Date: **September 14, 2012**

Jeremy Henson
Crown Castle
12725 Morris Road Extension, Suite 400
Alpharetta, GA 30004

Crown Castle
2000 Corporate Dr
Canonsburg, PA 15317
(724) 416-2509

Subject: **Structural Analysis Report**

Carrier Designation:	***T-Mobile* Co-Locate**	
	Carrier Site Number:	6FB1098A
	Carrier Site Name:	6FB1098A
Crown Castle Designation:	**Crown Castle BU Number:**	851864
	Crown Castle Site Name:	CCCN
	Crown Castle JDE Job Number:	187515
	Crown Castle Work Order Number:	528259
	Crown Castle Application Number:	160334 Rev. 1
Engineering Firm Designation:	**Crown Castle Project Number:**	528259
Site Data:	**7600 LYONS ROAD, Coconut Creek, Broward County, FL** **Latitude *26° 19' 27.31"*, Longitude *-80° 10' 50.83"*** **100 Foot - Monopole Tower**	

Dear Jeremy Henson,

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 528259, in accordance with application 160334, revision 1.

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:

LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2010 Florida Building Code based upon an ultimate 3-second gust wind speed of 170 mph converted to a nominal 3-second gust wind speed of 132 mph per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C and Risk Category II were used in this analysis.

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: Prashanth Kamath / Alex Mrkajic, EI

Respectfully submitted by:

Aaron C. Poot, P.E.
Manager Engineering

tnxTower Report - version 6.0.4.0

AARON C. POOT LICENSE No 63372 STATE OF FLORIDA PROFESSIONAL ENGINEER
9/14/12

Aaron C. Poot, P.E.
Professional Engineer License: #63372
Crown Castle USA, Inc.
Certificate of Authorization: #28970

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1) INTRODUCTION

This tower is a 100 ft Monopole tower designed by FWT INC. in August of 1997. The tower was originally designed for a wind speed of 126 mph per TIA/EIA-222-F.

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 132 mph with no ice and 60 mph under service loads, exposure category C with topographic category 1 and crest height of 0 feet.

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
70.0	73.0	3	cellmax technologies	CMA-B/6520/E0-8 w/ Mount Pipe	1	1-1/4	-
		6	cellmax technologies	CMA-BDHH/6520/E0-8 w/ Mount Pipe			
		3	nokia	FRIG			
		2	nokia	RG20-FXFB			
		1	raycap	ASU9338TYP01			

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
95.0	98.0	1	andrew	VHLP2-11	2 6	1/2 5/16	1
		1	andrew	VHLP2-23-CR1			
	97.0	3	clearwire	Type IV BTS DAP			
		3	powerwave technologies	P65-18-XXW2-RR w/ Mount Pipe			
	95.0	1	tower mounts	Side Arm Mount [SO 101-3]			
85.0	85.0	6	ericsson	RRUS-11	2 4	7/8 3/8	2
		2	kathrein	800 10765 K w/ Mount Pipe			
		1	kathrein	800 10766 K w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		2	kathrein	742-264 w/ Mount Pipe	18	7/8	1
		4	kathrein	800 10122 w/ Mount Pipe			
		2	rfs celwave	ATM192012B-0			
		4	rfs celwave	ATM19801712-0			
		6	rfs celwave	FDGW5504/3C-3L			
		1	tower mounts	Platform Mount [LP 712-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
70.0	73.0	9	rfs celwave	APXV18-206517S-C-A20 w/ Mount Pipe	-	-	3
		2	rfs celwave	ATMAP1412D-1A20			
	70.0	6	rfs celwave	ATMAP1412D-1A20	18	7/8	1
		1	tower mounts	Platform Mount [LP 306-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment To Be Removed: Feedlines to Remain

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	97	12	Decibel	Shielded DB874H Panel	-	-
		12	Generic	Canister Antenna Shroud (3' Diam.x54" High)		
93	93	2	Generic	HP 6' Diam.	-	-
75	75	12	Decibel	Shielded DB874H Panel	-	-
		12	Generic	Canister Antenna Shroud (3' Diam.x54" High)		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	PSI	2314469	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	WAYNE E. VENSEL	448042	CCISITES
4-TOWER MANUFACTURER DRAWINGS	FWT	792925	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.4.0), 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 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.

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	100 - 95.5	Pole	TP14x14x0.438	1	-0.420	1429.000	1.0	Pass
L2	95.5 - 42.0833	Pole	TP40.777x14x0.438	2	-15.078	3885.920	28.8	Pass
L3	42.0833 - 0	Pole	TP61x37.228x0.5	3	-33.031	6758.790	28.3	Pass
							Summary	
						Pole (L2)	28.8	Pass
						Rating =	28.8	Pass

Table 6 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	33.8	Pass
1	Base Plate	0	23.2	Pass
1	Base Foundation Soil Interaction	0	33.2	Pass

