Date: **March 05, 2012**

Eva Morales
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
2730 Rowland Road
Raleigh, NC 27615
(919) 755-1012

Subject: **Structural Analysis Report**

Carrier Designation:	***Sprint PCS* – Interim Loading Co-Locate**	
	Carrier Site Number:	NY06XC474
	Carrier Site Name:	1 BRIDGE STREET
Crown Castle Designation:	**Crown Castle BU Number:**	878863
	Crown Castle Site Name:	1 BRIDGE STREET
	Crown Castle JDE Job Number:	180426
	Crown Castle Work Order Number:	473546
	Crown Castle Application Number:	142559 Rev. 0
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number:**	12-02738E S1
Site Data:	**1 Bridge St., Hillburn, Rockland County, NY**	
	Latitude *41° 8' 24.86"*, Longitude *-74° 10' 12.64"*	
	123 Foot - Monopole Tower	

Dear Eva Morales,

FDH Engineering, Inc. 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 451909, in accordance with application 142559, 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:

LC7: 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/EIA-222-F standard and based upon a wind speed of 80 mph fastest mile.

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 *FDH Engineering, Inc.* 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.

Respectfully submitted by:

Brad Smith, EI
Project Engineer

Neil J. Kuplic, PE
Vice President
NY PE License No. 076178-1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 123 ft Monopole tower designed by SUMMIT in December of 1998. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

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
123.0	125.0	3	alcatel lucent	1900MHz RRH (25MHz)	3	1-1/4”	1
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		9	rfs celwave	ACU-A20-N			
		1	rfs celwave	APXV9ERR18-C-A20 w/ Mount Pipe			
		2	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			

1. Proposed Equipment

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
123.0	125.0	3	decibel	932LG65T2A-M w/ Mount Pipe	9 6	7/8” 1-1/4”	1
		6	ems wireless	RR65-12-00DBL w/ Mount Pipe			
	123.0	1	crown mounts	Platform Mount [LP 101-1]			
114.0	114.0	3	allgon	7391.00 w/ Mount Pipe	12	1-1/4”	1
		3	andrew	DBXLH-9090A-VTM w/ Mount Pipe			
		12	andrew	ETD819G-12UB			
		1	crown mounts	T-Arm Mount [TA 602-3]			
		3	powerwave technologies	7740.00 w/ Mount Pipe			
106.0	106.0	6	andrew	ECC1920-VPUB	---	---	2
		6	andrew	ETD19V2S12UB			
		3	rfs celwave	APX16DWV-16DWVS-E-A20 w/ Mount Pipe			
		1	crown mounts	Side Arm Mount [SO 305-3]	6 1	1-1/4” 1/4"	1
69.0	70.0	1	lucent	KS24019-L112A	1	1/2"	1
	69.0	1	crown mounts	Side Arm Mount [SO 701-1]			

1. Existing Equipment
2. Reserved Equipment

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)
123	123	9	DAPA	58210	9	1-5/8"
112	115	9	Swedcom	ALP-9212-N	9	1-5/8"
102	105	9	Swedcom	ALP-9212-N	9	1-5/8"
70	70	1	Generic	GPS	1	1-5/8"

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Tectonic Engineering Consultants P.C. (September 2, 1997)	1563270	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	FDH Engineering, Inc. (May 7, 2009)	1620553	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit Manufacturing, LLC (December 11, 1998)	1619431	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) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, Inc. 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	123 - 73	Pole	TP27.5x16.5x0.1875	1	-6.59	821.19	97.6	Pass
L2	73 - 37.5	Pole	TP34.94x26.355x0.3125	2	-11.39	1734.47	71.7	Pass
L3	37.5 - 0	Pole	TP42.56x33.3244x0.3125	3	-18.61	2178.48	76.9	Pass
							Summary	
						Pole (L1)	97.6	Pass
						Rating =	97.6	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	59.4	Pass
1	Base Plate	0	60.0	Pass
1	Base Foundation	0	49.9	Pass
1	Base Foundation Soil Interaction	0	50.0	Pass

Structure Rating (max from all components) =	97.6%

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

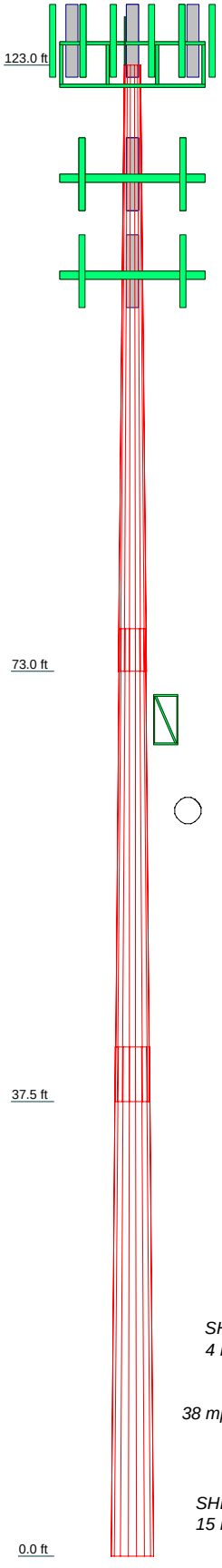
4.1) Recommendations

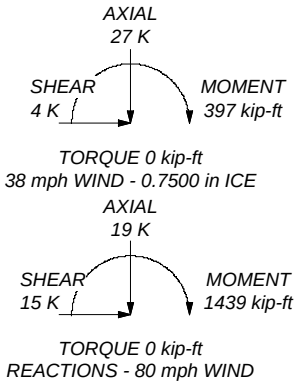
1. Coax must be installed as shown in Appendix B.

APPENDIX A

TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	50.00	18	0.1875	3.50	16.5000	27.5000		2.2
2	39.00	18	0.3125	4.50	26.3550	34.9400	A607-65	4.0
3	42.00	18	0.3125		33.3244	42.5600		5.3
								11.5





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	123	DBXLH-9090A-VTM w/ Mount Pipe	114
932LG65T2A-M w/ Mount Pipe	123	DBXLH-9090A-VTM w/ Mount Pipe	114
932LG65T2A-M w/ Mount Pipe	123	DBXLH-9090A-VTM w/ Mount Pipe	114
932LG65T2A-M w/ Mount Pipe	123	7740.00 w/ Mount Pipe	114
(2) RR65-12-00DBL w/ Mount Pipe	123	7740.00 w/ Mount Pipe	114
(2) RR65-12-00DBL w/ Mount Pipe	123	7740.00 w/ Mount Pipe	114
(2) RR65-12-00DBL w/ Mount Pipe	123	(4) ETD819G-12UB	114
APXV9ERR18-C-A20 w/ Mount Pipe	123	(4) ETD819G-12UB	114
APXVSPP18-C-A20 w/ Mount Pipe	123	(4) ETD819G-12UB	114
APXVSPP18-C-A20 w/ Mount Pipe	123	T-Arm Mount [TA 602-3]	114
1900MHz RRH (25MHz)	123	APX16DWV-16DWVS-E-A20 w/ Mount Pipe	106
1900MHz RRH (25MHz)	123	APX16DWV-16DWVS-E-A20 w/ Mount Pipe	106
1900MHz RRH (25MHz)	123	APX16DWV-16DWVS-E-A20 w/ Mount Pipe	106
800 EXTERNAL NOTCH FILTER	123	(2) ECC1920-VPUB	106
800 EXTERNAL NOTCH FILTER	123	(2) ECC1920-VPUB	106
800 EXTERNAL NOTCH FILTER	123	(2) ECC1920-VPUB	106
800MHZ RRH	123	(2) ETD19V2S12UB	106
800MHZ RRH	123	(2) ETD19V2S12UB	106
800MHZ RRH	123	(2) ETD19V2S12UB	106
(3) ACU-A20-N	123	Side Arm Mount [SO 305-3]	106
(3) ACU-A20-N	123	KS24019-L112A	69
(3) ACU-A20-N	123	Side Arm Mount [SO 701-1]	69
Platform Mount (LP 101-1)	123		
7391.00 w/ Mount Pipe	114		
7391.00 w/ Mount Pipe	114		
7391.00 w/ Mount Pipe	114		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Rockland County, New York.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 97.6%

FDH Engineering, Inc.
2730 Rowland Road
Raleigh, NC 27615
Phone: (919) 755-1012
FAX: (919) 755-1031
Tower Analysis

Job: BU: 878863			
Project: 12-02738E S1			
Client: Crown Castle	Drawn by: Bradley Smith	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/12	Scale: NTS	
Path: C:\Users\Bradley Smith\Desktop\1 Bridge St, NY\S1 - SA, SNV\Analysis\Bridge Street, NY (BU 878863).eri		Dwg No. E-1	

Tower Input Data

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

Tower is located in Rockland County, New York.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
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	123.00-73.00	50.00	3.50	18	16.5000	27.5000	0.1875	0.7500	A607-65 (65 ksi)
L2	73.00-37.50	39.00	4.50	18	26.3550	34.9400	0.3125	1.2500	A607-65 (65 ksi)
L3	37.50-0.00	42.00		18	33.3244	42.5600	0.3125	1.2500	A607-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia.	Area	I	r	C	I/C	J	It/Q	w	w/t
	in	in^2	in^4	in	in	in^3	in^4	in^2	in	
L1	16.7545	9.7080	326.3677	5.7909	8.3820	38.9367	653.1649	4.8549	2.5740	13.728
	27.9242	16.2544	1531.8986	9.6959	13.9700	109.6563	3065.8128	8.1287	4.5100	24.053
L2	27.5439	25.8309	2213.3108	9.2451	13.3883	165.3163	4429.5340	12.9179	4.0885	13.083
	35.4790	34.3462	5203.0477	12.2928	17.7495	293.1374	10412.9417	17.1763	5.5994	17.918
L3	34.8433	32.7437	4508.2383	11.7192	16.9288	266.3057	9022.4087	16.3750	5.3151	17.008
	43.2166	41.9042	9449.2522	14.9979	21.6205	437.0510	18910.9379	20.9561	6.9406	22.21

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft^2	in					in	in
L1 123.00-73.00				1	1	1		
L2 73.00-37.50				1	1	1		
L3 37.50-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

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

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number		C_AA_A	Weight
				ft			ft^2/ft	plf
***								
LDF5-50A(7/8")	A	No	Inside Pole	123.00 - 0.00	9	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
						2" Ice	0.00	0.33
						4" Ice	0.00	0.33
LDF6-50A(1-1/4")	A	No	Inside Pole	123.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
HB114-1-0813U4-M5J(1 1/4")	A	No	Inside Pole	123.00 - 0.00	3	No Ice	0.00	1.20
						1/2" Ice	0.00	1.20
						1" Ice	0.00	1.20
						2" Ice	0.00	1.20
						4" Ice	0.00	1.20
***								
LDF6-50A(1-1/4")	A	No	Inside Pole	114.00 - 0.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
***								
LDF1-50A(1/4")	B	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
						2" Ice	0.00	0.06
						4" Ice	0.00	0.06
LDF6-50A(1-1/4")	B	No	Inside Pole	106.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
***								
LDF4-50A(1/2")	A	No	Inside Pole	69.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
***								

