197 SOUTH 3769 WEST, WEST ROY, Weber County, UT**	
	Latitude *41° 10' 8.2"*, Longitude *-112° 4' 15.1"*	
	97.5 Foot - Monopole Tower	

Dear Michael Murray,

Crown Castle is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 699695, in accordance with application 206436, revision 0.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC8: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA-222-G standard and local code requirements based upon a wind speed of 90 mph 3-second gust, exposure category C.

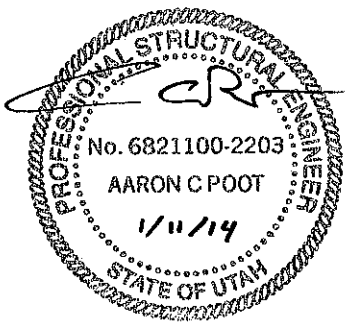
All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

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

Structural analysis prepared by: Nathan Martinak, EIT / CMS

Respectfully submitted by:

Aaron C. Poot, P.E.
Manager Engineering



tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 97.5 ft Monopole tower designed by Rohn in July of 1996. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-E. The reserved 10' extension and loading was not considered in this analysis.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 90 mph with no ice and 60 mph under service loads, exposure category C.

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
96.0	96.0	2	kmw communications	ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	3	1-7/16	-
		3	kmw communications	ET-X-WM-18-65-8P w/ Mount Pipe			
		1	rfs celwave	APXV9ERR18-C w/ Mount Pipe			
		1	samsung telecommunications	2.5G 8T8R RADAR FILTER			
		3	samsung telecommunications	2.5GHz RRH-V3			
		3	samsung telecommunications	OPTIC FIBER JUNCTION CYLINDER			
		3	samsung telecommunications	POWER JUNCTION CYLINDER			
		3	samsung telecommunications	RRH-C2 w/EXT FILTER			
		3	samsung telecommunications	RRH-P4			

Table 2 - Existing and Reserved 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
96.0	96.0	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-1/4	3
		1	tower mounts	Platform Mount [LP 502-1]	-	-	1
80.0	80.0	3	andrew	ONEBASE TWIN DUAL DUPLEX TMA	1	1-5/8	2
		3	ericsson	ERICSSON AIR 21 B2A B4P w/ Mount Pipe			
		3	ericsson	ERICSSON AIR 21 B4A B2P w/ Mount Pipe			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		1	andrew	TMBX-6516-R2M w/ Mount Pipe	12	7/8	1
		2	andrew	TMBXX-6516-R2M w/ Mount Pipe			
		1	tower mounts	T-Arm Mount [TA 602-3]			
64.0	65.0	6	ems wireless	RV65-18-00DPL2 w/ Mount Pipe	6	7/8	1
	64.0	1	tower mounts	T-Arm Mount [TA 602-3]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be Removed, not considered in this analysis

Table 3 - Design 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)
97.5	97.5	12	swedcom	ALP9212	-	-
80	80	12	swedcom	ALP9212	-	-
60	60	12	swedcom	ALP9212	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Smith Geotechnical	1585880	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Rohn	1491540	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Rohn	2045227	CCISITES

3.1) Analysis Method

tnxTower (version 6.1.4.1), 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 were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) The existing base plate grout was not considered in this analysis.
5) Base and flange plate design methodology of the manufacturer has been reviewed and found to be an acceptable means of designing to resist the full capacity of the bolts and shaft.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	97.5 - 65	Pole	P24x1/4	1	-6.70	662.26	53.6	Pass
L2	65 - 32.5	Pole	P30x3/8	2	-12.95	1311.06	60.5	Pass
L3	32.5 - 0	Pole	P36x3/8	3	-19.07	1490.10	74.1	Pass
							Summary	
						Pole (L3)	74.1	Pass
						Rating =	74.1	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC8

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	52.6	Pass
1,2	Base Plate	0	74.1	Pass
1	Base Foundation	0	34.8	Pass
1,2	Flange Plate / Bolts	32.5	60.5 / 36.4	Pass
1,2	Flange Plate / Bolts	65	53.6 / 20.9	Pass

Structure Rating (max from all components) =	**74.1%**

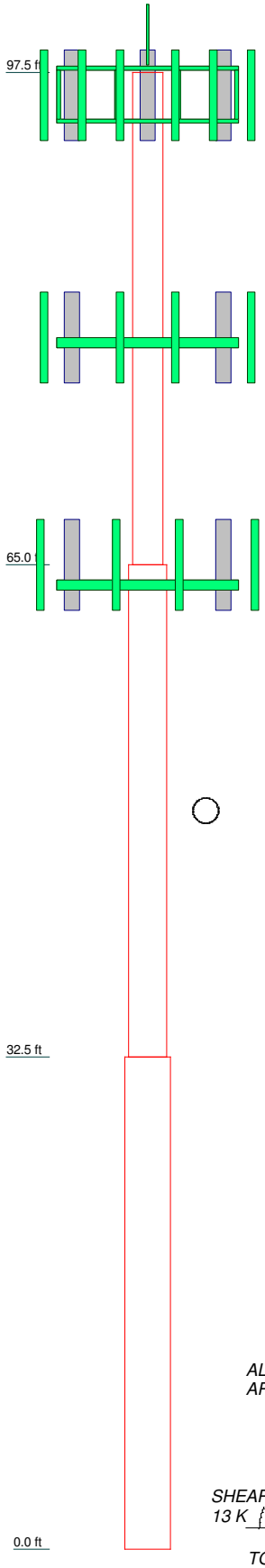
Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity consumed.
2) Base and flange plates have the same capacity as their respective shaft

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing, reserved, and proposed loads. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT



Section	Size	Length (ft)	Grade	Weight (K)
1	P24x1/4	32'6"	A572-42	2.1
2	P30x3/8	32'6"		3.9
3	P36x3/8	32'6"		4.6
				10.6