Structure Rating (max from all components) =	33.8%

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

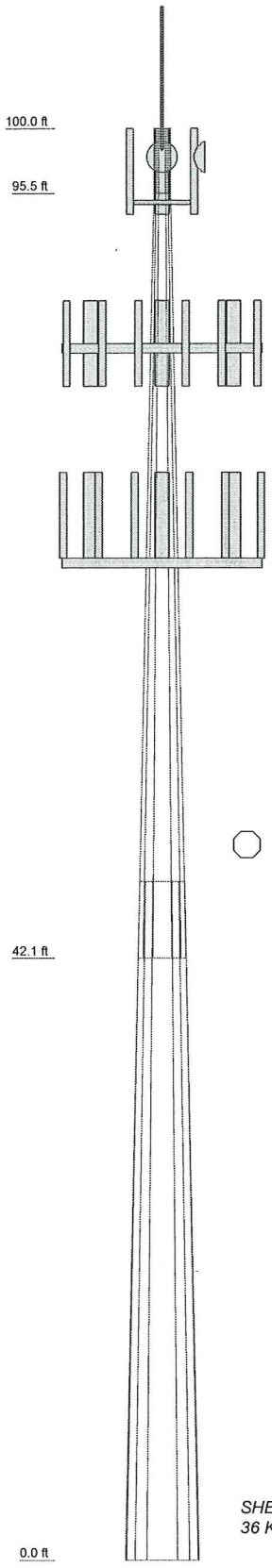
4.1) Recommendations

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

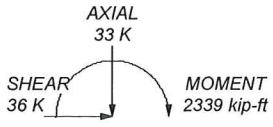
APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3
Length (ft)	4'6"	53'5"	47'5"
Number of Sides	8	18	18
Thickness (in)	0.438	0.438	0.500
Socket Length (ft)		5'4"	
Top Dia (in)	14.000	14.000	37.228
Bot Dia (in)	14.000	40.777	61.000
Grade		A572-65	
Weight (K)	0.3	6.8	12.4



ALL REACTIONS ARE FACTORED



TORQUE 4 kip-ft
REACTIONS - 132 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8" x 7'	103.5	(2) RRUS-11	85
P65-18-XXW2-RR w/ Mount Pipe	95	DC6-48-60-18-8F	85
P65-18-XXW2-RR w/ Mount Pipe	95	Platform Mount [LP 712-1]	85
P65-18-XXW2-RR w/ Mount Pipe	95	(2) 800 10122 w/ Mount Pipe	85
Type IV BTS DAP	95	(2) 800 10122 w/ Mount Pipe	85
Type IV BTS DAP	95	CMA-B/6520/E0-8 w/ Mount Pipe	70
Type IV BTS DAP	95	(2) CMA-BDHH/6520/E0-8 w/ Mount Pipe	70
Side Arm Mount [SO 101-3]	95		
7'x2" Antenna Mount Pipe	95	(2) CMA-BDHH/6520/E0-8 w/ Mount Pipe	70
7'x2" Antenna Mount Pipe	95		
7'x2" Antenna Mount Pipe	95	(2) CMA-BDHH/6520/E0-8 w/ Mount Pipe	70
VHLP2-23-CR1	95		
VHLP2-11	95	(3) ATMAP1412D-1A20	70
(2) 742-264 w/ Mount Pipe	85	(2) ATMAP1412D-1A20	70
800 10765 K w/ Mount Pipe	85	ATMAP1412D-1A20	70
800 10765 K w/ Mount Pipe	85	FRIG	70
800 10766 K w/ Mount Pipe	85	FRIG	70
(2) ATM19801712-0	85	FRIG	70
(2) ATM192012B-0	85	ASU9338TYP01	70
(2) ATM19801712-0	85	RG20-FXFB	70
(2) FDGW5504/3C-3L	85	RG20-FXFB	70
(2) FDGW5504/3C-3L	85	Platform Mount [LP 306-1]	70
(2) FDGW5504/3C-3L	85	CMA-B/6520/E0-8 w/ Mount Pipe	70
(2) RRUS-11	85	CMA-B/6520/E0-8 w/ Mount Pipe	70
(2) RRUS-11	85		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Broward County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 132 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: 28.8%

CROWN CASTLE
WE ARE SOLUTIONS

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Job: *BU 851864*			
Project:			
Client: Crown Castle	Drawn by: AMrkajic		App'd:
Code: TIA-222-G	Date: 09/14/12		Scale: NTS
Path: R:\SA Models - Letters\Work Area\AMrkajic\India QA\851864\851864.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 Broward County, Florida.
5) Basic wind speed of 132 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, feedline 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				

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	100'-95'6"	4'6"	0'	8	14.000	14.000	0.438	1.750	A572-65 (65 ksi)
L2	95'6"-42'1"	53'5"	5'4"	18	14.000	40.777	0.438	1.750	A572-65 (65 ksi)
L3	42'1"-0'	47'5"		18	37.228	61.000	0.500	2.000	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	15.153	19.700	478.048	4.937	7.574	63.117	979.213	9.601	3.985	9.108
	15.153	19.700	478.048	4.937	7.574	63.117	979.213	9.601	3.985	9.108
L2	14.216	18.833	437.665	4.815	7.112	61.539	875.906	9.418	1.694	3.872
	41.406	56.016	11516.326	14.321	20.715	555.949	23047.806	28.014	6.407	14.644
L3	40.518	58.288	9933.977	13.039	18.912	525.272	19881.025	29.150	5.672	11.344

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
	61.941	96.013	44399.748	21.477	30.988	1432.805	88857.917	48.016	9.856	19.712

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 100'-95'6"				1	1	1		
L2 95'6"-42'1"				1	1	1		
L3 42'1"-0'				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight klf
****									
LCF78-50J(7/8")	B	Surface Ar (CaAa)	85' - 0'	6	6	-0.100 0.000	1.100		0.001
12 PAIR(3/8")	B	Surface Ar (CaAa)	85' - 0'	4	2	0.000 0.050	0.400		0.000
WR-VG86ST-BRDA(7/8)	B	Surface Ar (CaAa)	85' - 0'	2	2	0.050 0.100	0.880		0.001
****									
Safety Line 3/8	B	Surface Ar (CaAa)	100' - 0'	1	1	0.000 0.000	0.375		0.000
****									

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
EC4-50(1/2")	C	No	Inside Pole	95' - 0'	2	No Ice	0.000	0.000
RG-11(5/16")	C	No	Inside Pole	95' - 0'	6	No Ice	0.000	0.000
3" Conduit	C	No	Inside Pole	95' - 0'	2	No Ice	0.000	0.003
LCF78-50J(7/8")	B	No	Inside Pole	85' - 0'	12	No Ice	0.000	0.001
****								
EC5-50(7/8")	C	No	Inside Pole	70' - 0'	18	No Ice	0.000	0.000
ASU9323TYP01(1-1/4)	C	No	Inside Pole	70' - 0'	1	No Ice	0.000	0.001
****								