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	123.00-73.00	A	0.000	0.000	0.000	0.000	0.85
		B	0.000	0.000	0.000	0.000	0.13
		C	0.000	0.000	0.000	0.000	0.00
L2	73.00-37.50	A	0.000	0.000	0.000	0.000	0.66
		B	0.000	0.000	0.000	0.000	0.14
		C	0.000	0.000	0.000	0.000	0.00
L3	37.50-0.00	A	0.000	0.000	0.000	0.000	0.70
		B	0.000	0.000	0.000	0.000	0.15
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	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	123.00-73.00	A	0.853	0.000	0.000	0.000	0.000	0.85
		B		0.000	0.000	0.000	0.000	0.13
		C		0.000	0.000	0.000	0.000	0.00
L2	73.00-37.50	A	0.797	0.000	0.000	0.000	0.000	0.66
		B		0.000	0.000	0.000	0.000	0.14
		C		0.000	0.000	0.000	0.000	0.00
L3	37.50-0.00	A	0.750	0.000	0.000	0.000	0.000	0.70
		B		0.000	0.000	0.000	0.000	0.15
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	123.00-73.00	0.0000	0.0000	0.0000	0.0000
L2	73.00-37.50	0.0000	0.0000	0.0000	0.0000
L3	37.50-0.00	0.0000	0.0000	0.0000	0.0000

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	C	From Leg	0.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.25 0.66 0.97 1.49 2.68	0.25 0.66 0.97 1.49 2.68	0.03 0.03 0.04 0.06 0.14
***									
932LG65T2A-M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.49 4.95 5.42 6.38 8.42	4.37 5.06 5.73 7.19 10.38	0.03 0.07 0.12 0.24 0.59
932LG65T2A-M w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.49 4.95 5.42 6.38 8.42	4.37 5.06 5.73 7.19 10.38	0.03 0.07 0.12 0.24 0.59
932LG65T2A-M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.49 4.95 5.42 6.38 8.42	4.37 5.06 5.73 7.19 10.38	0.03 0.07 0.12 0.24 0.59
(2) RR65-12-00DBL w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.84 6.29 6.76 7.72 9.77	4.45 5.12 5.80 7.22 10.31	0.04 0.08 0.14 0.27 0.64
(2) RR65-12-00DBL w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.84 6.29 6.76 7.72 9.77	4.45 5.12 5.80 7.22 10.31	0.04 0.08 0.14 0.27 0.64
(2) RR65-12-00DBL w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.84 6.29 6.76 7.72 9.77	4.45 5.12 5.80 7.22 10.31	0.04 0.08 0.14 0.27 0.64
APXV9ERR18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	7.47 8.66 9.56 11.39 15.53	0.09 0.16 0.23 0.42 0.94
APXVSPP18-C-A20 w/	B	From Leg	4.00	0.0000	123.00	No Ice	8.50	6.95	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Mount Pipe			0.00			1/2" Ice	9.15	8.13	0.15
			2.00			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.00	0.0000	123.00	No Ice	8.50	6.95	0.08
			0.00			1/2" Ice	9.15	8.13	0.15
			2.00			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
1900MHz RRH (25MHz)	A	From Leg	4.00	0.0000	123.00	No Ice	2.70	2.77	0.06
			0.00			1/2" Ice	2.94	3.01	0.08
			2.00			1" Ice	3.18	3.26	0.11
						2" Ice	3.70	3.78	0.18
						4" Ice	4.85	4.93	0.35
1900MHz RRH (25MHz)	B	From Leg	4.00	0.0000	123.00	No Ice	2.70	2.77	0.06
			0.00			1/2" Ice	2.94	3.01	0.08
			2.00			1" Ice	3.18	3.26	0.11
						2" Ice	3.70	3.78	0.18
						4" Ice	4.85	4.93	0.35
1900MHz RRH (25MHz)	C	From Leg	4.00	0.0000	123.00	No Ice	2.70	2.77	0.06
			0.00			1/2" Ice	2.94	3.01	0.08
			2.00			1" Ice	3.18	3.26	0.11
						2" Ice	3.70	3.78	0.18
						4" Ice	4.85	4.93	0.35
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00	0.0000	123.00	No Ice	0.77	0.37	0.01
			0.00			1/2" Ice	0.89	0.46	0.02
			2.00			1" Ice	1.02	0.56	0.02
						2" Ice	1.30	0.79	0.04
						4" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00	0.0000	123.00	No Ice	0.77	0.37	0.01
			0.00			1/2" Ice	0.89	0.46	0.02
			2.00			1" Ice	1.02	0.56	0.02
						2" Ice	1.30	0.79	0.04
						4" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00	0.0000	123.00	No Ice	0.77	0.37	0.01
			0.00			1/2" Ice	0.89	0.46	0.02
			2.00			1" Ice	1.02	0.56	0.02
						2" Ice	1.30	0.79	0.04
						4" Ice	1.97	1.34	0.11
800MHZ RRH	A	From Leg	4.00	0.0000	123.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			2.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
800MHZ RRH	B	From Leg	4.00	0.0000	123.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			2.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
800MHZ RRH	C	From Leg	4.00	0.0000	123.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			2.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
(3) ACU-A20-N	A	From Leg	4.00	0.0000	123.00	No Ice	0.08	0.14	0.00
			0.00			1/2" Ice	0.12	0.19	0.00
			2.00			1" Ice	0.17	0.25	0.00

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" Ice	0.30	0.40	0.01
						4" Ice	0.67	0.80	0.04
(3) ACU-A20-N	B	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.08 0.12 0.17 0.30 0.67	0.14 0.19 0.25 0.40 0.80	0.00 0.00 0.00 0.01 0.04
(3) ACU-A20-N	C	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.08 0.12 0.17 0.30 0.67	0.14 0.19 0.25 0.40 0.80	0.00 0.00 0.00 0.01 0.04
Platform Mount (LP 101-1)	C	None		0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	36.21 42.82 49.43 62.65 89.09	36.21 42.82 49.43 62.65 89.09	1.50 2.30 3.10 4.70 7.89
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7391.00 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.91 6.40 6.89 7.90 10.04	4.04 4.76 5.43 6.83 10.02	0.04 0.08 0.13 0.26 0.63
7391.00 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.91 6.40 6.89 7.90 10.04	4.04 4.76 5.43 6.83 10.02	0.04 0.08 0.13 0.26 0.63
7391.00 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.91 6.40 6.89 7.90 10.04	4.04 4.76 5.43 6.83 10.02	0.04 0.08 0.13 0.26 0.63
DBXLH-9090A-VTM w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.93 8.44 8.95 9.99 12.21	3.95 4.63 5.29 6.66 9.82	0.05 0.10 0.16 0.30 0.70
DBXLH-9090A-VTM w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.93 8.44 8.95 9.99 12.21	3.95 4.63 5.29 6.66 9.82	0.05 0.10 0.16 0.30 0.70
DBXLH-9090A-VTM w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.93 8.44 8.95 9.99 12.21	3.95 4.63 5.29 6.66 9.82	0.05 0.10 0.16 0.30 0.70
7740.00 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.61 4.01 4.44 5.38 7.37	3.33 4.01 4.66 6.01 9.00	0.04 0.07 0.11 0.21 0.51
7740.00 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.61 4.01 4.44 5.38	3.33 4.01 4.66 6.01	0.04 0.07 0.11 0.21

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	7.37	9.00	0.51
7740.00 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.61 4.01 4.44 5.38 7.37	3.33 4.01 4.66 6.01 9.00	0.04 0.07 0.11 0.21 0.51
(4) ETD819G-12UB	A	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.15 2.35 2.55 2.99 3.97	0.48 0.60 0.74 1.04 1.73	0.03 0.04 0.06 0.09 0.20
(4) ETD819G-12UB	B	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.15 2.35 2.55 2.99 3.97	0.48 0.60 0.74 1.04 1.73	0.03 0.04 0.06 0.09 0.20
(4) ETD819G-12UB	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.15 2.35 2.55 2.99 3.97	0.48 0.60 0.74 1.04 1.73	0.03 0.04 0.06 0.09 0.20
T-Arm Mount [TA 602-3]	C	None		0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.59 15.44 19.29 26.99 42.39	11.59 15.44 19.29 26.99 42.39	0.77 0.99 1.21 1.64 2.50
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APX16DWV-16DWVS-E-A 20 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.47 7.99 8.52 9.59 11.87	3.49 4.26 4.96 6.40 9.49	0.06 0.11 0.16 0.30 0.68
APX16DWV-16DWVS-E-A 20 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.47 7.99 8.52 9.59 11.87	3.49 4.26 4.96 6.40 9.49	0.06 0.11 0.16 0.30 0.68
APX16DWV-16DWVS-E-A 20 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.47 7.99 8.52 9.59 11.87	3.49 4.26 4.96 6.40 9.49	0.06 0.11 0.16 0.30 0.68
(2) ECC1920-VPUB	A	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.54 0.64 0.75 0.99 1.59	0.21 0.28 0.36 0.55 1.02	0.01 0.01 0.02 0.03 0.09
(2) ECC1920-VPUB	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.54 0.64 0.75 0.99 1.59	0.21 0.28 0.36 0.55 1.02	0.01 0.01 0.02 0.03 0.09
(2) ECC1920-VPUB	C	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.54 0.64 0.75 0.99 1.59	0.21 0.28 0.36 0.55 1.02	0.01 0.01 0.02 0.03 0.09

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
(2) ETD19V2S12UB	A	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.21 0.30 0.39 0.60 1.12	0.01 0.02 0.02 0.04 0.10
(2) ETD19V2S12UB	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.21 0.30 0.39 0.60 1.12	0.01 0.02 0.02 0.04 0.10
(2) ETD19V2S12UB	C	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.21 0.30 0.39 0.60 1.12	0.01 0.02 0.02 0.04 0.10
Side Arm Mount [SO 305-3]	C	None		0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.64 4.10 5.56 8.48 14.32	2.64 4.10 5.56 8.48 14.32	0.09 0.13 0.17 0.25 0.41
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KS24019-L112A	B	From Leg	4.00 0.00 1.00	0.0000	69.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.16 0.22 0.30 0.48 0.95	0.16 0.22 0.30 0.48 0.95	0.01 0.01 0.01 0.02 0.06
Side Arm Mount [SO 701-1]	B	From Leg	2.00 0.00 0.00	0.0000	69.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.85 1.14 1.43 2.01 3.17	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18
***									

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp

Comb. No.	Description
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	123 - 73	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-13.08	0.02	0.03
			Max. Mx	11	-6.59	434.13	0.02
			Max. My	2	-6.59	0.00	433.09
			Max. Vy	5	11.17	-434.10	0.04
			Max. Vx	8	11.15	0.01	-433.02
			Max. Torque	11			-0.10
L2	73 - 37.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-18.78	-0.26	-0.13
			Max. Mx	5	-11.39	-851.36	0.26
			Max. My	8	-11.39	0.15	-849.81
			Max. Vy	5	12.98	-851.36	0.26
			Max. Vx	8	12.97	0.15	-849.81
			Max. Torque	8			0.17
L3	37.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-27.24	-0.26	-0.13
			Max. Mx	5	-18.61	-1438.94	0.77
			Max. My	8	-18.61	0.67	-1437.07
			Max. Vy	5	15.01	-1438.94	0.77
			Max. Vx	8	15.00	0.67	-1437.07
			Max. Torque	8			0.17

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	27.24	-0.00	-0.00
	Max. H_x	11	18.62	15.00	-0.01
	Max. H_z	2	18.62	-0.01	14.99
	Max. M_x	2	1436.91	-0.01	14.99
	Max. M_z	5	1438.94	-15.00	0.01
	Max. Torsion	8	0.17	0.01	-14.99
	Min. Vert	5	18.62	-15.00	0.01
	Min. H_x	5	18.62	-15.00	0.01
	Min. H_z	8	18.62	0.01	-14.99
	Min. M_x	8	-1437.07	0.01	-14.99
	Min. M_z	11	-1438.57	15.00	-0.01
	Min. Torsion	2	-0.17	-0.01	14.99