ALL REACTIONS ARE FACTORED

AXIAL 19 K

SHEAR 13 K

MOMENT 975 kip-ft

TORQUE 0 kip-ft

REACTIONS - 90 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lighting Rod 5/8" x 5'	100	Platform Mount [LP 502-1]	96
ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	96	TMBXX-6516-R2M w/ Mount Pipe	80
ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	96	TMBX-6516-R2M w/ Mount Pipe	80
APXV9ERR18-C w/ Mount Pipe	96	TMBXX-6516-R2M w/ Mount Pipe	80
RRH-P4	96	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	80
RRH-P4	96	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	80
RRH-P4	96	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	80
RRH-C2 w/EXT FILTER	96	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	80
RRH-C2 w/EXT FILTER	96	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	80
RRH-C2 w/EXT FILTER	96	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	80
ET-X-WM-18-65-8P w/ Mount Pipe	96	ONEBASE TWIN DUAL DUPLEX TMA	80
ET-X-WM-18-65-8P w/ Mount Pipe	96	ONEBASE TWIN DUAL DUPLEX TMA	80
ET-X-WM-18-65-8P w/ Mount Pipe	96	ONEBASE TWIN DUAL DUPLEX TMA	80
2.5GHz RRH-V3	96	T-Arm Mount [TA 602-3]	80
2.5GHz RRH-V3	96	(2) RV65-18-00DPL2 w/ Mount Pipe	64
2.5GHz RRH-V3	96	(2) RV65-18-00DPL2 w/ Mount Pipe	64
OPTIC FIBER JUNCTION CYLINDER	96	(2) RV65-18-00DPL2 w/ Mount Pipe	64
OPTIC FIBER JUNCTION CYLINDER	96	6' x 2" Mount Pipe	64
OPTIC FIBER JUNCTION CYLINDER	96	6' x 2" Mount Pipe	64
POWER JUNCTION CYLINDER	96	6' x 2" Mount Pipe	64
POWER JUNCTION CYLINDER	96	T-Arm Mount [TA 602-3]	64
POWER JUNCTION CYLINDER	96		
2.5G 8T8R RADAR FILTER	96		
7'x2" Antenna Mount Pipe	96		
7'x2" Antenna Mount Pipe	96		
7'x2" Antenna Mount Pipe	96		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-42	42 ksi	60 ksi			

TOWER DESIGN NOTES

1. Tower is located in Weber County, Utah.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 90 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 1 with Crest Height of 0'
7. TOWER RATING: 74.1%

CROWN CASTLE
We are Solutions

Crown Castle
2000 Corporate Drive
Canonsburg, PA 15317
Phone: (724) 416-2000
FAX: (724) 416-4594

Job:	***89027.001.01- Weber Basin Water, UT (BU#880538)***		
Project:			
Client: Crown Castle	Drawn by: NMartinak	App'd:	
Code: TIA-222-G	Date: 01/11/14	Scale: NTS	
Path: R:\SA Models - Letters\Work Area\NMartinak\880538_699695\880538.eri		Dwg No. E-1	

Tower Input Data

There is a pole section.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

4) Tower is located in Weber County, Utah.
5) Basic wind speed of 90 mph.
6) Structure Class II.
7) Exposure Category C.
8) Topographic Category 1.
9) Crest Height 0'.
10) Deflections calculated using a wind speed of 60 mph.
11) A non-linear (P-delta) analysis was used.
12) Pressures are calculated at each section.
13) Stress ratio used in pole design is 1.
14) 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		Treat Feedline Bundles As Cylinder
	Consider Moments - Horizontals		Assume Legs Pinned		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Calculate Redundant Bracing Forces
	Use Moment Magnification	√	Use Clear Spans For Wind Area		Ignore Redundant Members in FEA
√	Use Code Stress Ratios		Use Clear Spans For KL/r		SR Leg Bolts Resist Compression
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		All Leg Panels Have Same Allowable
	Escalate Ice	√	Bypass Mast Stability Checks		Offset Girt At Foundation
	Always Use Max Kz	√	Use Azimuth Dish Coefficients	√	Consider Feedline Torque
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Include Angle Block Shear Check
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Poles
	Leg Bolts Are At Top Of Section		SR Members Have Cut Ends	√	Include Shear-Torsion Interaction
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component		Always Use Sub-Critical Flow
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Use Top Mounted Sockets
	Add IBC .6D+W Combination		Use TIA-222-G Tension Splice Capacity Exemption		

Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Pole Size*	*Pole Grade*	*Socket Length* *ft*
L1	97'6"-65'	32'6"	P24x1/4	A572-42 (42 ksi)	
L2	65'-32'6"	32'6"	P30x3/8	A572-42 (42 ksi)	
L3	32'6"-0'	32'6"	P36x3/8	A572-42 (42 ksi)	

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*
L1 97'6"-65'				1	1	1		
L2 65'-32'6"				1	1	1		
L3 32'6"-0'				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
**										
**										

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
TYPE 2(1-7/16)	A	No	Inside Pole	96' - 0'	3	No Ice	0.00	0.00
AVA5-50(7/8")	C	No	Inside Pole	80' - 0'	12	No Ice	0.00	0.00
MLE Hybrid 9Power/18Fiber RL 2(1 5/8)	C	No	Inside Pole	80' - 0'	1	No Ice	0.00	0.00
LDF5-50A(7/8")	C	No	Inside Pole	64' - 0'	6	No Ice	0.00	0.00
**								
**								

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	97'6"-65'	A	0.000	0.000	0.000	0.000	0.06
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.07
L2	65'-32'6"	A	0.000	0.000	0.000	0.000	0.06
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.21
L3	32'6"-0'	A	0.000	0.000	0.000	0.000	0.06
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.22