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	100'-95'6"	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.169	0.000	0.001
		C	0.000	0.000	0.000	0.000	0.000
L2	95'6"-42'1"	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	41.315	0.000	0.510
		C	0.000	0.000	0.000	0.000	0.551
L3	42'1"-0'	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	40.126	0.000	0.498
		C	0.000	0.000	0.000	0.000	0.588

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	100'-95'6"	0.045	-0.026	0.045	-0.026
L2	95'6"-42'1"	0.863	-0.545	0.863	-0.545
L3	42'1"-0'	1.024	-0.647	1.024	-0.647

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	13	Safety Line 3/8	95.50 - 100.00	1.0000	1.0000
L2	5	LCF78-50J(7/8")	42.08 - 85.00	1.0000	1.0000
L2	7	12 PAIR(3/8")	42.08 - 85.00	1.0000	1.0000
L2	8	WR-VG86ST-BRDA(7/8)	42.08 - 85.00	1.0000	1.0000
L2	13	Safety Line 3/8	42.08 - 95.50	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Lightning Rod 5/8" x 7' ****	C	None		0.000	103'6"	No Ice	0.438	0.438	0.030
P65-18-XXW2-RR w/ Mount Pipe	A	From Leg	2.000 0' 2'	0.000	95'	No Ice	6.537	3.237	0.038
P65-18-XXW2-RR w/ Mount Pipe	B	From Leg	2.000 0' 2'	0.000	95'	No Ice	6.537	3.237	0.038
P65-18-XXW2-RR w/ Mount Pipe	C	From Leg	2.000 0' 2'	0.000	95'	No Ice	6.537	3.237	0.038
Type IV BTS DAP	A	From Leg	2.000 0' 2'	0.000	95'	No Ice	1.050	2.275	0.045
Type IV BTS DAP	B	From Leg	2.000 0' 2'	0.000	95'	No Ice	1.050	2.275	0.045
Type IV BTS DAP	C	From Leg	2.000 0' 2'	0.000	95'	No Ice	1.050	2.275	0.045
Side Arm Mount [SO 101-3]	C	None		0.000	95'	No Ice	7.500	7.500	0.252
7'x2" Antenna Mount Pipe	A	From Leg	2.000 0'	0.000	95'	No Ice	1.663	1.663	0.026

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
7'x2" Antenna Mount Pipe	B	From Leg	0' 2.000 0'	0.000	95'	No Ice	1.663	1.663	0.026
7'x2" Antenna Mount Pipe	C	From Leg	0' 2.000 0'	0.000	95'	No Ice	1.663	1.663	0.026
****									
(2) 800 10122 w/ Mount Pipe	A	From Leg	0' 4.000 0'	0.000	85'	No Ice	7.855	6.653	0.086
(2) 800 10122 w/ Mount Pipe	B	From Leg	0' 4.000 0'	0.000	85'	No Ice	7.855	6.653	0.086
(2) 742-264 w/ Mount Pipe	C	From Leg	0' 4.000 0'	0.000	85'	No Ice	5.425	4.192	0.056
800 10765 K w/ Mount Pipe	A	From Leg	0' 4.000 0'	0.000	85'	No Ice	8.876	6.701	0.077
800 10765 K w/ Mount Pipe	B	From Leg	0' 4.000 0'	0.000	85'	No Ice	8.876	6.701	0.077
800 10766 K w/ Mount Pipe	C	From Leg	0' 4.000 0'	0.000	85'	No Ice	11.549	8.938	0.095
(2) ATM19801712-0	A	From Leg	0' 4.000 0'	0.000	85'	No Ice	1.118	0.583	0.019
(2) ATM192012B-0	B	From Leg	0' 4.000 0'	0.000	85'	No Ice	1.118	0.583	0.011
(2) ATM19801712-0	C	From Leg	0' 4.000 0'	0.000	85'	No Ice	1.118	0.583	0.019
(2) FDGW5504/3C-3L	A	From Leg	0' 4.000 0'	0.000	85'	No Ice	0.386	0.080	0.003
(2) FDGW5504/3C-3L	B	From Leg	0' 4.000 0'	0.000	85'	No Ice	0.386	0.080	0.003
(2) FDGW5504/3C-3L	C	From Leg	0' 4.000 0'	0.000	85'	No Ice	0.386	0.080	0.003
(2) RRUS-11	A	From Leg	0' 4.000 0'	0.000	85'	No Ice	4.424	1.186	0.055
(2) RRUS-11	B	From Leg	0' 4.000 0'	0.000	85'	No Ice	4.424	1.186	0.055
(2) RRUS-11	C	From Leg	0' 4.000 0'	0.000	85'	No Ice	4.424	1.186	0.055
DC6-48-60-18-8F	A	From Leg	0' 4.000 0'	0.000	85'	No Ice	1.266	1.266	0.020
Platform Mount [LP 712-1]	C	None		0.000	85'	No Ice	24.530	24.530	1.335
****									
CMA-B/6520/E0-8 w/ Mount Pipe	A	From Leg	4.000 0' 3'	0.000	70'	No Ice	5.234	4.994	0.052
CMA-B/6520/E0-8 w/ Mount Pipe	B	From Leg	4.000 0' 3'	0.000	70'	No Ice	5.234	4.994	0.052
CMA-B/6520/E0-8 w/	C	From Leg	4.000	0.000	70'	No Ice	5.234	4.994	0.052