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	18.63	0.00	0.00	0.08	-0.18	0.00
Dead+Wind 0 deg - No Ice	18.62	0.01	-14.99	-1436.91	-1.04	0.17
Dead+Wind 30 deg - No Ice	18.63	7.51	-12.99	-1244.95	-720.39	0.15
Dead+Wind 60 deg - No Ice	18.63	12.99	-7.51	-719.23	-1246.75	0.09
Dead+Wind 90 deg - No Ice	18.62	15.00	-0.01	-0.77	-1438.94	0.00
Dead+Wind 120 deg - No Ice	18.63	12.98	7.48	717.91	-1245.90	-0.08
Dead+Wind 150 deg - No Ice	18.63	7.49	12.98	1244.26	-718.91	-0.15
Dead+Wind 180 deg - No Ice	18.62	-0.01	14.99	1437.07	0.67	-0.17
Dead+Wind 210 deg - No Ice	18.63	-7.51	12.99	1245.11	720.01	-0.15
Dead+Wind 240 deg - No Ice	18.63	-12.99	7.51	719.39	1246.37	-0.08
Dead+Wind 270 deg - No Ice	18.62	-15.00	0.01	0.94	1438.57	-0.00
Dead+Wind 300 deg - No Ice	18.63	-12.98	-7.48	-717.75	1245.52	0.08
Dead+Wind 330 deg - No Ice	18.63	-7.49	-12.98	-1244.10	718.53	0.14
Dead+Ice+Temp	27.24	0.00	0.00	0.13	-0.26	0.00
Dead+Wind 0 deg+Ice+Temp	27.24	0.00	-3.90	-395.83	-0.61	0.06
Dead+Wind 30 deg+Ice+Temp	27.24	1.95	-3.38	-342.95	-198.68	0.06
Dead+Wind 60 deg+Ice+Temp	27.24	3.38	-1.95	-198.14	-343.58	0.04
Dead+Wind 90 deg+Ice+Temp	27.24	3.90	-0.00	-0.20	-396.49	0.02
Dead+Wind 120 deg+Ice+Temp	27.24	3.37	1.94	197.83	-343.24	-0.02
Dead+Wind 150 deg+Ice+Temp	27.24	1.94	3.37	342.89	-198.09	-0.04
Dead+Wind 180 deg+Ice+Temp	27.24	-0.00	3.90	396.11	0.06	-0.06
Dead+Wind 210 deg+Ice+Temp	27.24	-1.95	3.38	343.23	198.13	-0.06
Dead+Wind 240 deg+Ice+Temp	27.24	-3.38	1.95	198.41	343.03	-0.04
Dead+Wind 270 deg+Ice+Temp	27.24	-3.90	0.00	0.48	395.94	-0.02
Dead+Wind 300 deg+Ice+Temp	27.24	-3.37	-1.94	-197.55	342.69	0.02
Dead+Wind 330 deg+Ice+Temp	27.24	-1.94	-3.37	-342.61	197.54	0.04
Dead+Wind 0 deg - Service	18.63	0.00	-5.85	-562.08	-0.52	0.07
Dead+Wind 30 deg - Service	18.63	2.93	-5.07	-486.94	-281.91	0.06
Dead+Wind 60 deg - Service	18.63	5.08	-2.93	-281.29	-487.81	0.03
Dead+Wind 90 deg - Service	18.63	5.86	-0.00	-0.25	-563.05	0.00
Dead+Wind 120 deg - Service	18.63	5.07	2.92	280.87	-487.47	-0.03
Dead+Wind 150 deg - Service	18.63	2.92	5.07	486.76	-281.33	-0.06
Dead+Wind 180 deg - Service	18.63	-0.00	5.85	562.25	0.14	-0.07
Dead+Wind 210 deg - Service	18.63	-2.93	5.07	487.10	281.53	-0.06
Dead+Wind 240 deg - Service	18.63	-5.08	2.93	281.45	487.43	-0.03
Dead+Wind 270 deg - Service	18.63	-5.86	0.00	0.42	562.67	-0.00
Dead+Wind 300 deg - Service	18.63	-5.07	-2.92	-280.71	487.09	0.03
Dead+Wind 330 deg - Service	18.63	-2.92	-5.07	-486.60	280.95	0.06

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-18.63	0.00	-0.00	18.63	0.00	0.000%
2	0.01	-18.63	-14.99	-0.01	18.62	14.99	0.007%
3	7.51	-18.63	-12.99	-7.51	18.63	12.99	0.000%
4	12.99	-18.63	-7.51	-12.99	18.63	7.51	0.000%
5	15.00	-18.63	-0.01	-15.00	18.62	0.01	0.007%
6	12.98	-18.63	7.48	-12.98	18.63	-7.48	0.000%
7	7.49	-18.63	12.98	-7.49	18.63	-12.98	0.000%
8	-0.01	-18.63	14.99	0.01	18.62	-14.99	0.007%
9	-7.51	-18.63	12.99	7.51	18.63	-12.99	0.000%
10	-12.99	-18.63	7.51	12.99	18.63	-7.51	0.000%
11	-15.00	-18.63	0.01	15.00	18.62	-0.01	0.007%
12	-12.98	-18.63	-7.48	12.98	18.63	7.48	0.000%
13	-7.49	-18.63	-12.98	7.49	18.63	12.98	0.000%
14	0.00	-27.24	0.00	-0.00	27.24	-0.00	0.000%
15	0.00	-27.24	-3.90	-0.00	27.24	3.90	0.001%
16	1.95	-27.24	-3.38	-1.95	27.24	3.38	0.001%
17	3.38	-27.24	-1.95	-3.38	27.24	1.95	0.001%
18	3.90	-27.24	-0.00	-3.90	27.24	0.00	0.001%
19	3.37	-27.24	1.94	-3.37	27.24	-1.94	0.001%
20	1.94	-27.24	3.37	-1.94	27.24	-3.37	0.001%
21	-0.00	-27.24	3.90	0.00	27.24	-3.90	0.001%
22	-1.95	-27.24	3.38	1.95	27.24	-3.38	0.001%
23	-3.38	-27.24	1.95	3.38	27.24	-1.95	0.001%
24	-3.90	-27.24	0.00	3.90	27.24	-0.00	0.001%
25	-3.37	-27.24	-1.94	3.37	27.24	1.94	0.001%
26	-1.94	-27.24	-3.37	1.94	27.24	3.37	0.001%
27	0.00	-18.63	-5.86	-0.00	18.63	5.85	0.004%
28	2.93	-18.63	-5.07	-2.93	18.63	5.07	0.003%
29	5.08	-18.63	-2.93	-5.08	18.63	2.93	0.003%
30	5.86	-18.63	-0.00	-5.86	18.63	0.00	0.004%
31	5.07	-18.63	2.92	-5.07	18.63	-2.92	0.003%
32	2.93	-18.63	5.07	-2.92	18.63	-5.07	0.003%
33	-0.00	-18.63	5.86	0.00	18.63	-5.85	0.004%
34	-2.93	-18.63	5.07	2.93	18.63	-5.07	0.003%
35	-5.08	-18.63	2.93	5.08	18.63	-2.93	0.003%
36	-5.86	-18.63	0.00	5.86	18.63	-0.00	0.004%
37	-5.07	-18.63	-2.92	5.07	18.63	2.92	0.003%
38	-2.93	-18.63	-5.07	2.92	18.63	5.07	0.003%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	13	0.00006569	0.00013073
3	Yes	16	0.00000001	0.00008983
4	Yes	16	0.00000001	0.00008939
5	Yes	13	0.00006567	0.00013005
6	Yes	16	0.00000001	0.00008915
7	Yes	16	0.00000001	0.00008975
8	Yes	13	0.00006569	0.00013041

9	Yes	16	0.00000001	0.00008910
10	Yes	16	0.00000001	0.00008967
11	Yes	13	0.00006568	0.00012998
12	Yes	16	0.00000001	0.00008961
13	Yes	16	0.00000001	0.00008887
14	Yes	6	0.00000001	0.00000001
15	Yes	14	0.00000001	0.00008465
16	Yes	14	0.00000001	0.00010749
17	Yes	14	0.00000001	0.00010729
18	Yes	14	0.00000001	0.00008484
19	Yes	14	0.00000001	0.00010726
20	Yes	14	0.00000001	0.00010738
21	Yes	14	0.00000001	0.00008470
22	Yes	14	0.00000001	0.00010709
23	Yes	14	0.00000001	0.00010740
24	Yes	14	0.00000001	0.00008472
25	Yes	14	0.00000001	0.00010711
26	Yes	14	0.00000001	0.00010689
27	Yes	13	0.00000001	0.00007159
28	Yes	13	0.00000001	0.00010275
29	Yes	13	0.00000001	0.00010102
30	Yes	13	0.00000001	0.00007168
31	Yes	13	0.00000001	0.00010041
32	Yes	13	0.00000001	0.00010287
33	Yes	13	0.00000001	0.00007159
34	Yes	13	0.00000001	0.00010000
35	Yes	13	0.00000001	0.00010212
36	Yes	13	0.00000001	0.00007162
37	Yes	13	0.00000001	0.00010231
38	Yes	13	0.00000001	0.00009947

Compression Checks

Pole Design Data

Section No.	*Elevation*	*Size*	*L*	L_u	*Kl/r*	F_a	*A*	*Actual P*	*Allow.* P_a	*Ratio* $\frac{P}{P_a}$
	ft		*ft*	*ft*		*ksi*	in^2	*K*	*K*	
L1	123 - 73 (1)	TP27.5x16.5x0.1875	50.00	0.00	0.0	39.000	15.7961	-6.59	616.05	0.011
L2	73 - 37.5 (2)	TP34.94x26.355x0.3125	39.00	0.00	0.0	39.000	33.3636	-11.39	1301.18	0.009
L3	37.5 - 0 (3)	TP42.56x33.3244x0.3125	42.00	0.00	0.0	39.000	41.9042	-18.61	1634.27	0.011

Pole Bending Design Data

Section No.	*Elevation*	*Size*	*Actual* M_x	*Actual* f_{bx}	*Allow.* F_{bx}	*Ratio* $\frac{f_{bx}}{F_{bx}}$	*Actual* M_y	*Actual* f_{by}	*Allow.* F_{by}	*Ratio* $\frac{f_{by}}{F_{by}}$
	ft		*kip-ft*	*ksi*	*ksi*		*kip-ft*	*ksi*	*ksi*	
L1	123 - 73 (1)	TP27.5x16.5x0.1875	434.13	50.315	39.000	1.290	0.00	0.000	39.000	0.000
L2	73 - 37.5 (2)	TP34.94x26.355x0.3125	851.36	36.944	39.000	0.947	0.00	0.000	39.000	0.000
L3	37.5 - 0 (3)	TP42.56x33.3244x0.3125	1439.33	39.519	39.000	1.013	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	123 - 73 (1)	TP27.5x16.5x0.1875	11.17	0.707	26.000	0.054	0.10	0.006	26.000	0.000
L2	73 - 37.5 (2)	TP34.94x26.355x0.3125	12.98	0.389	26.000	0.030	0.00	0.000	26.000	0.000
L3	37.5 - 0 (3)	TP42.56x33.3244x0.3125	15.02	0.358	26.000	0.028	0.09	0.001	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	123 - 73 (1)	0.011	1.290	0.000	0.054	0.000	1.302 ✔	1.333	H1-3+VT ✔
L2	73 - 37.5 (2)	0.009	0.947	0.000	0.030	0.000	0.956 ✔	1.333	H1-3+VT ✔
L3	37.5 - 0 (3)	0.011	1.013	0.000	0.028	0.000	1.025 ✔	1.333	H1-3+VT ✔