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	97'6"-65'	0.0000	0.0000	0.0000	0.0000
L2	65'-32'6"	0.0000	0.0000	0.0000	0.0000
L3	32'6"-0'	0.0000	0.0000	0.0000	0.0000

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 Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Lighting Rod 5/8" x 5' ** **	C	None		0.0000	100'	No Ice	0.31	0.31	0.03
ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	8.70	6.49	0.07
ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	8.70	6.49	0.07
APXV9ERR18-C w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	8.50	6.95	0.08
RRH-P4	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	3.19	2.07	0.06
RRH-P4	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	3.19	2.07	0.06
RRH-P4	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	3.19	2.07	0.06
RRH-C2 w/EXT FILTER	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	6.17	5.14	0.07
RRH-C2 w/EXT FILTER	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	6.17	5.14	0.07
RRH-C2 w/EXT FILTER	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	6.17	5.14	0.07
ET-X-WM-18-65-8P w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	7.35	4.43	0.06
ET-X-WM-18-65-8P w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	7.35	4.43	0.06
ET-X-WM-18-65-8P w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	7.35	4.43	0.06
2.5GHz RRH-V3	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	2.80	1.42	0.06
2.5GHz RRH-V3	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	2.80	1.42	0.06
2.5GHz RRH-V3	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	2.80	1.42	0.06
OPTIC FIBER JUNCTION CYLINDER	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	0.45	0.45	0.00
OPTIC FIBER JUNCTION CYLINDER	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	0.45	0.45	0.00
OPTIC FIBER JUNCTION CYLINDER	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	0.45	0.45	0.00
POWER JUNCTION CYLINDER	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	0.43	0.43	0.00
POWER JUNCTION CYLINDER	B	From Leg	4.00 0'	0.0000	96'	No Ice	0.43	0.43	0.00

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
POWER JUNCTION CYLINDER	C	From Leg	0' 4.00 0' 0'	0.0000	96'	No Ice	0.43	0.43	0.00
2.5G 8T8R RADAR FILTER	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	0.94	0.35	0.02
7'x2" Antenna Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	96'	No Ice	1.66	1.66	0.03
7'x2" Antenna Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	96'	No Ice	1.66	1.66	0.03
7'x2" Antenna Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	96'	No Ice	1.66	1.66	0.03
Platform Mount [LP 502-1] **	C	None		0.0000	96'	No Ice	32.35	32.35	0.93
TMBXX-6516-R2M w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.18	4.53	0.05
TMBX-6516-R2M w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	80'	No Ice	3.60	3.24	0.03
TMBXX-6516-R2M w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.18	4.53	0.05
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.83	5.64	0.11
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.83	5.64	0.11
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.83	5.64	0.11
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.83	5.64	0.11
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.83	5.64	0.11
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	80'	No Ice	6.83	5.64	0.11
ONEBASE TWIN DUAL DUPLEX TMA	A	From Leg	4.00 0' 0'	0.0000	80'	No Ice	0.67	0.31	0.01
ONEBASE TWIN DUAL DUPLEX TMA	B	From Leg	4.00 0' 0'	0.0000	80'	No Ice	0.67	0.31	0.01
ONEBASE TWIN DUAL DUPLEX TMA	C	From Leg	4.00 0' 0'	0.0000	80'	No Ice	0.67	0.31	0.01
T-Arm Mount [TA 602-3] **	C	None		0.0000	80'	No Ice	11.59	11.59	0.77
(2) RV65-18-00DPL2 w/ Mount Pipe	A	From Leg	4.00 0' 1'	0.0000	64'	No Ice	3.54	3.29	0.03
(2) RV65-18-00DPL2 w/ Mount Pipe	B	From Leg	4.00 0' 1'	0.0000	64'	No Ice	3.54	3.29	0.03
(2) RV65-18-00DPL2 w/ Mount Pipe	C	From Leg	4.00 0' 1'	0.0000	64'	No Ice	3.54	3.29	0.03

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
6' x 2" Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	64'	No Ice	1.43	1.43	0.02
6' x 2" Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	64'	No Ice	1.43	1.43	0.02
6' x 2" Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	64'	No Ice	1.43	1.43	0.02
T-Arm Mount [TA 602-3]	C	None		0.0000	64'	No Ice	11.59	11.59	0.77
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**									
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**									

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 Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	97.5 - 65	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	10	-6.70	-179.52	-103.87
			Max. Mx	20	-6.70	208.00	-0.28
			Max. My	14	-6.70	0.51	-208.15
			Max. Vy	20	-8.68	208.00	-0.28
			Max. Vx	14	8.71	0.51	-208.15
			Max. Torque	14			-0.33
L2	65 - 32.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	10	-12.95	-485.94	-280.84
			Max. Mx	20	-12.95	562.17	-0.86
			Max. My	14	-12.95	1.10	-563.08
			Max. Vy	20	-11.78	562.17	-0.86
			Max. Vx	14	11.81	1.10	-563.08
			Max. Torque	14			-0.33
L3	32.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	10	-19.07	-840.72	-485.72
			Max. Mx	20	-19.07	972.17	-1.43
			Max. My	14	-19.07	1.67	-973.85
			Max. Vy	20	-13.36	972.17	-1.43
			Max. Vx	14	13.38	1.67	-973.85
			Max. Torque	14			-0.33

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	19.08	0.02	-13.37
	Max. H_x	20	19.08	13.35	-0.02
	Max. H_z	2	19.08	-0.02	13.37
	Max. M_x	2	973.78	-0.02	13.37
	Max. M_z	8	971.63	-13.35	0.02
	Max. Torsion	2	0.33	-0.02	13.37
	Min. Vert	11	14.31	-11.55	-6.67
	Min. H_x	8	19.08	-13.35	0.02
	Min. H_z	14	19.08	0.02	-13.37
	Min. M_x	14	-973.85	0.02	-13.37
	Min. M_z	20	-972.17	13.35	-0.02
	Min. Torsion	14	-0.33	0.02	-13.37