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
Mount Pipe			0' 3'						
(2) CMA-BDHH/6520/E0-8 w/ Mount Pipe	A	From Leg	4.000 0' 3'	0.000	70'	No Ice	10.224	5.099	0.085
(2) CMA-BDHH/6520/E0-8 w/ Mount Pipe	B	From Leg	4.000 0' 3'	0.000	70'	No Ice	10.224	5.099	0.085
(2) CMA-BDHH/6520/E0-8 w/ Mount Pipe	C	From Leg	4.000 0' 3'	0.000	70'	No Ice	10.224	5.099	0.085
(3) ATMAP1412D-1A20	A	From Leg	4.000 0' 0'	0.000	70'	No Ice	0.467	1.167	0.013
(2) ATMAP1412D-1A20	B	From Leg	4.000 0' 0'	0.000	70'	No Ice	0.467	1.167	0.013
ATMAP1412D-1A20	C	From Leg	4.000 0' 0'	0.000	70'	No Ice	0.467	1.167	0.013
FRIG	A	From Leg	4.000 0' 3'	0.000	70'	No Ice	2.793	1.103	0.057
FRIG	B	From Leg	4.000 0' 3'	0.000	70'	No Ice	2.793	1.103	0.057
FRIG	C	From Leg	4.000 0' 3'	0.000	70'	No Ice	2.793	1.103	0.057
ASU9338TYP01	A	From Leg	4.000 0' 3'	0.000	70'	No Ice	3.737	1.155	0.019
RG20-FXFB	B	From Leg	4.000 0' 3'	0.000	70'	No Ice	0.981	1.117	0.055
RG20-FXFB	C	From Leg	4.000 0' 3'	0.000	70'	No Ice	0.981	1.117	0.055
Platform Mount [LP 306-1]	C	None		0.000	70'	No Ice	20.810	20.810	1.616
****									

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
VHLP2-23-CR1	A	Paraboloid w/Shroud (HP)	From Leg	2.000 0' 3'	60.000		95'	2.175	No Ice	3.720	0.031
VHLP2-11	B	Paraboloid w/o Radome	From Leg	2.000 0' 3'	60.000		95'	2.175	No Ice	3.720	0.027
****											

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	100 - 95.5	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	8	-0.433	-2.984	0.311
			Max. Mx	21	-0.313	3.064	-0.344
			Max. My	2	-0.420	-0.391	3.862
			Max. Vy	20	-1.224	3.055	-0.331
			Max. Vx	2	-1.496	-0.391	3.862
			Max. Torque	23			-2.145
L2	95.5 - 42.0833	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	8	-15.113	-819.420	7.111
			Max. Mx	20	-15.110	822.715	-8.074
			Max. My	2	-15.097	-8.745	840.158
			Max. Vy	20	-25.849	822.715	-8.074
			Max. Vx	2	-26.224	-8.745	840.158
			Max. Torque	22			-4.082
L3	42.0833 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	8	-33.032	-2242.389	14.462
			Max. Mx	20	-33.032	2248.717	-16.412
			Max. My	2	-33.031	-17.703	2284.787
			Max. Vy	20	-34.536	2248.717	-16.412
			Max. Vx	2	-34.908	-17.703	2284.787

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Torque	22			-4.081

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	24	33.041	17.580	31.213
	Max. H_x	21	24.781	34.527	-0.182
	Max. H_z	2	33.041	-0.176	34.899
	Max. M_x	2	2284.787	-0.176	34.899
	Max. M_z	8	2242.389	-34.440	0.147
	Max. Torsion	10	2.805	-29.877	-17.186
	Min. Vert	11	24.781	-29.877	-17.186
	Min. H_x	8	33.041	-34.440	0.147
	Min. H_z	14	33.041	0.259	-34.745
	Min. M_x	14	-2268.093	0.259	-34.745
	Min. M_z	20	-2248.717	34.527	-0.182
	Min. Torsion	22	-4.080	29.861	17.540

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	27.534	0.000	0.000	-0.617	-0.943	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	33.041	0.176	-34.899	-2284.787	-17.703	2.109
0.9 Dead+1.6 Wind 0 deg - No Ice	24.781	0.176	-34.899	-2280.516	-17.379	2.109
1.2 Dead+1.6 Wind 30 deg - No Ice	33.041	17.280	-30.314	-1987.341	-1126.965	0.787
0.9 Dead+1.6 Wind 30 deg - No Ice	24.781	17.280	-30.314	-1983.598	-1124.671	0.786
1.2 Dead+1.6 Wind 60 deg - No Ice	33.041	29.855	-17.836	-1180.270	-1944.572	-0.221
0.9 Dead+1.6 Wind 60 deg - No Ice	24.781	29.855	-17.836	-1177.957	-1940.824	-0.222
1.2 Dead+1.6 Wind 90 deg - No Ice	33.041	34.440	-0.147	-14.462	-2242.389	-2.182
0.9 Dead+1.6 Wind 90 deg - No Ice	24.781	34.440	-0.147	-14.244	-2238.111	-2.182
1.2 Dead+1.6 Wind 120 deg - No Ice	33.041	29.877	17.186	1115.930	-1947.607	-2.805
0.9 Dead+1.6 Wind 120 deg - No Ice	24.781	29.877	17.186	1114.133	-1943.850	-2.805
1.2 Dead+1.6 Wind 150 deg - No Ice	33.041	17.794	30.902	2012.214	-1160.426	-2.581
0.9 Dead+1.6 Wind 150 deg - No Ice	24.781	17.794	30.902	2008.828	-1158.079	-2.581
1.2 Dead+1.6 Wind 180 deg - No Ice	33.041	-0.259	34.745	2268.093	23.653	-1.423
0.9 Dead+1.6 Wind 180 deg - No Ice	24.781	-0.259	34.745	2264.233	23.885	-1.423
1.2 Dead+1.6 Wind 210 deg - No Ice	33.041	-17.494	30.103	1964.983	1145.855	-0.230
0.9 Dead+1.6 Wind 210 deg - No Ice	24.781	-17.494	30.103	1961.664	1144.089	-0.229
1.2 Dead+1.6 Wind 240 deg - No Ice	33.041	-30.004	17.462	1141.844	1957.085	1.068
0.9 Dead+1.6 Wind 240 deg	24.781	-30.004	17.462	1139.991	1953.878	1.068