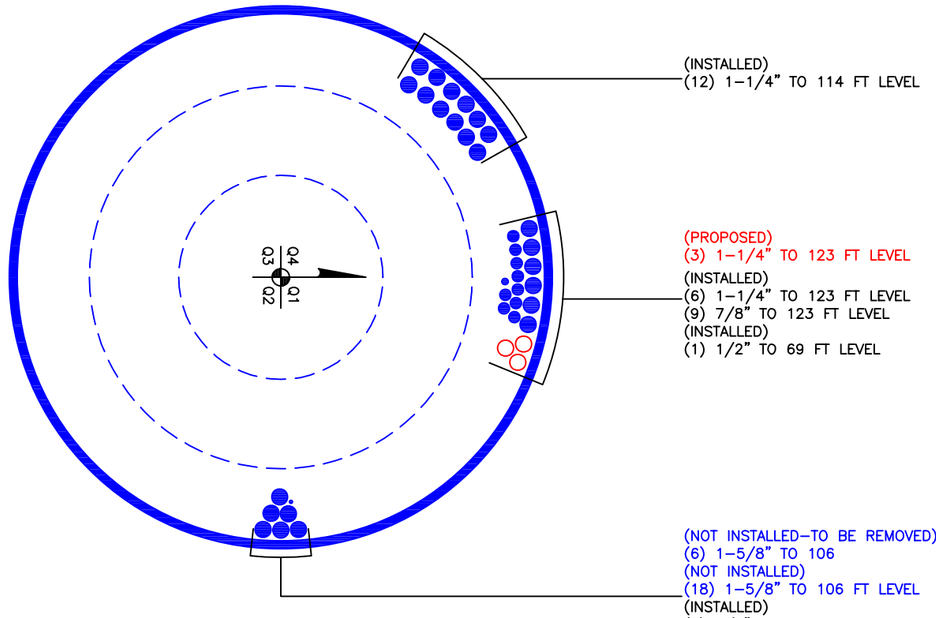
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	123 - 73	Pole	TP27.5x16.5x0.1875	1	-6.59	821.19	97.6	Pass
L2	73 - 37.5	Pole	TP34.94x26.355x0.3125	2	-11.39	1734.47	71.7	Pass
L3	37.5 - 0	Pole	TP42.56x33.3244x0.3125	3	-18.61	2178.48	76.9	Pass
							Summary	
						Pole (L1)	97.6	Pass
						RATING =	**97.6**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

TRUE



0 1 2 3FT

: SCALE :

BUSINESS UNIT: 878863 TOWER ID: C_BASELEVEL

LEGEND: FEEDLINES

- SOLID BLUE CIRCLE DENOTES EXISTING FEEDLINE
- OPEN RED CIRCLE DENOTES PROPOSED FEEDLINE
- X BLUE "X" DENOTES LOCATION NOT GIVEN

NOTE: ASSUME FEEDLINE ATTACHMENT HEIGHT TO TOWER STEEL AT 8–FEET ABOVE FINISHED GRADE UNLESS OTHERWISE SPECIFIED

BASE LEVEL DRAWING

SCALE: 1" = 1'–0" | 1

PLOT DATE: 2/27/2012 FILE NAME: 878863_BASELEVEL.DWG

CROWN REGION ADDRESS

USA

1	16/04/07	NEW BUILD PER WORK ORDER # 129859 — MAM
2	24/01/08	APPLICATION ADDED PER WORK ORDER # 191935 — SLP
3	08/01/09	AS–BUILT INFORMATION ADDED PER WORK ORDER # 208411 — AGC
4	14/04/09	APPLICATION ADDED PER WORK ORDER # 265514 — LAN
5	22/08/11	UPDATED PER WORK ORDER # 431716 — PS
6	12/01/12	AS–BUILT INFORMATION ADDED PER WORK ORDER # 454391 — WJM
7	27/02/12	APPLICATION ADDED PER WORK ORDER # 473550 — AGC

DRAWN BY: **MAM**
CHECKED BY: **JEE**
DRAWING DATE: **16/04/07**

SITE NUMBER:
SITE NAME:

SITE NAME

1 BRIDGE STREET

BUSINESS UNIT NUMBER

878863

SITE ADDRESS

1 BRIDGE STREET
RAMAPO, NY 10931
ROCKLAND COUNTY
USA

SHEET TITLE

BASE LEVEL

SHEET NUMBER

A1-0

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#: *878863*
Site Name:
App #:

Enter Load Factors Below:

For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Pier Properties

Concrete:

Pier Diameter =	6.5	ft
Concrete Area =	4778.4	in^2

Reinforcement:

Clear Cover to **Tie**=	4.00	in
Horiz. **Tie** Bar Size=	5	
Vert. Cage Diameter =	5.61	ft
Vert. Cage Diameter =	67.34	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	18	
As Total=	28.08	in^2
A s/ Aconc, Rho:	0.0059	0.59%

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	
IBC 1810.1.2:	0.0025	SDC C
Governing:	0.0033	**0.33%**

ACI 10.8 and 10.9
Min As for Columns, Comp. Controlled, Shafts:

Min As:	0.0050	**0.50%**

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.59%	**OK**

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	7174.97	kips
at Mu=(ϕ=0.65)Mn=	4030.05	ft-kips
Max Tu, (φ=0.9) Tn =	1516.32	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces

TIA Revision:	F	
Max. Service Shaft M:	1556.1	ft-kips **(* Note)**
Max. Service Shaft P:	19	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**		
1.30	Mu:	2022.93	ft-kips
1.30	Pu:	24.7	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=	2008

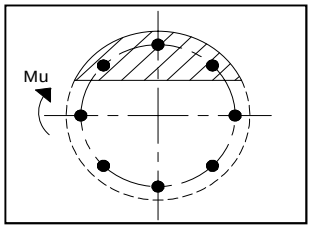
Seismic Properties

Seismic Design Category =	C
Seismic Risk =	**Moderate**

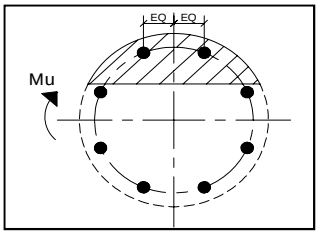
Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**12.93**	in
Extreme Steel Strain, ϵt:	**0.0137**	
	ϵt > 0.0050, Tension Controlled	
Reduction Factor,φ:	**0.900**	

<-- Comment Box

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	24.70	kips
Drilled Shaft Moment Capacity, φMn:	**4049.31**	ft-kips
Drilled Shaft Superimposed Mu:	**2022.93**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**49.96%**

CAISSON Version 10.61 2:47:45 PM Monday, March 05, 2012
FDH Engineering

```
*****************************************************************************************************
*                                                                                                   *
* CAISSON - Pier Foundations Analysis and Design -  Copyright Power Line Systems, Inc. 1993-2010 *
*                                                                                                   *
*****************************************************************************************************
```

Project Title: BU: 878863
Project Notes: 12-02738E S1

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)
6.50	3.00	3.00	60.00

Soil Properties

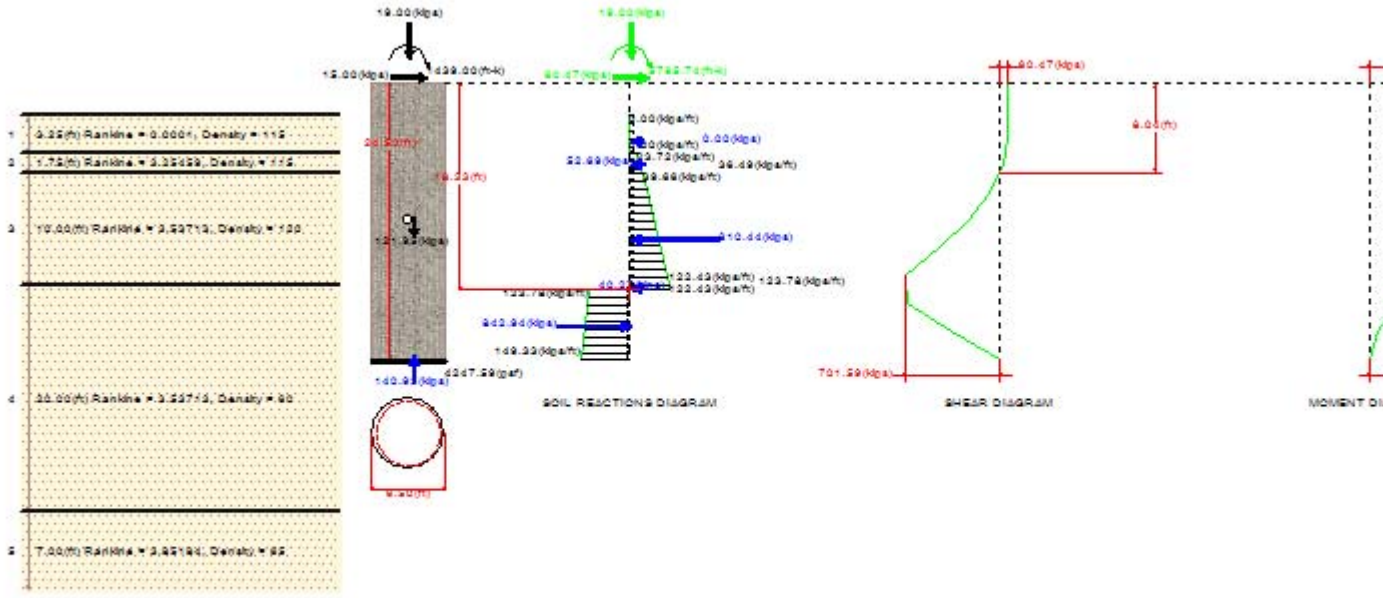
Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Sand	3.25	0.00	115.0	0.000	-88.85	
2	Sand	1.75	3.25	115.0	3.255	32.00	
3	Sand	10.00	5.00	120.0	3.537	34.00	
4	Sand	20.00	15.00	60.0	3.537	34.00	
5	Sand	7.00	35.00	65.0	3.852	36.00	

Design (Factored) Loads at Top of Pier

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
1439.0	19.0	15.00	4.00

CAPACITY = 2/4 = 50.0%

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



Calculated Pier Properties

Length (ft)	Weight (kips)	Pressure Due To Axial Load (psf)	Pressure Due To Weight (psf)	Total End-Bearing Pressure (psf)
24.500	121.948	572.6	3675.0	4247.6

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)
Sand	3.00	3.25	115.0		0.000	0.00	5.17
Sand	6.25	1.75	115.0		3.255	52.69	7.19
Sand	8.00	10.00	120.0		3.537	810.44	13.85
Sand	18.00	0.33	60.0		3.537	40.27	18.16
Sand	18.33	6.17	60.0		3.537	-842.94	21.51

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	60.5	5795.7	15.1	1448.9
2.45	60.5	5943.9	15.1	1486.0
4.90	60.5	6092.0	15.1	1523.0
7.35	30.0	6224.2	7.5	1556.1
9.80	-77.0	6178.3	-19.3	1544.6
12.25	-235.5	5805.6	-58.9	1451.4
14.70	-443.7	4983.7	-110.9	1245.9
17.15	-701.6	3590.8	-175.4	897.7
19.60	-682.0	1711.5	-170.5	427.9
22.05	-353.4	438.0	-88.4	109.5
24.50	-0.0	-0.0	-0.0	-0.0

Reinforcement and Capacity

Total Reinforcement Percent	Reinforcement Area (in^2)	Usable Axial Capacity (kips)	Usable Moment Capacity (ft-k)
0.32	15.29	19.0	2229.7

US Standard Re-Bars (Select one of the following)