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	15.90	0.00	0.00	0.03	0.22	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	19.08	0.02	-13.37	-973.78	-1.13	-0.33
0.9 Dead+1.6 Wind 0 deg - No Ice	14.31	0.02	-13.37	-968.59	-1.20	-0.33
1.2 Dead+1.6 Wind 30 deg - No Ice	19.08	6.69	-11.59	-844.02	-486.89	-0.30
0.9 Dead+1.6 Wind 30 deg - No Ice	14.31	6.69	-11.59	-839.52	-484.36	-0.30
1.2 Dead+1.6 Wind 60 deg - No Ice	19.08	11.57	-6.70	-488.09	-842.12	-0.19
0.9 Dead+1.6 Wind 60 deg - No Ice	14.31	11.57	-6.70	-485.49	-837.69	-0.19

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.6 Wind 90 deg - No Ice	19.08	13.35	-0.02	-1.37	-971.63	-0.03
0.9 Dead+1.6 Wind 90 deg - No Ice	14.31	13.35	-0.02	-1.37	-966.50	-0.03
1.2 Dead+1.6 Wind 120 deg - No Ice	19.08	11.55	6.67	485.72	-840.72	0.14
0.9 Dead+1.6 Wind 120 deg - No Ice	14.31	11.55	6.67	483.12	-836.29	0.14
1.2 Dead+1.6 Wind 150 deg - No Ice	19.08	6.66	11.57	842.68	-484.46	0.27
0.9 Dead+1.6 Wind 150 deg - No Ice	14.31	6.66	11.57	838.17	-481.94	0.27
1.2 Dead+1.6 Wind 180 deg - No Ice	19.08	-0.02	13.37	973.85	1.67	0.33
0.9 Dead+1.6 Wind 180 deg - No Ice	14.31	-0.02	13.37	968.63	1.60	0.33
1.2 Dead+1.6 Wind 210 deg - No Ice	19.08	-6.69	11.59	844.08	487.43	0.30
0.9 Dead+1.6 Wind 210 deg - No Ice	14.31	-6.69	11.59	839.56	484.76	0.30
1.2 Dead+1.6 Wind 240 deg - No Ice	19.08	-11.57	6.70	488.16	842.66	0.19
0.9 Dead+1.6 Wind 240 deg - No Ice	14.31	-11.57	6.70	485.54	838.09	0.19
1.2 Dead+1.6 Wind 270 deg - No Ice	19.08	-13.35	0.02	1.43	972.17	0.03
0.9 Dead+1.6 Wind 270 deg - No Ice	14.31	-13.35	0.02	1.42	966.90	0.03
1.2 Dead+1.6 Wind 300 deg - No Ice	19.08	-11.55	-6.67	-485.66	841.26	-0.14
0.9 Dead+1.6 Wind 300 deg - No Ice	14.31	-11.55	-6.67	-483.07	836.69	-0.14
1.2 Dead+1.6 Wind 330 deg - No Ice	19.08	-6.66	-11.57	-842.62	485.00	-0.27
0.9 Dead+1.6 Wind 330 deg - No Ice	14.31	-6.66	-11.57	-838.12	482.34	-0.27
Dead+Wind 0 deg - Service	15.90	0.00	-3.32	-241.22	-0.12	-0.08
Dead+Wind 30 deg - Service	15.90	1.66	-2.88	-209.07	-120.46	-0.07
Dead+Wind 60 deg - Service	15.90	2.88	-1.67	-120.90	-208.46	-0.05
Dead+Wind 90 deg - Service	15.90	3.32	-0.00	-0.32	-240.55	-0.01
Dead+Wind 120 deg - Service	15.90	2.87	1.66	120.35	-208.12	0.04
Dead+Wind 150 deg - Service	15.90	1.65	2.88	208.78	-119.86	0.07
Dead+Wind 180 deg - Service	15.90	-0.00	3.32	241.27	0.57	0.08
Dead+Wind 210 deg - Service	15.90	-1.66	2.88	209.12	120.91	0.07
Dead+Wind 240 deg - Service	15.90	-2.88	1.67	120.95	208.91	0.05
Dead+Wind 270 deg - Service	15.90	-3.32	0.00	0.37	240.99	0.01
Dead+Wind 300 deg - Service	15.90	-2.87	-1.66	-120.30	208.56	-0.04
Dead+Wind 330 deg - Service	15.90	-1.65	-2.88	-208.73	120.31	-0.07