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
- No Ice 1.2 Dead+1.6 Wind 270 deg - No Ice	33.041	-34.527	0.182	16.412	2248.717	2.303
0.9 Dead+1.6 Wind 270 deg - No Ice	24.781	-34.527	0.182	16.563	2244.994	2.303
1.2 Dead+1.6 Wind 300 deg - No Ice	33.041	-29.861	-17.540	-1152.450	1943.695	4.080
0.9 Dead+1.6 Wind 300 deg - No Ice	24.781	-29.861	-17.540	-1150.198	1940.517	4.080
1.2 Dead+1.6 Wind 330 deg - No Ice	33.041	-17.580	-31.213	-2044.491	1137.010	3.331
0.9 Dead+1.6 Wind 330 deg - No Ice	24.781	-17.580	-31.213	-2040.659	1135.285	3.330
Dead+Wind 0 deg - Service	27.534	0.020	-4.032	-264.234	-2.861	0.244
Dead+Wind 30 deg - Service	27.534	1.996	-3.502	-229.904	-130.887	0.091
Dead+Wind 60 deg - Service	27.534	3.449	-2.061	-136.752	-225.246	-0.025
Dead+Wind 90 deg - Service	27.534	3.979	-0.017	-2.205	-259.616	-0.252
Dead+Wind 120 deg - Service	27.534	3.452	1.986	128.255	-225.595	-0.325
Dead+Wind 150 deg - Service	27.534	2.056	3.570	231.704	-134.749	-0.299
Dead+Wind 180 deg - Service	27.534	-0.030	4.014	261.228	1.911	-0.164
Dead+Wind 210 deg - Service	27.534	-2.021	3.478	226.246	131.426	-0.026
Dead+Wind 240 deg - Service	27.534	-3.467	2.018	131.246	225.052	0.124
Dead+Wind 270 deg - Service	27.534	-3.989	0.021	1.357	258.709	0.266
Dead+Wind 300 deg - Service	27.534	-3.450	-2.027	-133.542	223.507	0.472
Dead+Wind 330 deg - Service	27.534	-2.031	-3.606	-236.502	130.410	0.385

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	0.000	-27.534	0.000	0.000	27.534	0.000	0.000%
2	0.176	-33.041	-34.899	-0.176	33.041	34.899	0.000%
3	0.176	-24.781	-34.899	-0.176	24.781	34.899	0.000%
4	17.280	-33.041	-30.314	-17.280	33.041	30.314	0.000%
5	17.280	-24.781	-30.314	-17.280	24.781	30.314	0.000%
6	29.855	-33.041	-17.836	-29.855	33.041	17.836	0.000%
7	29.855	-24.781	-17.836	-29.855	24.781	17.836	0.000%
8	34.440	-33.041	-0.147	-34.440	33.041	0.147	0.000%
9	34.440	-24.781	-0.147	-34.440	24.781	0.147	0.000%
10	29.877	-33.041	17.186	-29.877	33.041	-17.186	0.000%
11	29.877	-24.781	17.186	-29.877	24.781	-17.186	0.000%
12	17.794	-33.041	30.902	-17.794	33.041	-30.902	0.000%
13	17.794	-24.781	30.902	-17.794	24.781	-30.902	0.000%
14	-0.259	-33.041	34.745	0.259	33.041	-34.745	0.000%
15	-0.259	-24.781	34.745	0.259	24.781	-34.745	0.000%
16	-17.494	-33.041	30.103	17.494	33.041	-30.103	0.000%
17	-17.494	-24.781	30.103	17.494	24.781	-30.103	0.000%
18	-30.004	-33.041	17.462	30.004	33.041	-17.462	0.000%
19	-30.004	-24.781	17.462	30.004	24.781	-17.462	0.000%
20	-34.527	-33.041	0.182	34.527	33.041	-0.182	0.000%
21	-34.527	-24.781	0.182	34.527	24.781	-0.182	0.000%
22	-29.861	-33.041	-17.540	29.861	33.041	17.540	0.000%
23	-29.861	-24.781	-17.540	29.861	24.781	17.540	0.000%
24	-17.580	-33.041	-31.213	17.580	33.041	31.213	0.000%
25	-17.580	-24.781	-31.213	17.580	24.781	31.213	0.000%
26	0.020	-27.534	-4.032	-0.020	27.534	4.032	0.000%
27	1.996	-27.534	-3.502	-1.996	27.534	3.502	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
28	3.449	-27.534	-2.061	-3.449	27.534	2.061	0.000%
29	3.979	-27.534	-0.017	-3.979	27.534	0.017	0.000%
30	3.452	-27.534	1.986	-3.452	27.534	-1.986	0.000%
31	2.056	-27.534	3.570	-2.056	27.534	-3.570	0.000%
32	-0.030	-27.534	4.014	0.030	27.534	-4.014	0.000%
33	-2.021	-27.534	3.478	2.021	27.534	-3.478	0.000%
34	-3.467	-27.534	2.018	3.467	27.534	-2.018	0.000%
35	-3.989	-27.534	0.021	3.989	27.534	-0.021	0.000%
36	-3.450	-27.534	-2.027	3.450	27.534	2.027	0.000%
37	-2.031	-27.534	-3.606	2.031	27.534	3.606	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	0.00001006
3	Yes	4	0.00000001	0.00000604
4	Yes	4	0.00000001	0.00002150
5	Yes	4	0.00000001	0.00001275
6	Yes	4	0.00000001	0.00001907
7	Yes	4	0.00000001	0.00001123
8	Yes	4	0.00000001	0.00000884
9	Yes	4	0.00000001	0.00000533
10	Yes	4	0.00000001	0.00001596
11	Yes	4	0.00000001	0.00000949
12	Yes	4	0.00000001	0.00002598
13	Yes	4	0.00000001	0.00001547
14	Yes	4	0.00000001	0.00000473
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00001855
17	Yes	4	0.00000001	0.00001095
18	Yes	4	0.00000001	0.00001712
19	Yes	4	0.00000001	0.00001010
20	Yes	4	0.00000001	0.00000890
21	Yes	4	0.00000001	0.00000536
22	Yes	4	0.00000001	0.00003291
23	Yes	4	0.00000001	0.00001982
24	Yes	4	0.00000001	0.00001758
25	Yes	4	0.00000001	0.00001044
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	100 - 95.5	2.377	37	0.218	0.004
L2	95.5 - 42.0833	2.172	37	0.218	0.004