Quantity	Name	Area (in^2)	Diameter (in)	Spacing (in)
77	#4	0.20	0.500	2.77
50	#5	0.31	0.625	4.27
35	#6	0.44	0.750	6.10
26	#7	0.60	0.875	8.22
20	#8	0.79	1.000	10.68
16	#9	1.00	1.128	13.35
13	#10	1.27	1.270	16.43
10	#11	1.56	1.410	21.36
7	#14	2.25	1.693	30.52

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

BU#: *878863*
Site Name:
App #:

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	49	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	48	in
Thick:	2.75	in
Grade:	50	ksi
Clip Distance:	5	in

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
Weld Type:	Fillet	**
Groove Depth:	0.375	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	24	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	42.56	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	1439	ft-kips
Unfactored Axial, P:	19	kips
Unfactored Shear, V:	15	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension	115.9	Kips
Allowable Tension:	195.0	Kips
Anchor Rod Stress Ratio:	59.4%	**Pass**

Base Plate Results Flexural Check

Base Plate Stress:	30.0	ksi
Allowable PL Bending Stress:	50.0	ksi
Base Plate Stress Ratio:	60.0%	**Pass**

PL Ref. Data	
Yield Line (in):	25.32
Max PL Length:	25.32

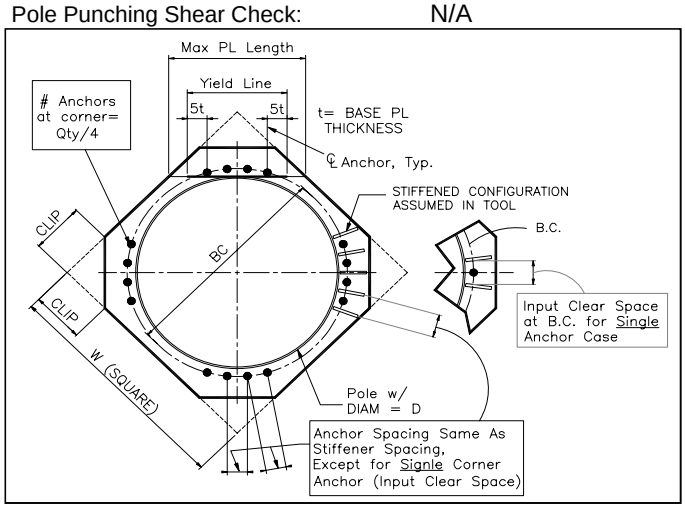
N/A - Unstiffened

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



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

Date: **March 05, 2012**

Eva Morales
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
2730 Rowland Road
Raleigh, NC 27615
(919) 755-1012

Subject: **Structural Analysis Report**

Carrier Designation:	***Sprint PCS* Co-Locate**	
	Carrier Site Number:	NY06XC474
	Carrier Site Name:	1 BRIDGE STREET
Crown Castle Designation:	**Crown Castle BU Number:**	878863
	Crown Castle Site Name:	1 BRIDGE STREET
	Crown Castle JDE Job Number:	180426
	Crown Castle Work Order Number:	473546
	Crown Castle Application Number:	142559 Rev. 0
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number:**	12-02738E S2
Site Data:	**1 Bridge St., Hillburn, Rockland County, NY**	
	Latitude *41° 8' 24.86"*, Longitude *-74° 10' 12.64"*	
	123 Foot - Monopole Tower	

Dear Eva Morales,

FDH Engineering, Inc. 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 451909, in accordance with application 142559, 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:

LC7: 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/EIA-222-F standard and based upon a wind speed of 80 mph fastest mile.

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 *FDH Engineering, Inc.* 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.

Respectfully submitted by:

Brad Smith, EI
Project Engineer

Neil J. Kuplic, PE
Vice President
NY PE License No. 076178-1

tnxTower Report - version 6.0.4.0

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 123 ft Monopole tower designed by SUMMIT in December of 1998. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

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
123.0	125.0	3	alcatel lucent	1900MHz RRH (65MHz)	3	1-1/4”	1
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		9	rfs celwave	ACU-A20-N			
		1	rfs celwave	APXV9ERR18-C-A20 w/ Mount Pipe			
		2	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			

1. Proposed Equipment

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
123.0	125.0	3	decibel	932LG65T2A-M w/ Mount Pipe	9 6	7/8” 1-1/4”	2
		6	ems wireless	RR65-12-00DBL w/ Mount Pipe			
	123.0	1	crown mounts	Platform Mount [LP 101-1]	---	---	1
114.0	114.0	3	allgon	7391.00 w/ Mount Pipe	12	1-1/4”	1
		3	andrew	DBXLH-9090A-VTM w/ Mount Pipe			
		12	andrew	ETD819G-12UB			
		1	crown mounts	T-Arm Mount [TA 602-3]			
		3	powerwave technologies	7740.00 w/ Mount Pipe			
106.0	106.0	6	andrew	ECC1920-VPUB	---	---	3
		6	andrew	ETD19V2S12UB			
		3	rfs celwave	APX16DWV-16DWVS-E-A20 w/ Mount Pipe			
		1	crown mounts	Side Arm Mount [SO 305-3]	6 1	1-1/4” 1/4"	1
69.0	70.0	1	lucent	KS24019-L112A	1	1/2"	1
	69.0	1	crown mounts	Side Arm Mount [SO 701-1]			

1. Existing Equipment
2. Equipment to be removed
3. Reserved Equipment

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)
123	123	9	DAPA	58210	9	1-5/8"
112	115	9	Swedcom	ALP-9212-N	9	1-5/8"
102	105	9	Swedcom	ALP-9212-N	9	1-5/8"
70	70	1	Generic	GPS	1	1-5/8"

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Tectonic Engineering Consultants P.C. (September 2, 1997)	1563270	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	FDH Engineering, Inc. (May 7, 2009)	1620553	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit Manufacturing, LLC (December 11, 1998)	1619431	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) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, Inc. 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	123 - 73	Pole	TP27.5x16.5x0.1875	1	-6.17	821.19	77.0	Pass
L2	73 - 37.5	Pole	TP34.94x26.355x0.3125	2	-10.62	1734.47	58.5	Pass
L3	37.5 - 0	Pole	TP42.56x33.3244x0.3125	3	-17.43	2178.48	64.4	Pass
							Summary	
						Pole (L1)	77.0	Pass
						Rating =	77.0	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	49.7	Pass
1	Base Plate	0	50.3	Pass
1	Base Foundation	0	42.0	Pass
1	Base Foundation Soil Interaction	0	42.1	Pass

Structure Rating (max from all components) =	77.0%

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

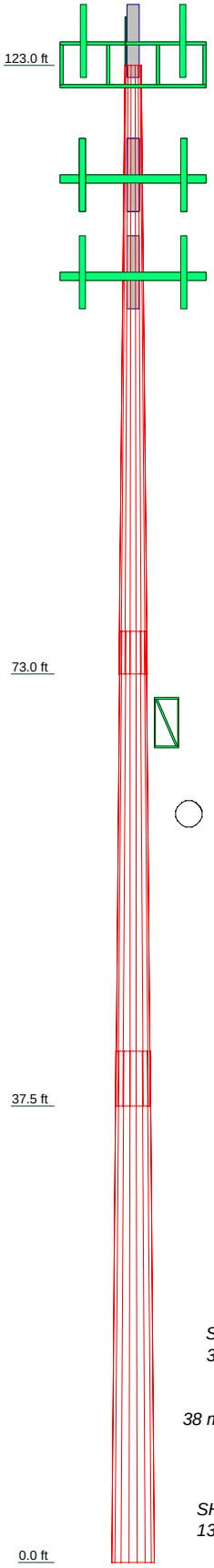
4.1) Recommendations

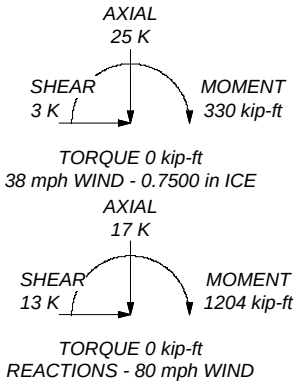
1. Coax must be installed as shown in Appendix B.

APPENDIX A

TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	50.00	18	0.1875	3.50	16.5000	27.5000		2.2
2	39.00	18	0.3125	4.50	26.3550	34.9400	A607-65	4.0
3	42.00	18	0.3125		33.3244	42.5600		5.3
								11.5





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	123	7740.00 w/ Mount Pipe	114
APXV9ERR18-C-A20 w/ Mount Pipe	123	7740.00 w/ Mount Pipe	114
APXVSPP18-C-A20 w/ Mount Pipe	123	7740.00 w/ Mount Pipe	114
APXVSPP18-C-A20 w/ Mount Pipe	123	(4) ETD819G-12UB	114
1900MHz RRH (65MHz)	123	(4) ETD819G-12UB	114
1900MHz RRH (65MHz)	123	(4) ETD819G-12UB	114
1900MHz RRH (65MHz)	123	T-Arm Mount [TA 602-3]	114
800 EXTERNAL NOTCH FILTER	123	APX16DWV-16DWVS-E-A20 w/ Mount Pipe	106
800 EXTERNAL NOTCH FILTER	123	APX16DWV-16DWVS-E-A20 w/ Mount Pipe	106
800 EXTERNAL NOTCH FILTER	123	APX16DWV-16DWVS-E-A20 w/ Mount Pipe	106
800MHZ RRH	123	(2) ECC1920-VPUB	106
800MHZ RRH	123	(2) ECC1920-VPUB	106
800MHZ RRH	123	(2) ECC1920-VPUB	106
(3) ACU-A20-N	123	(2) ETD19V2S12UB	106
(3) ACU-A20-N	123	(2) ETD19V2S12UB	106
(3) ACU-A20-N	123	(2) ETD19V2S12UB	106
Platform Mount (LP 101-1)	123	Side Arm Mount [SO 305-3]	106
7391.00 w/ Mount Pipe	114	KS24019-L112A	69
7391.00 w/ Mount Pipe	114	Side Arm Mount [SO 701-1]	69
7391.00 w/ Mount Pipe	114		
DBXLH-9090A-VTM w/ Mount Pipe	114		
DBXLH-9090A-VTM w/ Mount Pipe	114		
DBXLH-9090A-VTM w/ Mount Pipe	114		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Rockland County, New York.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 77%

FDH Engineering, Inc.
2730 Rowland Road
Raleigh, NC 27615
Phone: (919) 755-1012
FAX: (919) 755-1031
Tower Analysis

Job: BU: 878863			
Project: 12-02738E S2			
Client: Crown Castle	Drawn by: Bradley Smith	App'd:	
Code: TIA/EIA-222-F	Date: 03/05/12	Scale: NTS	
Path: C:\Users\Bradley Smith\Desktop\1 Bridge St, NY\S2 - RR SA SNVAnalysis\Bridge Street, NY (BU 878863).eri		Dwg No. E-1	

Tower Input Data

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

Tower is located in Rockland County, New York.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
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	123.00-73.00	50.00	3.50	18	16.5000	27.5000	0.1875	0.7500	A607-65 (65 ksi)
L2	73.00-37.50	39.00	4.50	18	26.3550	34.9400	0.3125	1.2500	A607-65 (65 ksi)
L3	37.50-0.00	42.00		18	33.3244	42.5600	0.3125	1.2500	A607-65 (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	16.7545	9.7080	326.3677	5.7909	8.3820	38.9367	653.1649	4.8549	2.5740	13.728
	27.9242	16.2544	1531.8986	9.6959	13.9700	109.6563	3065.8128	8.1287	4.5100	24.053
L2	27.5439	25.8309	2213.3108	9.2451	13.3883	165.3163	4429.5340	12.9179	4.0885	13.083
	35.4790	34.3462	5203.0477	12.2928	17.7495	293.1374	10412.9417	17.1763	5.5994	17.918
L3	34.8433	32.7437	4508.2383	11.7192	16.9288	266.3057	9022.4087	16.3750	5.3151	17.008
	43.2166	41.9042	9449.2522	14.9979	21.6205	437.0510	18910.9379	20.9561	6.9406	22.21