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-15.90	0.00	0.00	15.90	0.00	0.000%
2	0.02	-19.08	-13.37	-0.02	19.08	13.37	0.000%
3	0.02	-14.31	-13.37	-0.02	14.31	13.37	0.000%
4	6.69	-19.08	-11.59	-6.69	19.08	11.59	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
5	6.69	-14.31	-11.59	-6.69	14.31	11.59	0.000%
6	11.57	-19.08	-6.70	-11.57	19.08	6.70	0.000%
7	11.57	-14.31	-6.70	-11.57	14.31	6.70	0.000%
8	13.35	-19.08	-0.02	-13.35	19.08	0.02	0.000%
9	13.35	-14.31	-0.02	-13.35	14.31	0.02	0.000%
10	11.55	-19.08	6.67	-11.55	19.08	-6.67	0.000%
11	11.55	-14.31	6.67	-11.55	14.31	-6.67	0.000%
12	6.66	-19.08	11.57	-6.66	19.08	-11.57	0.000%
13	6.66	-14.31	11.57	-6.66	14.31	-11.57	0.000%
14	-0.02	-19.08	13.37	0.02	19.08	-13.37	0.000%
15	-0.02	-14.31	13.37	0.02	14.31	-13.37	0.000%
16	-6.69	-19.08	11.59	6.69	19.08	-11.59	0.000%
17	-6.69	-14.31	11.59	6.69	14.31	-11.59	0.000%
18	-11.57	-19.08	6.70	11.57	19.08	-6.70	0.000%
19	-11.57	-14.31	6.70	11.57	14.31	-6.70	0.000%
20	-13.35	-19.08	0.02	13.35	19.08	-0.02	0.000%
21	-13.35	-14.31	0.02	13.35	14.31	-0.02	0.000%
22	-11.55	-19.08	-6.67	11.55	19.08	6.67	0.000%
23	-11.55	-14.31	-6.67	11.55	14.31	6.67	0.000%
24	-6.66	-19.08	-11.57	6.66	19.08	11.57	0.000%
25	-6.66	-14.31	-11.57	6.66	14.31	11.57	0.000%
26	0.00	-15.90	-3.32	-0.00	15.90	3.32	0.000%
27	1.66	-15.90	-2.88	-1.66	15.90	2.88	0.000%
28	2.88	-15.90	-1.67	-2.88	15.90	1.67	0.000%
29	3.32	-15.90	-0.00	-3.32	15.90	0.00	0.000%
30	2.87	-15.90	1.66	-2.87	15.90	-1.66	0.000%
31	1.65	-15.90	2.88	-1.65	15.90	-2.88	0.000%
32	-0.00	-15.90	3.32	0.00	15.90	-3.32	0.000%
33	-1.66	-15.90	2.88	1.66	15.90	-2.88	0.000%
34	-2.88	-15.90	1.67	2.88	15.90	-1.67	0.000%
35	-3.32	-15.90	0.00	3.32	15.90	-0.00	0.000%
36	-2.87	-15.90	-1.66	2.87	15.90	1.66	0.000%
37	-1.65	-15.90	-2.88	1.65	15.90	2.88	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00007928
3	Yes	4	0.00000001	0.00004978
4	Yes	5	0.00000001	0.00003026
5	Yes	4	0.00000001	0.00077684
6	Yes	5	0.00000001	0.00003167
7	Yes	4	0.00000001	0.00081311
8	Yes	4	0.00000001	0.00002310
9	Yes	4	0.00000001	0.00001206
10	Yes	5	0.00000001	0.00003138
11	Yes	4	0.00000001	0.00080558
12	Yes	5	0.00000001	0.00003010
13	Yes	4	0.00000001	0.00077282
14	Yes	4	0.00000001	0.00008761
15	Yes	4	0.00000001	0.00005513
16	Yes	5	0.00000001	0.00003215
17	Yes	4	0.00000001	0.00082475
18	Yes	5	0.00000001	0.00003066
19	Yes	4	0.00000001	0.00078672
20	Yes	4	0.00000001	0.00002169
21	Yes	4	0.00000001	0.00001087
22	Yes	5	0.00000001	0.00003052
23	Yes	4	0.00000001	0.00078326
24	Yes	5	0.00000001	0.00003187
25	Yes	4	0.00000001	0.00081776
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00002374

28	Yes	4	0.00000001	0.00002689
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00002647
31	Yes	4	0.00000001	0.00002364
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00002820
34	Yes	4	0.00000001	0.00002454
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00002447
37	Yes	4	0.00000001	0.00002781

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	97.5 - 65	7.731	33	0.6426	0.0009
L2	65 - 32.5	3.663	33	0.4909	0.0004
L3	32.5 - 0	0.976	33	0.2631	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100'	Lighting Rod 5/8" x 5'	33	7.731	0.6426	0.0009	53965
96'	ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	33	7.531	0.6365	0.0009	53965
80'	TMBXX-6516-R2M w/ Mount Pipe	33	5.443	0.5678	0.0006	15418
64'	(2) RV65-18-00DPL2 w/ Mount Pipe	33	3.554	0.4851	0.0004	8254

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	97.5 - 65	31.189	16	2.5921	0.0036
L2	65 - 32.5	14.783	16	1.9816	0.0016
L3	32.5 - 0	3.939	16	1.0621	0.0006

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100'	Lighting Rod 5/8" x 5'	16	31.189	2.5921	0.0036	13463
96'	ET-X-TS-70-15-62-18-iR-RD w/ Mount Pipe	16	30.385	2.5672	0.0035	13463
80'	TMBXX-6516-R2M w/ Mount Pipe	16	21.964	2.2912	0.0024	3846
64'	(2) RV65-18-00DPL2 w/ Mount Pipe	16	14.344	1.9581	0.0016	2057

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	97.5 - 65 (1)	P24x1/4	32'6"	0'	0.0	18.6532	-6.70	662.26	0.010
L2	65 - 32.5 (2)	P30x3/8	32'6"	0'	0.0	34.9011	-12.95	1311.06	0.010
L3	32.5 - 0 (3)	P36x3/8	32'6"	0'	0.0	41.9697	-19.07	1490.10	0.013

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	97.5 - 65 (1)	P24x1/4	208.40	396.68	0.525	0.00	396.68	0.000
L2	65 - 32.5 (2)	P30x3/8	563.64	947.86	0.595	0.00	947.86	0.000
L3	32.5 - 0 (3)	P36x3/8	974.72	1338.81	0.728	0.00	1338.81	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	97.5 - 65 (1)	P24x1/4	8.71	331.13	0.026	0.30	648.61	0.000
L2	65 - 32.5 (2)	P30x3/8	11.81	655.53	0.018	0.30	1598.37	0.000
L3	32.5 - 0 (3)	P36x3/8	13.39	745.05	0.018	0.30	2189.07	0.000