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L3	47.4167 - 0	0.478	37	0.098	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
103'6"	Lightning Rod 5/8" x 7'	37	2.377	0.218	0.004	47864
98'	VHLP2-23-CR1	37	2.285	0.218	0.004	47864
95'	P65-18-XXW2-RR w/ Mount Pipe	37	2.149	0.217	0.003	47864
85'	(2) 800 10122 w/ Mount Pipe	37	1.713	0.206	0.003	32118
70'	CMA-B/6520/E0-8 w/ Mount Pipe	37	1.130	0.169	0.001	23533

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	100 - 95.5	20.573	24	1.885	0.034
L2	95.5 - 42.0833	18.798	24	1.882	0.030
L3	47.4167 - 0	4.138	24	0.853	0.003

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
103'6"	Lightning Rod 5/8" x 7'	24	20.573	1.885	0.034	5735
98'	VHLP2-23-CR1	24	19.781	1.885	0.033	5735
95'	P65-18-XXW2-RR w/ Mount Pipe	24	18.603	1.880	0.030	5735
85'	(2) 800 10122 w/ Mount Pipe	24	14.831	1.783	0.022	3801
70'	CMA-B/6520/E0-8 w/ Mount Pipe	24	9.785	1.465	0.012	2742

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	100 - 95.5 (1)	TP14x14x0.438	4'6"	0'	0.0	19.699	-0.420	1429.000	0.000
L2	95.5 - 42.0833 (2)	TP40.777x14x0.438	53'5"	0'	0.0	52.304	-15.078	3885.920	0.004
L3	42.0833 - 0 (3)	TP61x37.228x0.5	47'5"	0'	0.0	96.013	-33.031	6758.790	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	100 - 95.5 (1)	TP14x14x0.438	3.882	381.543	0.010	0.000	381.543	0.000
L2	95.5 - 42.0833 (2)	TP40.777x14x0.438	852.017	2998.608	0.284	0.000	2998.608	0.000
L3	42.0833 - 0 (3)	TP61x37.228x0.5	2339.392	8405.083	0.278	0.000	8405.083	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	100 - 95.5 (1)	TP14x14x0.438	1.502	714.502	0.002	0.933	781.252	0.001
L2	95.5 - 42.0833 (2)	TP40.777x14x0.438	26.985	1942.960	0.014	3.331	6004.558	0.001
L3	42.0833 - 0 (3)	TP61x37.228x0.5	35.833	3379.400	0.011	3.331	16830.749	0.000

Pole Interaction Design Data

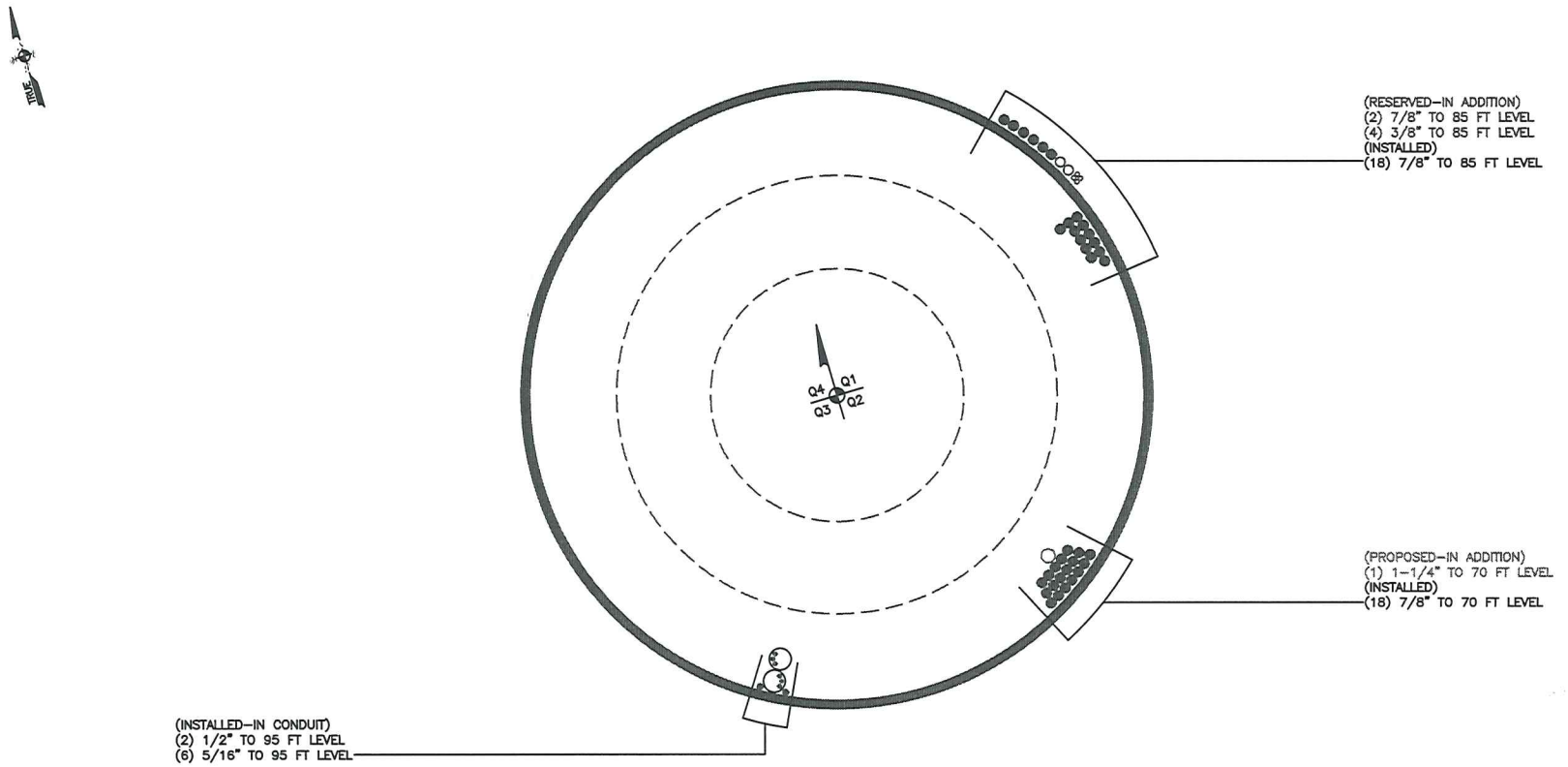
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	100 - 95.5 (1)	0.000	0.010	0.000	0.002	0.001	0.010 ✓	1.000	4.8.2 ✓
L2	95.5 - 42.0833 (2)	0.004	0.284	0.000	0.014	0.001	0.288 ✓	1.000	4.8.2 ✓
L3	42.0833 - 0 (3)	0.005	0.278	0.000	0.011	0.000	0.283 ✓	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	100 - 95.5	Pole	TP14x14x0.438	1	-0.420	1429.000	1.0	Pass
L2	95.5 - 42.0833	Pole	TP40.777x14x0.438	2	-15.078	3885.920	28.8	Pass
L3	42.0833 - 0	Pole	TP61x37.228x0.5	3	-33.031	6758.790	28.3	Pass
							Summary	
						Pole (L2)	28.8	Pass
						RATING =	**28.8**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 851864 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