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 123.00-73.00				1	1	1		
L2 73.00-37.50				1	1	1		
L3 37.50-0.00				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 plf
***										

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 plf
***								
HB114-1-0813U4-M5J(1 1/4")	A	No	Inside Pole	123.00 - 0.00	3	No Ice	0.00	1.20
						1/2" Ice	0.00	1.20
						1" Ice	0.00	1.20
						2" Ice	0.00	1.20
						4" Ice	0.00	1.20
***								
LDF6-50A(1-1/4")	A	No	Inside Pole	114.00 - 0.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
***								
LDF1-50A(1/4")	B	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
						2" Ice	0.00	0.06
						4" Ice	0.00	0.06
LDF6-50A(1-1/4")	B	No	Inside Pole	106.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						4" Ice	0.00	0.66
***								
LDF4-50A(1/2")	A	No	Inside Pole	69.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
***								

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	123.00-73.00	A	0.000	0.000	0.000	0.000	0.50
		B	0.000	0.000	0.000	0.000	0.13
		C	0.000	0.000	0.000	0.000	0.00
L2	73.00-37.50	A	0.000	0.000	0.000	0.000	0.41
		B	0.000	0.000	0.000	0.000	0.14
		C	0.000	0.000	0.000	0.000	0.00
L3	37.50-0.00	A	0.000	0.000	0.000	0.000	0.44
		B	0.000	0.000	0.000	0.000	0.15
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	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	123.00-73.00	A	0.853	0.000	0.000	0.000	0.000	0.50
		B		0.000	0.000	0.000	0.000	0.13
		C		0.000	0.000	0.000	0.000	0.00
L2	73.00-37.50	A	0.797	0.000	0.000	0.000	0.000	0.41
		B		0.000	0.000	0.000	0.000	0.14
		C		0.000	0.000	0.000	0.000	0.00
L3	37.50-0.00	A	0.750	0.000	0.000	0.000	0.000	0.44
		B		0.000	0.000	0.000	0.000	0.15
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	123.00-73.00	0.0000	0.0000	0.0000	0.0000
L2	73.00-37.50	0.0000	0.0000	0.0000	0.0000
L3	37.50-0.00	0.0000	0.0000	0.0000	0.0000

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	C	From Leg	0.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.25 0.66 0.97 1.49 2.68	0.25 0.66 0.97 1.49 2.68	0.03 0.03 0.04 0.06 0.14
***									
APXV9ERR18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	7.47 8.66 9.56 11.39 15.53	0.09 0.16 0.23 0.42 0.94
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.22 0.41 0.91
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.22 0.41 0.91
1900MHz RRH (65MHz)	A	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
1900MHz RRH (65MHz)	B	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
1900MHz RRH (65MHz)	C	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.77 0.89 1.02 1.30 1.97	0.37 0.46 0.56 0.79 1.34	0.01 0.02 0.02 0.04 0.11
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.77 0.89 1.02 1.30 1.97	0.37 0.46 0.56 0.79 1.34	0.01 0.02 0.02 0.04 0.11
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00 0.00 2.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.77 0.89 1.02 1.30 1.97	0.37 0.46 0.56 0.79 1.34	0.01 0.02 0.02 0.04 0.11
800MHZ RRH	A	From Leg	4.00 0.00	0.0000	123.00	No Ice 1/2" Ice	2.49 2.71	2.07 2.27	0.05 0.07

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
			2.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
800MHZ RRH	B	From Leg	4.00	0.0000	123.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			2.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
800MHZ RRH	C	From Leg	4.00	0.0000	123.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			2.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
(3) ACU-A20-N	A	From Leg	4.00	0.0000	123.00	No Ice	0.08	0.14	0.00
			0.00			1/2" Ice	0.12	0.19	0.00
			2.00			1" Ice	0.17	0.25	0.00
						2" Ice	0.30	0.40	0.01
						4" Ice	0.67	0.80	0.04
(3) ACU-A20-N	B	From Leg	4.00	0.0000	123.00	No Ice	0.08	0.14	0.00
			0.00			1/2" Ice	0.12	0.19	0.00
			2.00			1" Ice	0.17	0.25	0.00
						2" Ice	0.30	0.40	0.01
						4" Ice	0.67	0.80	0.04
(3) ACU-A20-N	C	From Leg	4.00	0.0000	123.00	No Ice	0.08	0.14	0.00
			0.00			1/2" Ice	0.12	0.19	0.00
			2.00			1" Ice	0.17	0.25	0.00
						2" Ice	0.30	0.40	0.01
						4" Ice	0.67	0.80	0.04
Platform Mount (LP 101-1)	C	None		0.0000	123.00	No Ice	36.21	36.21	1.50
						1/2" Ice	42.82	42.82	2.30
						1" Ice	49.43	49.43	3.10
						2" Ice	62.65	62.65	4.70
						4" Ice	89.09	89.09	7.89
***									
7391.00 w/ Mount Pipe	A	From Leg	4.00	0.0000	114.00	No Ice	5.91	4.04	0.04
			0.00			1/2" Ice	6.40	4.76	0.08
			0.00			1" Ice	6.89	5.43	0.13
						2" Ice	7.90	6.83	0.26
						4" Ice	10.04	10.02	0.63
7391.00 w/ Mount Pipe	B	From Leg	4.00	0.0000	114.00	No Ice	5.91	4.04	0.04
			0.00			1/2" Ice	6.40	4.76	0.08
			0.00			1" Ice	6.89	5.43	0.13
						2" Ice	7.90	6.83	0.26
						4" Ice	10.04	10.02	0.63
7391.00 w/ Mount Pipe	C	From Leg	4.00	0.0000	114.00	No Ice	5.91	4.04	0.04
			0.00			1/2" Ice	6.40	4.76	0.08
			0.00			1" Ice	6.89	5.43	0.13
						2" Ice	7.90	6.83	0.26
						4" Ice	10.04	10.02	0.63
DBXLH-9090A-VTM w/ Mount Pipe	A	From Leg	4.00	0.0000	114.00	No Ice	7.93	3.95	0.05
			0.00			1/2" Ice	8.44	4.63	0.10
			0.00			1" Ice	8.95	5.29	0.16
						2" Ice	9.99	6.66	0.30
						4" Ice	12.21	9.82	0.70
DBXLH-9090A-VTM w/ Mount Pipe	B	From Leg	4.00	0.0000	114.00	No Ice	7.93	3.95	0.05
			0.00			1/2" Ice	8.44	4.63	0.10
			0.00			1" Ice	8.95	5.29	0.16

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" Ice	9.99	6.66	0.30
						4" Ice	12.21	9.82	0.70
DBXLH-9090A-VTM w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.93 8.44 8.95 9.99 12.21	3.95 4.63 5.29 6.66 9.82	0.05 0.10 0.16 0.30 0.70
7740.00 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.61 4.01 4.44 5.38 7.37	3.33 4.01 4.66 6.01 9.00	0.04 0.07 0.11 0.21 0.51
7740.00 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.61 4.01 4.44 5.38 7.37	3.33 4.01 4.66 6.01 9.00	0.04 0.07 0.11 0.21 0.51
7740.00 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.61 4.01 4.44 5.38 7.37	3.33 4.01 4.66 6.01 9.00	0.04 0.07 0.11 0.21 0.51
(4) ETD819G-12UB	A	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.15 2.35 2.55 2.99 3.97	0.48 0.60 0.74 1.04 1.73	0.03 0.04 0.06 0.09 0.20
(4) ETD819G-12UB	B	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.15 2.35 2.55 2.99 3.97	0.48 0.60 0.74 1.04 1.73	0.03 0.04 0.06 0.09 0.20
(4) ETD819G-12UB	C	From Leg	4.00 0.00 0.00	0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.15 2.35 2.55 2.99 3.97	0.48 0.60 0.74 1.04 1.73	0.03 0.04 0.06 0.09 0.20
T-Arm Mount [TA 602-3]	C	None		0.0000	114.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.59 15.44 19.29 26.99 42.39	11.59 15.44 19.29 26.99 42.39	0.77 0.99 1.21 1.64 2.50
***									
APX16DWV-16DWVS-E-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.47 7.99 8.52 9.59 11.87	3.49 4.26 4.96 6.40 9.49	0.06 0.11 0.16 0.30 0.68
APX16DWV-16DWVS-E-A20 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.47 7.99 8.52 9.59 11.87	3.49 4.26 4.96 6.40 9.49	0.06 0.11 0.16 0.30 0.68
APX16DWV-16DWVS-E-A20 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.47 7.99 8.52 9.59	3.49 4.26 4.96 6.40	0.06 0.11 0.16 0.30

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	11.87	9.49	0.68
(2) ECC1920-VPUB	A	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.54 0.64 0.75 0.99 1.59	0.21 0.28 0.36 0.55 1.02	0.01 0.01 0.02 0.03 0.09
(2) ECC1920-VPUB	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.54 0.64 0.75 0.99 1.59	0.21 0.28 0.36 0.55 1.02	0.01 0.01 0.02 0.03 0.09
(2) ECC1920-VPUB	C	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.54 0.64 0.75 0.99 1.59	0.21 0.28 0.36 0.55 1.02	0.01 0.01 0.02 0.03 0.09
(2) ETD19V2S12UB	A	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.21 0.30 0.39 0.60 1.12	0.01 0.02 0.02 0.04 0.10
(2) ETD19V2S12UB	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.21 0.30 0.39 0.60 1.12	0.01 0.02 0.02 0.04 0.10
(2) ETD19V2S12UB	C	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.21 0.30 0.39 0.60 1.12	0.01 0.02 0.02 0.04 0.10
Side Arm Mount [SO 305-3]	C	None		0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.64 4.10 5.56 8.48 14.32	2.64 4.10 5.56 8.48 14.32	0.09 0.13 0.17 0.25 0.41
***									
KS24019-L112A	B	From Leg	4.00 0.00 1.00	0.0000	69.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.16 0.22 0.30 0.48 0.95	0.16 0.22 0.30 0.48 0.95	0.01 0.01 0.01 0.02 0.06
Side Arm Mount [SO 701-1]	B	From Leg	2.00 0.00 0.00	0.0000	69.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.85 1.14 1.43 2.01 3.17	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18
***									

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	123 - 73	Pole	Max Tension	21	0.00	0.00	0.00
			Max. Compression	14	-11.67	0.02	0.03
			Max. Mx	11	-6.17	342.04	0.03
			Max. My	2	-6.18	0.01	341.00
			Max. Vy	5	9.26	-342.01	0.04
			Max. Vx	8	9.24	0.02	-340.92
			Max. Torque	11			-0.10
L2	73 - 37.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-17.13	-0.26	-0.13
			Max. Mx	5	-10.62	-693.85	0.26
			Max. My	8	-10.62	0.15	-692.30
			Max. Vy	5	11.10	-693.85	0.26
			Max. Vx	8	11.09	0.15	-692.30
			Max. Torque	8			0.17
L3	37.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	14	-25.30	-0.26	-0.13
			Max. Mx	5	-17.43	-1204.02	0.77
			Max. My	8	-17.43	0.67	-1202.15
			Max. Vy	5	13.22	-1204.02	0.77
			Max. Vx	8	13.21	0.67	-1202.15
			Max. Torque	8			0.17