Pole Interaction Design Data

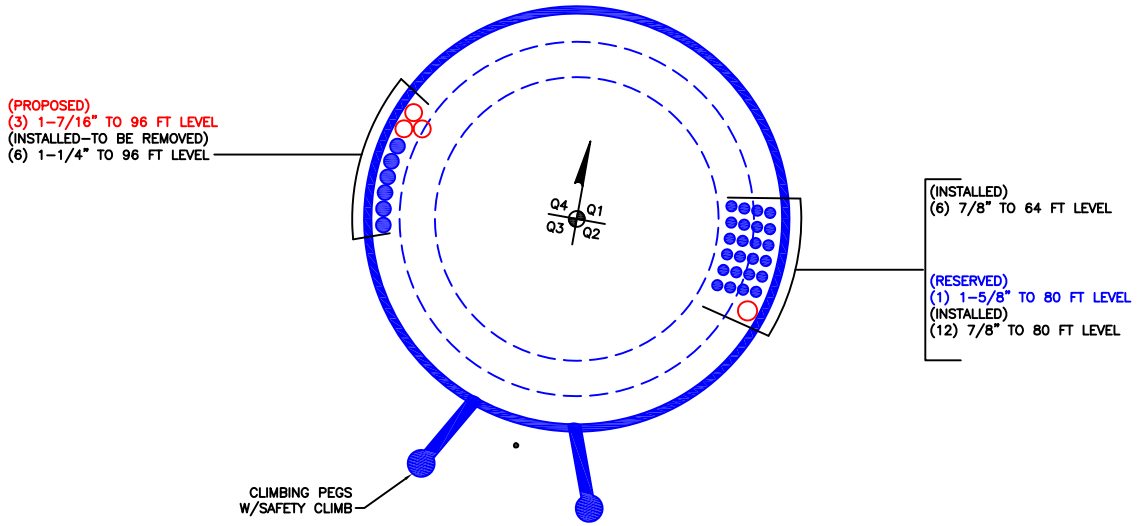
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	97.5 - 65 (1)	0.010	0.525	0.000	0.026	0.000	0.536 ✔	1.000	4.8.2 ✔
L2	65 - 32.5 (2)	0.010	0.595	0.000	0.018	0.000	0.605 ✔	1.000	4.8.2 ✔
L3	32.5 - 0 (3)	0.013	0.728	0.000	0.018	0.000	0.741 ✔	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	97.5 - 65	Pole	P24x1/4	1	-6.70	662.26	53.6	Pass
L2	65 - 32.5	Pole	P30x3/8	2	-12.95	1311.06	60.5	Pass
L3	32.5 - 0	Pole	P36x3/8	3	-19.07	1490.10	74.1	Pass
							Summary	
						Pole (L3)	74.1	Pass
						RATING =	**74.1**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 880538 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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#: *880538*
Site Name: *WEBER BASIN WATER*
App #: *206436 Rev. 0*

Pole Manufacturer:	*Rohn*

Anchor Rod Data		
Qty:	16	
Diam:	1.5	in
Rod Material:	Other	
Strength (Fu):	125	ksi
Yield (Fy):	109	ksi
Bolt Circle:	41	in

Plate Data		
Diam:	47	in
Thick:	2	in
Grade:	36	ksi
Single-Rod B-eff:	7.07	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:	36	in
Thick:	0.375	in
Grade:	42	ksi
# of Sides:	0	"0" IF Round
Fu	60	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions		
Mu:	975	ft-kips
Axial, Pu:	19	kips
Shear, Vu:	13	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

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

Anchor Rod Results

Max Rod (Cu+ Vu/ń):	74.2	Kips
Allowable Axial, Φ*Fu*Anet:	141.0	Kips
Anchor Rod Stress Ratio:	52.6%	**Pass**

Rigid
AISC LRFD
φ*Tn

Base Plate Results Flexural Check

Base Plate Stress:	Rohn/Pirod,	OK
Allowable Plate Stress:	32.4	ksi
Base Plate Stress Ratio:	Rohn/Pirod,	OK

Rigid
AISC LRFD
φ*Fy
Y.L. Length: 19.62

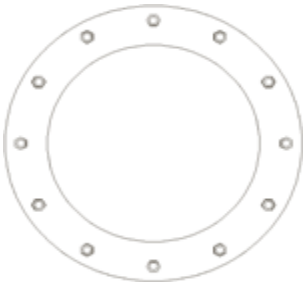
n/a

Stiffener Results N/A for Rohn / Pirod

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#: *880538*
Site Name: *WEBER BASIN WATER*
App #: *206436 Rev. 0*

Reactions		
Mu	208.4	ft-kips
Axial, Pu:	6.7	kips
Shear, Vu:	8.71	kips
Elevation:	65	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
76.54

Pole Manufacturer:	Rohn

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

Bolt Data			
Qty:	12		
Diameter (in.):	1.5	Bolt Fu:	105
Bolt Material:	A325	Bolt Fy:	81
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle (in.):	35		

Plate Data		
Diam:	41	in
Thick, t:	2	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	6.28	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:	24	in
Thick:	0.25	in
Grade:	42	ksi
# of Sides:	0	"0" IF Round
Fu	60	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

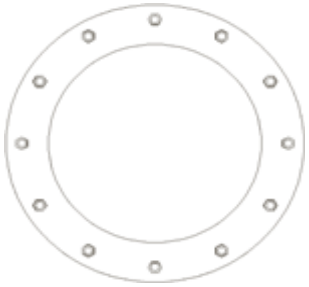
Bolt Tension Capacity, φ*Tn,**B1**:	111.04	kips	Rigid
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	111.03	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	23.26	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	2.535	in	
Min PL "treq" for actual **T w/ Pry**:	0.877	in	
Min PL "t1" for actual **T w/o Pry**:	1.160	in	
T allowable with Prying:	87.61	kips	0≤α'≤1 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	23.26	kips	
Prying Bolt Stress Ratio=(Tu+q)/(B):	20.9%	**Pass**	