BU#: *851864*
Site Name: *CCCN*
App #: *160334*

Loads Already Factored		
For M (WL)	1.3	<----Disregard
For P (DL)	1.3	<----Disregard

Pier Properties

Concrete:

Pier Diameter =	8.0	ft
Concrete Area =	7238.2	in^2

Reinforcement:

Clear Cover to **Tie**=	3.00	in
Horiz. **Tie** Bar Size=	4	
Vert. Cage Diameter =	7.30	ft
Vert. Cage Diameter =	87.59	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	57	
As Total=	88.92	in^2
A s/ Aconc, Rho:	0.0123	1.23%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	1.23%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	12254.29	kips
at Mu=(ϕ=0.65)Mn=	8165.22	ft-kips
Max Tu, (φ=0.9) Tn =	4801.68	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces

TIA Revision:	G	
Max. Factored Shaft Mu:	2566.046	ft-kips **(* Note)**
Max. Factored Shaft Pu:	33	kips
Max Axial Force Type:	Comp.	

(*) Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

Load Factor	Shaft Factored Loads		
1.00	Mu:	2566.046	ft-kips
1.00	Pu:	33	kips

Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	

ACI 318 Code

Select Analysis ACI Code= 2005

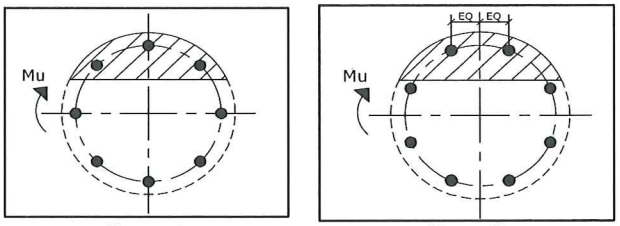
Seismic Properties

Seismic Design Category = B
Seismic Risk = **Low**

Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1 Case 2

Dist. From Edge to Neutral Axis: **21.67** in
Extreme Steel Strain, εt: **0.0097**
εt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	33.00	kips
Drilled Shaft Moment Capacity, φMn:	**14834.04**	ft-kips
Drilled Shaft Superimposed Mu:	**2566.05**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**17.3%**

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#: *851864*
Site Name: *CCCN*
App #: *160334*

Pole Manufacturer:	*Other*

Anchor Rod Data		
Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	68	in

Plate Data		
Diam:	74	in
Thick:	2.5	in
Grade:	60	ksi
Single-Rod B-eff:	9.68	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:	61	in
Thick:	0.5	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions		
Mu:	2339	ft-kips
Axial, Pu:	33	kips
Shear, Vu:	36	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

		Rigid
Max Rod (Cu+ Vu/ή):	87.8 Kips	AISC LRFD
Allowable Axial, Φ*Fu*Anet:	260.0 Kips	φ*Tn
Anchor Rod Stress Ratio:	33.8% Pass	

Base Plate Results Flexural Check

		Rigid
Base Plate Stress:	12.5 ksi	AISC LRFD
Allowable Plate Stress:	54.0 ksi	φ*Fy
Base Plate Stress Ratio:	23.2% Pass	Y.L. Length: 30.05

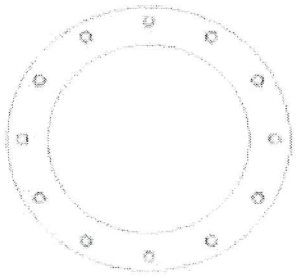
n/a

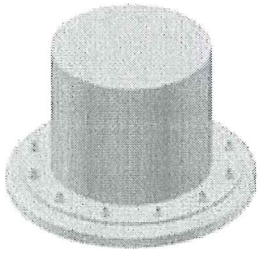
Stiffener Results

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

Terzaghi's Equation for Bearing Capacity

BU #: 851864
Site Name: CCCN
App. Name: 160334

Allowable Gross Bearing Capacity = 14.40 ksf

Footing Parameters		
Depth, **D**:	25.0	ft
Width, **W**:	8.0	ft
*Foundation Type, **T**:	D	
Type, **J (0, 1, 2):	1	