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	25.30	-0.00	-0.00
	Max. H_x	11	17.44	13.21	-0.01
	Max. H_z	2	17.44	-0.01	13.20
	Max. M_x	2	1201.99	-0.01	13.20
	Max. M_z	5	1204.02	-13.21	0.01
	Max. Torsion	8	0.17	0.01	-13.20
	Min. Vert	5	17.44	-13.21	0.01
	Min. H_x	5	17.44	-13.21	0.01
	Min. H_z	8	17.44	0.01	-13.20
	Min. M_x	8	-1202.15	0.01	-13.20
	Min. M_z	11	-1203.64	13.21	-0.01
	Min. Torsion	2	-0.17	-0.01	13.20

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	17.44	0.00	0.00	0.08	-0.18	0.00
Dead+Wind 0 deg - No Ice	17.44	0.01	-13.20	-1201.99	-1.04	0.17
Dead+Wind 30 deg - No Ice	17.44	6.61	-11.44	-1041.46	-602.90	0.15
Dead+Wind 60 deg - No Ice	17.44	11.44	-6.61	-601.74	-1043.26	0.09
Dead+Wind 90 deg - No Ice	17.44	13.21	-0.01	-0.77	-1204.02	0.00
Dead+Wind 120 deg - No Ice	17.44	11.43	6.59	600.43	-1042.40	-0.08
Dead+Wind 150 deg - No Ice	17.44	6.59	11.43	1040.77	-601.42	-0.15
Dead+Wind 180 deg - No Ice	17.44	-0.01	13.20	1202.15	0.67	-0.17
Dead+Wind 210 deg - No Ice	17.44	-6.61	11.44	1041.62	602.52	-0.15
Dead+Wind 240 deg - No Ice	17.44	-11.44	6.61	601.91	1042.88	-0.09
Dead+Wind 270 deg - No Ice	17.44	-13.21	0.01	0.94	1203.64	-0.00
Dead+Wind 300 deg - No Ice	17.44	-11.43	-6.59	-600.27	1042.03	0.08
Dead+Wind 330 deg - No Ice	17.44	-6.59	-11.43	-1040.61	601.04	0.14
Dead+Ice+Temp	25.30	0.00	0.00	0.13	-0.26	0.00
Dead+Wind 0 deg+Ice+Temp	25.30	0.00	-3.42	-329.65	-0.61	0.06
Dead+Wind 30 deg+Ice+Temp	25.30	1.71	-2.97	-285.67	-165.60	0.06
Dead+Wind 60 deg+Ice+Temp	25.30	2.97	-1.72	-165.07	-286.30	0.05
Dead+Wind 90 deg+Ice+Temp	25.30	3.42	-0.00	-0.20	-330.30	0.02
Dead+Wind 120 deg+Ice+Temp	25.30	2.96	1.71	164.76	-285.96	-0.02
Dead+Wind 150 deg+Ice+Temp	25.30	1.71	2.96	285.61	-165.02	-0.04
Dead+Wind 180 deg+Ice+Temp	25.30	-0.00	3.42	329.92	0.07	-0.06
Dead+Wind 210 deg+Ice+Temp	25.30	-1.71	2.97	285.95	165.06	-0.06
Dead+Wind 240 deg+Ice+Temp	25.30	-2.97	1.72	165.34	285.75	-0.05

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
Dead+Wind 270 deg+Ice+Temp	25.30	-3.42	0.00	0.47	329.76	-0.02
Dead+Wind 300 deg+Ice+Temp	25.30	-2.96	-1.71	-164.49	285.42	0.01
Dead+Wind 330 deg+Ice+Temp	25.30	-1.71	-2.96	-285.34	164.48	0.04
Dead+Wind 0 deg - Service	17.44	0.00	-5.16	-469.91	-0.52	0.07
Dead+Wind 30 deg - Service	17.44	2.58	-4.47	-407.11	-235.82	0.06
Dead+Wind 60 deg - Service	17.44	4.47	-2.58	-235.20	-407.98	0.03
Dead+Wind 90 deg - Service	17.44	5.16	-0.00	-0.25	-470.87	0.00
Dead+Wind 120 deg - Service	17.44	4.47	2.57	234.79	-407.65	-0.03
Dead+Wind 150 deg - Service	17.44	2.58	4.46	406.94	-235.24	-0.06
Dead+Wind 180 deg - Service	17.44	-0.00	5.16	470.07	0.14	-0.07
Dead+Wind 210 deg - Service	17.44	-2.58	4.47	407.27	235.44	-0.06
Dead+Wind 240 deg - Service	17.44	-4.47	2.58	235.37	407.60	-0.03
Dead+Wind 270 deg - Service	17.44	-5.16	0.00	0.42	470.49	-0.00
Dead+Wind 300 deg - Service	17.44	-4.47	-2.57	-234.63	407.27	0.03
Dead+Wind 330 deg - Service	17.44	-2.58	-4.46	-406.78	234.86	0.06

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	-17.44	0.00	-0.00	17.44	0.00	0.000%
2	0.01	-17.44	-13.20	-0.01	17.44	13.20	0.006%
3	6.61	-17.44	-11.44	-6.61	17.44	11.44	0.001%
4	11.44	-17.44	-6.61	-11.44	17.44	6.61	0.001%
5	13.21	-17.44	-0.01	-13.21	17.44	0.01	0.006%
6	11.43	-17.44	6.59	-11.43	17.44	-6.59	0.001%
7	6.59	-17.44	11.43	-6.59	17.44	-11.43	0.001%
8	-0.01	-17.44	13.20	0.01	17.44	-13.20	0.006%
9	-6.61	-17.44	11.44	6.61	17.44	-11.44	0.001%
10	-11.44	-17.44	6.61	11.44	17.44	-6.61	0.001%
11	-13.21	-17.44	0.01	13.21	17.44	-0.01	0.006%
12	-11.43	-17.44	-6.59	11.43	17.44	6.59	0.001%
13	-6.59	-17.44	-11.43	6.59	17.44	11.43	0.001%
14	0.00	-25.30	0.00	-0.00	25.30	-0.00	0.000%
15	0.00	-25.30	-3.42	-0.00	25.30	3.42	0.002%
16	1.71	-25.30	-2.97	-1.71	25.30	2.97	0.001%
17	2.97	-25.30	-1.72	-2.97	25.30	1.72	0.001%
18	3.42	-25.30	-0.00	-3.42	25.30	0.00	0.002%
19	2.96	-25.30	1.71	-2.96	25.30	-1.71	0.001%
20	1.71	-25.30	2.96	-1.71	25.30	-2.96	0.001%
21	-0.00	-25.30	3.42	0.00	25.30	-3.42	0.002%
22	-1.71	-25.30	2.97	1.71	25.30	-2.97	0.001%
23	-2.97	-25.30	1.72	2.97	25.30	-1.72	0.001%
24	-3.42	-25.30	0.00	3.42	25.30	-0.00	0.002%
25	-2.96	-25.30	-1.71	2.96	25.30	1.71	0.001%
26	-1.71	-25.30	-2.96	1.71	25.30	2.96	0.001%
27	0.00	-17.44	-5.16	-0.00	17.44	5.16	0.003%
28	2.58	-17.44	-4.47	-2.58	17.44	4.47	0.003%
29	4.47	-17.44	-2.58	-4.47	17.44	2.58	0.003%
30	5.16	-17.44	-0.00	-5.16	17.44	0.00	0.003%
31	4.47	-17.44	2.57	-4.47	17.44	-2.57	0.003%
32	2.58	-17.44	4.46	-2.58	17.44	-4.46	0.003%
33	-0.00	-17.44	5.16	0.00	17.44	-5.16	0.003%
34	-2.58	-17.44	4.47	2.58	17.44	-4.47	0.003%
35	-4.47	-17.44	2.58	4.47	17.44	-2.58	0.003%
36	-5.16	-17.44	0.00	5.16	17.44	-0.00	0.003%
37	-4.47	-17.44	-2.57	4.47	17.44	2.57	0.003%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
38	-2.58	-17.44	-4.46	2.58	17.44	4.46	0.003%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	13	0.00005937	0.00010921
3	Yes	15	0.00000001	0.00012816
4	Yes	15	0.00000001	0.00012716
5	Yes	13	0.00005936	0.00010872
6	Yes	15	0.00000001	0.00012668
7	Yes	15	0.00000001	0.00012803
8	Yes	13	0.00005937	0.00010899
9	Yes	15	0.00000001	0.00012655
10	Yes	15	0.00000001	0.00012783
11	Yes	13	0.00005936	0.00010866
12	Yes	15	0.00000001	0.00012772
13	Yes	15	0.00000001	0.00012610
14	Yes	6	0.00000001	0.00000001
15	Yes	13	0.00000001	0.00013861
16	Yes	14	0.00000001	0.00007402
17	Yes	14	0.00000001	0.00007394
18	Yes	13	0.00000001	0.00013899
19	Yes	14	0.00000001	0.00007391
20	Yes	14	0.00000001	0.00007395
21	Yes	13	0.00000001	0.00013871
22	Yes	14	0.00000001	0.00007379
23	Yes	14	0.00000001	0.00007397
24	Yes	13	0.00000001	0.00013875
25	Yes	14	0.00000001	0.00007377
26	Yes	14	0.00000001	0.00007364
27	Yes	13	0.00000001	0.00005686
28	Yes	13	0.00000001	0.00005644
29	Yes	13	0.00000001	0.00005509
30	Yes	13	0.00000001	0.00005696
31	Yes	13	0.00000001	0.00005470
32	Yes	13	0.00000001	0.00005655
33	Yes	13	0.00000001	0.00005686
34	Yes	13	0.00000001	0.00005434
35	Yes	13	0.00000001	0.00005599
36	Yes	13	0.00000001	0.00005691
37	Yes	13	0.00000001	0.00005619
38	Yes	13	0.00000001	0.00005403

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	123 - 73 (1)	TP27.5x16.5x0.1875	50.00	0.00	0.0	39.000	15.7961	-6.17	616.05	0.010
L2	73 - 37.5 (2)	TP34.94x26.355x0.3125	39.00	0.00	0.0	39.000	33.3636	-10.62	1301.18	0.008
L3	37.5 - 0 (3)	TP42.56x33.3244x0.3125	42.00	0.00	0.0	39.000	41.9042	-17.43	1634.27	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	123 - 73 (1)	TP27.5x16.5x0.1875	342.04	39.642	39.000	1.016	0.00	0.000	39.000	0.000
L2	73 - 37.5 (2)	TP34.94x26.355x0.3125	693.85	30.109	39.000	0.772	0.00	0.000	39.000	0.000
L3	37.5 - 0 (3)	TP42.56x33.3244x0.3125	1204.36	33.068	39.000	0.848	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	123 - 73 (1)	TP27.5x16.5x0.1875	9.26	0.586	26.000	0.045	0.10	0.006	26.000	0.000
L2	73 - 37.5 (2)	TP34.94x26.355x0.3125	11.10	0.333	26.000	0.026	0.00	0.000	26.000	0.000
L3	37.5 - 0 (3)	TP42.56x33.3244x0.3125	13.23	0.316	26.000	0.024	0.09	0.001	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	123 - 73 (1)	0.010	1.016	0.000	0.045	0.000	1.027 ✔	1.333	H1-3+VT ✔
L2	73 - 37.5 (2)	0.008	0.772	0.000	0.026	0.000	0.780 ✔	1.333	H1-3+VT ✔
L3	37.5 - 0 (3)	0.011	0.848	0.000	0.024	0.000	0.859 ✔	1.333	H1-3+VT ✔