Exterior Flange Plate Results Flexural Check

Compression Side Plate Stress:	Rohn/Pirod,	OK	Rigid
Allowable Plate Stress:	32.4	ksi	TIA G
Compression Plate Stress Ratio:	Rohn/Pirod,	OK	φ*Fy
No Prying			Comp. Y.L. Length: 25.48
Tension Side Stress Ratio, (treq/t)^2:	19.2%	**Pass**	

n/a

Stiffener Results	N/A for Rohn / Pirod
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#: *880538*
Site Name: *WEBER BASIN WATER*
App #: *206436 Rev. 0*

Reactions		
Mu	563.64	ft-kips
Axial, Pu:	12.95	kips
Shear, Vu:	11.81	kips
Elevation:	32.5	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
76.54

Pole Manufacturer: Rohn

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

Bolt Data			
Qty:	16		
Diameter (in.):	1.5	Bolt Fu:	105
Bolt Material:	A325	Bolt Fy:	81
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle (in.):	41		

Plate Data		
Diam:	47	in
Thick, t:	2	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	5.89	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:	30	in
Thick:	0.375	in
Grade:	42	ksi
# of Sides:	0	"0" IF Round
Fu	60	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

Bolt Tension Capacity, φ*Tn,**B1**:	111.04	kips	Rigid
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	111.03	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	40.43	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	2.618	in	
Min PL "treq" for actual **T w/ Pry**:	1.199	in	
Min PL "t1" for actual **T w/o Pry**:	1.580	in	
T allowable with Prying:	85.20	kips	0≤α'≤1 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	40.43	kips	
Prying Bolt Stress Ratio=(Tu+q)/(B):	36.4%	**Pass**	

Exterior Flange Plate Results Flexural Check — Rigid

Compression Side Plate Stress:	Rohn/Pirod, OK	TIA G
Allowable Plate Stress:	32.4 ksi	φ*Fy
Compression Plate Stress Ratio:	Rohn/Pirod, OK	Comp. Y.L. Length: 27.95

No Prying

Tension Side Stress Ratio, (treq/t)^2: 36.0% **Pass**

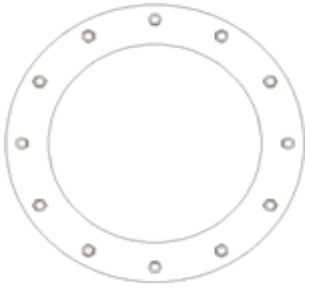
n/a

Stiffener Results N/A for Rohn / Pirod

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

CCI Foundation Tool Suite - Monopole Pier - Beta Release

CCI Foundation Tool Suite - v1.0 Date: 1/11/2014

BU:	880538
Site Name:	WEBER BASIN WATER
App Number:	206436 Rev. 0
Work Order:	699695

Monopole Drilled Pier

Input

Criteria

TIA Revision:	G
ACI 318 Revision:	2005
Seismic Category:	D

Forces

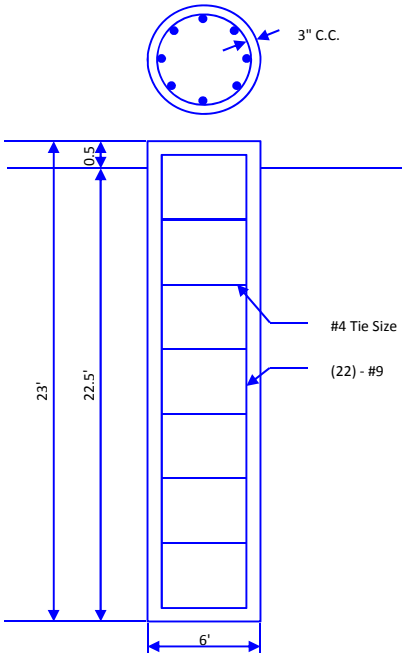
Compression	19	kips
Shear	13	kips
Moment	975	k-ft
Swelling Force	0	kips

Foundation Dimensions

Pier Diameter:	6	ft
Ext. above grade:	0.5	ft
Depth below grade:	22.5	ft

Material Properties

Number of Rebar:	22	
Rebar Size:	9	
Tie Size	4	
Rebar tensile strength:	60	ksi
Concrete Strength:	3000	psi
Ultimate Concrete Strain	0.003	in/in
Clear Cover to Ties:	3	in



Soil Profile: 1

Layer	Thickness (ft)	From (ft)	To (ft)	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (deg)	Ultimate Uplift Skin Friction (ksf)	Ultimate Comp. Skin Friction (ksf)	Ultimate Bearing Capacity (ksf)	SPT 'N' Counts
1	4.167	0	4.167	120	0	0	0	0	0	
2	2.333	4.167	6.5	120		30			0	
3	16	6.5	22.5	57.6		30				20

Analysis Results

Soil Lateral Capacity

Depth to Zero Shear:	5.80	ft
Max Moment, Mu:	1039.84	k-ft
Soil Safety Factor:	4.27	
Safety Factor Req'd:	1.33	
RATING:	31.2%	

Soil Axial Capacity

Skin Friction (k):	121.96	kips
End Bearing (k):	479.85	kips
Comp. Capacity (k), ϕCn:	601.81	kips
Comp. (k), Cu:	19.00	kips
RATING:	3.2%	