***Note: S= Shallow, D= Deep**

****Note: 0 = Strip, 1 = Round, 2 = Square**

Soil Parameters		
Unit Weight, **γ**:	0.0576	kcf
Cohesion, **Co**:	0.00	ksf
Phi Angle, **Φ**:	36.0	deg
Blows per foot @ Subgrade, **N**:	33	

Factors	
Nc:	50.6
Nq:	30.0
Nγ:	44.4

Modifiers	
Sc:	1.3
Sγ:	0.6

Monopole Drilled Pier

Checks capacity of a single drilled shaft foundation for a monopole per TIA-222-G

BU#: 851864
Site Name: *CCCN*
App Number: *160334*

ACI 318 Version:	2005

Factored Design Reactions		
Shear, **S**:	36.00	kips
Moment, **Mt**:	2339.00	ft-kips
Tower Weight, **Wt**:	33.00	kips
Tower Height, **H**:	100	ft
Base Diameter, **BD**:	61.0	in

Foundation Dimensions		
Caisson Diameter, **CD**:	8.0	ft
Ext. Above Grade, **E**:	1.0	ft
Depth Below Grade, **L**:	25.0	ft
Neglected Depth, **N**:	4.0	ft
Rebar Size, **Sp**:	11	
Rebar Quantity, **mp**:	57	
Tie Size, **tp**:	4	

Material Properties		
Rebar Tensile, **Fy**:	60	ksi
Concrete Strength, **F'c**:	3000	psi
Concrete Density, **δx**:	88	pcf
Clear Cover, **cc**:	3	in

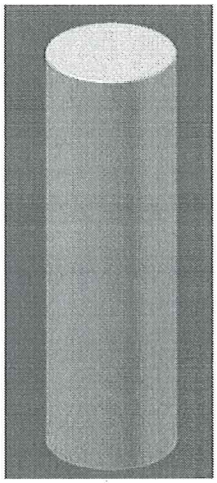
Soil Properties		
Soil Unit Weight, γ:	50	pcf
Ultimate Gross Bearing, **Bc**:	28.800	ksf
Seismic Design Cat, **z**:	B	

Caisson Analysis		
Depth to Zero Shear:	6.1	ft
Max Moment:	2566.05	ft-kips
Overturning FOS:	4.02	

Depth		Shear		Moment	
2.6	ft	36	kips	2439.8	ft-kips
5.2	ft	29.6	kips	2532.8	ft-kips
7.8	ft	-53.2	kips	2502.2	ft-kips

Design Checks	*Capacity/ Availability*	*Demand/ Limits*	*Check*
Bearing Pressure (ksf):	21.60	2.93	OK
Minimum Req'd Dia. (ft):	8.00	7.08	OK
Rebar Area (in²):	88.92	24.13	OK
Pier moment capacity (k-ft):	14834.04	2566.05	OK
Rebar spacing (in):	3.42	2 < Bs <18	OK
Development Length (in):	223.45	61.78	OK
Soil moment capacity (FOS):	4.02	1.33	OK

☐ **Assume 0.33% Minimum Steel?**



Bearing: 13.6%

Pier: 17.3%

Soil: 33.2%

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Project Title: BU 851864
Project Notes:

Calculation Method: Full 8CD

******* I N P U T D A T A

Pier Properties

Diameter (ft)	Distance of Top of Pier above Ground (ft)	Concrete Strength (ksi)	Steel Yield Strength (ksi)
8.00	1.00	3.00	60.00

Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Clay	2.00	0.00	109.1			
2	Clay	2.00	2.00	51.8			
3	Clay	6.00	4.00	51.8	2000.0		
4	Sand	6.00	10.00	51.8		3.255	32.00
5	Sand	8.00	16.00	46.7		3.255	32.00
6	Sand	11.00	24.00	51.8		3.852	36.00

Design (Factored) Loads at Top of Pier

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
2339.0	33.0	36.00	4.02

******* R E S U L T S

Calculated Pier Properties

Length (ft)	Weight (kips)	End Bearing Pressure (psf)
26.000	196.035	656.5

Ultimate Resisting Forces Along Pier

Type	Distance of Top of Layer to Top of Pier (ft)	Thickness (ft)	Density (lbs/ft^3)	CU (psf)	KP	Force (kips)	Arm (ft)
Clay	1.00	2.00	109.1			0.00	2.00
Clay	3.00	2.00	51.8			0.00	4.00
Clay	5.00	6.00	51.8	2000.0		768.00	8.00
Sand	11.00	4.86	51.8		3.255	288.21	13.57
Sand	15.86	1.14	51.8		3.255	-81.10	16.44
Sand	17.00	8.00	46.7		3.255	-706.24	21.22
Sand	25.00	1.00	51.8		3.852	-124.14	25.50

Shear and Moments Along Pier

Distance below Top of Pier (ft)	Shear (with Safety Factor) (kips)	Moment (with Safety Factor) (ft-k)	Shear (without Safety Factor) (kips)	Moment (without Safety Factor) (ft-k)
0.00	144.7	9431.8	36.0	2346.2
2.60	144.7	9808.1	36.0	2439.8
5.20	119.1	10181.8	29.6	2532.8
7.80	-213.7	10058.9	-53.2	2502.2
10.40	-546.5	9070.7	-135.9	2256.4
13.00	-730.2	7369.0	-181.6	1833.1
15.60	-893.4	5264.3	-222.2	1309.5
18.20	-739.3	3093.9	-183.9	769.6
20.80	-524.0	1446.2	-130.4	359.7
23.40	-284.1	390.3	-70.7	97.1
26.00	-19.4	-9.6	-4.8	-2.4