Concrete/Steel Check

Mu (from soil analysis)	1039.84	k-ft
ϕMn	2988.49	k-ft
RATING:	34.8%	

rho provided	0.54	
rho required	0.50	OK

Rebar Spacing	7.99	
Spacing required	18.05	OK

Dev. Length required	16.45	
Dev. Length provided	49.43	OK

Overall Foundation Rating: 34.8%

CCISeismic

Monopole Analysis
per *TIA-222-G*

Site BU:	880538
Work Order:	699695
Application:	206436 Rev. 0

From TNX:	Axial, W_t =	19.0	kips
	Shear, V_w =	13.0	kips

	degrees	minutes	seconds		
Site Latitude =	41	10	8.20	41.1689	degrees
Site Longitude =	-112	4	15.10	-112.0709	degrees
Mass or Stiffness Irregularities =	No			*(Table 2-9)*	
Ground Supported Structure =	Yes				
Structure Class =	II			*(Table 2-1)*	
Site Class =	D - Stiff Soil			*(Table 2-11)*	
Spectral response acceleration short periods, S_S =	1.085			USGS Seismic Tool	
Spectral response acceleration 1 s period, S_1 =	0.450				
Tower Height (AGL), H_t =	97.5			ft	
Importance Factor, I =	1.0			*(Table 2-3)*	
Acceleration-based site coefficient, F_a =	1.1			*(Table 2-12)*	
Velocity-based site coefficient, F_v =	1.6			*(Table 2-13)*	
Design spectral response acceleration short period, S_{DS} =	0.771			*(2.7.6)*	
Design spectral response acceleration 1 s period, S_{D1} =	0.465			*(2.7.6)*	
Calculated C_s =	0.514			*(2.7.7.1)*	
Base Seismic Shear, V_s =	8.1			kips	

Appurtenance Weight (top 1/3 of structure), W_u =	4.0	kips	
Average Moment of Inertia, I_{avg} =	3934.6	in^4	
Fundamental Frequency, F_f =	0.555	*(2.7.11.2)*	
F_f related variable, S_A =	0.258	*(2.7.8.1)*	

Calculated C_s =	0.172	*(2.7.7.1)*
Minimum C_s =	0.034	*(2.7.7.1)*
Minimum C_s when $S_1 \geq 0.75$ =	0.000	*(2.7.7.1)*
Final C_s =	0.172	
Alternative Base Seismic Shear, V_s =	2.7	kips

Seismic shear does not exceed 50% of wind shear. No further analysis is required per section 2.7.3 of TIA-222-G.

Linear Increment
10

Top 1/3 Weight
3.98328

Discrete							
Ht	Wt (kips)	a	b	c	S_{az}	Seismic Shear, F_{sz} (kips)	Seismic Induced Moment (kip-ft)
100	0.03	1.890	1.980	1.140	1.510	0.030	3.02
96	2.02078	1.832	1.689	1.034	1.365	1.839	176.51
80	1.5943	1.272	0.084	0.312	0.268	0.285	22.82
65	0.18	0.840	-0.118	0.066	-0.044	-0.005	-0.34
64	0.8343	0.814	-0.114	0.058	-0.043	-0.024	-1.54

Linear							
Mid Ht	Wt (kips)	a	b	c	S_{az}	Seismic Shear, F_{sz} (kips)	Seismic Induced Moment (kip-ft)
93	0.0108	1.720	1.198	0.845	1.096	0.008	0.73
85	0.018	1.436	0.356	0.470	0.523	0.006	0.53
75	0.0647	1.118	-0.059	0.198	0.092	0.004	0.30
65	0.0647	0.840	-0.118	0.066	-0.044	-0.002	-0.12
62	0.00792	0.764	-0.104	0.044	-0.036	0.000	-0.01
55	0.0845	0.601	-0.053	0.015	0.030	0.002	0.09
45	0.0845	0.403	0.017	0.006	0.140	0.008	0.35
35	0.0845	0.244	0.056	0.018	0.179	0.010	0.35
25	0.0845	0.124	0.070	0.034	0.169	0.010	0.24
15	0.0845	0.045	0.071	0.042	0.149	0.008	0.13
5	0.0845	0.005	0.045	0.025	0.094	0.005	0.03

Section Increment
10

Average Moment of Inertia (in^4)
3934.57

Monopole Section Data															
Height Above Base (ft)	Mid-Height, Z (ft)	Section Length (ft)	Number of Sides	Top Diameter (in)	Bottom Diameter (in)	Wall Thickness (in)	Volume (ft^3)	Weight (kips)	Average Moment of Inertia (in^4)	a	b	c	S_{az}	Seismic Shear, F_{sz} (kips)	Seismic Induced Moment (kip-ft)
97.5	92.5	10	0	24	24	0.25	1.295362	0.634727	1315.343	1.701	1.127	0.816	1.054	0.446	41.26
87.5	82.5	10	0	24	24	0.25	1.295362	0.634727	1315.343	1.353	0.201	0.385	0.386	0.163	13.47
77.5	72.5	10	0	24	24	0.25	1.295362	0.634727	1315.343	1.045	-0.096	0.155	0.032	0.014	0.98
67.5	66.25	2.5	0	24	24	0.25	0.32384	0.158682	1315.343	0.873	-0.121	0.077	-0.041	-0.004	-0.29
65	60	10	0	30	30	0.375	2.42369	1.187608	3829.445	0.716	-0.092	0.033	-0.023	-0.018	-1.09
55	50	10	0	30	30	0.375	2.42369	1.187608	3829.445	0.497	-0.015	0.007	0.091	0.072	3.60
45	40	10	0	30	30	0.375	2.42369	1.187608	3829.445	0.318	0.041	0.011	0.169	0.134	5.34
35	33.75	2.5	0	30	30	0.375	0.605922	0.296902	3829.445	0.226	0.059	0.020	0.179	0.036	1.20
32.5	27.5	10	0	36	36	0.375	2.914563	1.428136	6658.921	0.150	0.068	0.030	0.173	0.165	4.54
22.5	17.5	10	0	36	36	0.375	2.914563	1.428136	6658.921	0.061	0.072	0.041	0.154	0.147	2.57
12.5	7.5	10	0	36	36	0.375	2.914563	1.428136	6658.921	0.011	0.056	0.033	0.117	0.111	0.84
2.5	1.25	2.5	0	36	36	0.375	0.728641	0.357034	6658.921	0.000	0.014	0.008	0.032	0.008	0.01