Section Capacity Table

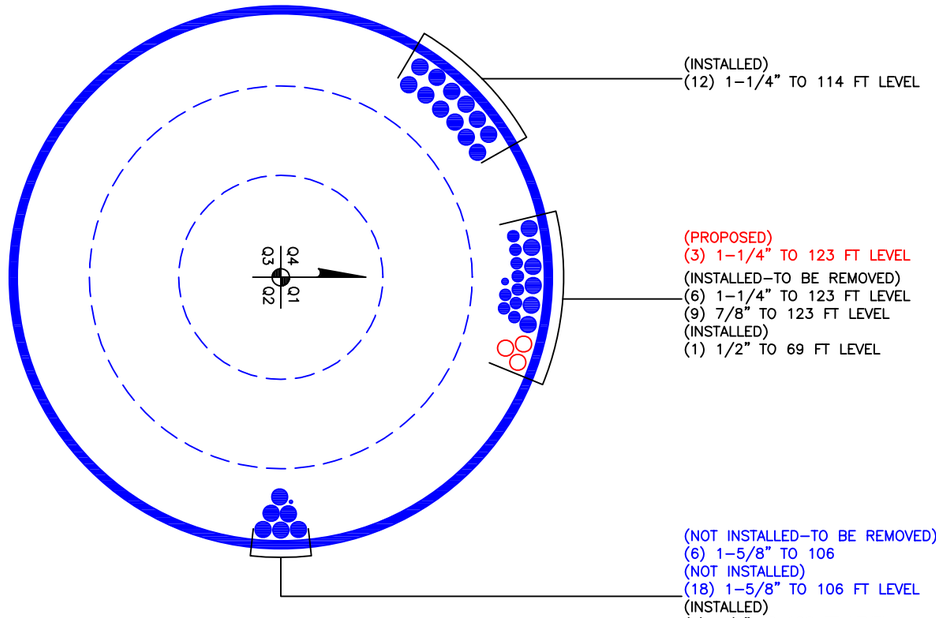
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	123 - 73	Pole	TP27.5x16.5x0.1875	1	-6.17	821.19	77.0	Pass
L2	73 - 37.5	Pole	TP34.94x26.355x0.3125	2	-10.62	1734.47	58.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L3	37.5 - 0	Pole	TP42.56x33.3244x0.3125	3	-17.43	2178.48	64.4	Pass
							Summary	
						Pole (L1)	77.0	Pass
						RATING =	**77.0**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

TRUE



(INSTALLED)
(12) 1–1/4" TO 114 FT LEVEL

(PROPOSED)
(3) 1–1/4" TO 123 FT LEVEL
(INSTALLED–TO BE REMOVED)
(6) 1–1/4" TO 123 FT LEVEL
(9) 7/8" TO 123 FT LEVEL
(INSTALLED)
(1) 1/2" TO 69 FT LEVEL

(NOT INSTALLED–TO BE REMOVED)
(6) 1–5/8" TO 106
(NOT INSTALLED)
(18) 1–5/8" TO 106 FT LEVEL
(INSTALLED)
(1) 1/4" TO 106 FT LEVEL
(6) 1–1/4" TO 106 FT LEVEL

0 1 2 3FT

: SCALE :

BUSINESS UNIT: 878863 TOWER ID: C_BASELEVEL

LEGEND: FEEDLINES

- SOLID BLUE CIRCLE DENOTES EXISTING FEEDLINE
- OPEN RED CIRCLE DENOTES PROPOSED FEEDLINE
- X BLUE "X" DENOTES LOCATION NOT GIVEN

NOTE: ASSUME FEEDLINE ATTACHMENT HEIGHT TO TOWER STEEL AT 8–FEET ABOVE FINISHED GRADE UNLESS OTHERWISE SPECIFIED

BASE LEVEL DRAWING

SCALE: 1" = 1'–0" | 1

PLOT DATE: 2/27/2012 FILE NAME: 878863_BASELEVEL.DWG

CROWN REGION ADDRESS

USA

1	16/04/07	NEW BUILD PER WORK ORDER # 129859 — MAM
2	24/01/08	APPLICATION ADDED PER WORK ORDER # 191935 — SLP
3	08/01/09	AS-BUILT INFORMATION ADDED PER WORK ORDER # 208411 — AGC
4	14/04/09	APPLICATION ADDED PER WORK ORDER # 265514 — LAN
5	22/08/11	UPDATED PER WORK ORDER # 431716 — PS
6	12/01/12	AS-BUILT INFORMATION ADDED PER WORK ORDER # 454391 — WJM
7	27/02/12	APPLICATION ADDED PER WORK ORDER # 473550 — AGC

DRAWN BY: **MAM**
CHECKED BY: **JEE**
DRAWING DATE: **16/04/07**

SITE NUMBER:
SITE NAME:

SITE NAME

1 BRIDGE STREET

BUSINESS UNIT NUMBER

878863

SITE ADDRESS

1 BRIDGE STREET
RAMAPO, NY 10931
ROCKLAND COUNTY
USA

SHEET TITLE

BASE LEVEL

SHEET NUMBER

A1-0

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#: *878863*
Site Name:
App #:

Enter Load Factors Below:

For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Pier Properties

Concrete:

Pier Diameter =	6.5	ft
Concrete Area =	4778.4	in^2

Reinforcement:

Clear Cover to **Tie**=	4.00	in
Horiz. **Tie** Bar Size=	5	
Vert. Cage Diameter =	5.61	ft
Vert. Cage Diameter =	67.34	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	18	
As Total=	28.08	in^2
A s/ Aconc, Rho:	0.0059	0.59%

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	
IBC 1810.1.2:	0.0025	SDC C
Governing:	0.0033	**0.33%**

ACI 10.8 and 10.9
Min As for Columns, Comp. Controlled, Shafts:

Min As:	0.0050	**0.50%**

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.59%	OK

Maximum Shaft Superimposed Forces

TIA Revision:	F	
Max. Service Shaft M:	1306.2	ft-kips **(* Note)**
Max. Service Shaft P:	17	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**		
1.30	Mu:	1698.06	ft-kips
1.30	Pu:	22.1	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=	2008

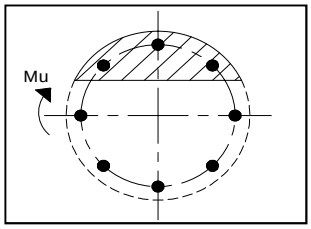
Seismic Properties

Seismic Design Category =	C
Seismic Risk =	**Moderate**

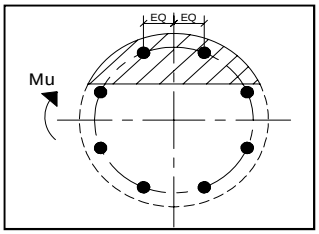
Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**12.91**	in
Extreme Steel Strain, ϵt:	**0.0138**	
	ϵt > 0.0050, Tension Controlled	
Reduction Factor,φ:	**0.900**	

<-- Comment Box

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	7174.97	kips
at Mu=(ϕ=0.65)Mn=	4030.05	ft-kips
Max Tu, (φ=0.9) Tn =	1516.32	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	22.10	kips
Drilled Shaft Moment Capacity, φMn:	**4043.39**	ft-kips
Drilled Shaft Superimposed Mu:	**1698.06**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**42.00%**

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FDH Engineering

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*****************************************************************************************************
*                                                                                                   *
* CAISSON - Pier Foundations Analysis and Design -  Copyright Power Line Systems, Inc. 1993-2010 *
*                                                                                                   *
*****************************************************************************************************
```

Project Title: BU: 878863
Project Notes: 12-02738E S2

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)
6.50	3.00	3.00	60.00

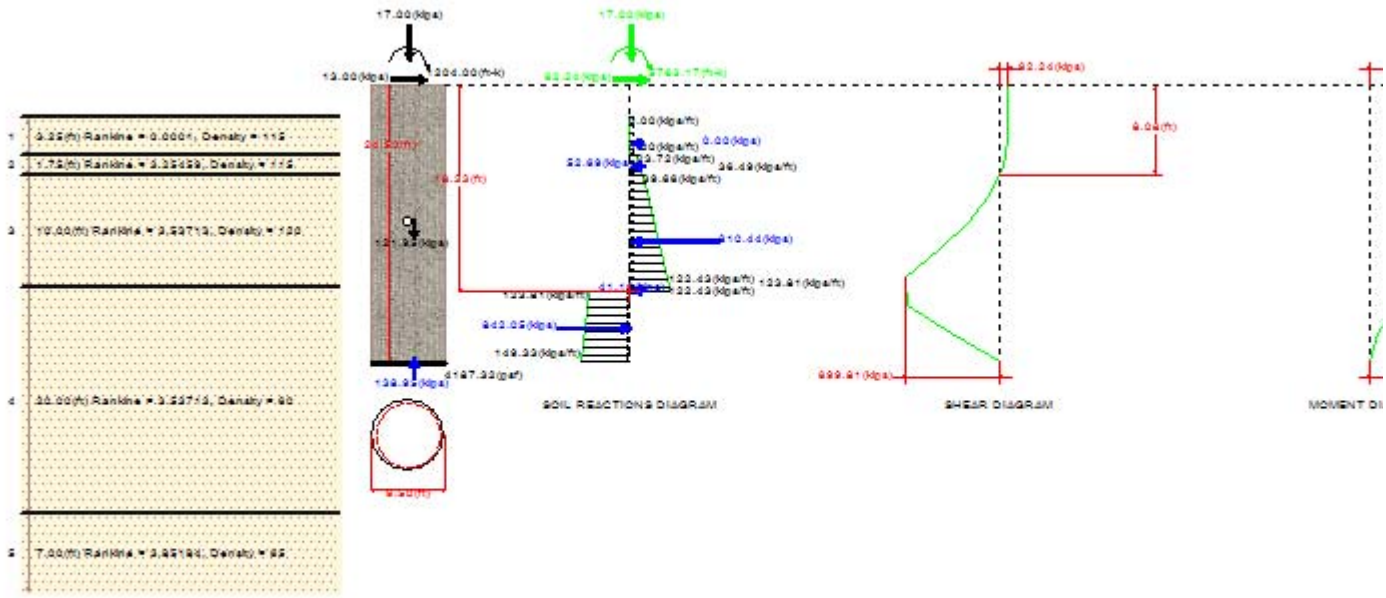
Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Sand	3.25	0.00	115.0	0.000	-88.85	
2	Sand	1.75	3.25	115.0	3.255	32.00	
3	Sand	10.00	5.00	120.0	3.537	34.00	
4	Sand	20.00	15.00	60.0	3.537	34.00	
5	Sand	7.00	35.00	65.0	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	
1204.0	17.0	13.00	4.75	CAPACITY = 2/4.75 = 42.1%

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



Calculated Pier Properties

Length (ft)	Weight (kips)	Pressure Due To Axial Load (psf)	Pressure Due To Weight (psf)	Total End-Bearing Pressure (psf)
24.500	121.948	512.3	3675.0	4187.3

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)
Sand	3.00	3.25	115.0		0.000	0.00	5.17
Sand	6.25	1.75	115.0		3.255	52.69	7.19
Sand	8.00	10.00	120.0		3.537	810.44	13.85
Sand	18.00	0.33	60.0		3.537	41.16	18.17
Sand	18.33	6.17	60.0		3.537	-842.05	21.51

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	62.2	5763.2	13.1	1213.3
2.45	62.2	5915.7	13.1	1245.4
4.90	62.2	6068.2	13.1	1277.5
7.35	31.7	6204.7	6.7	1306.2
9.80	-75.2	6163.2	-15.8	1297.5
12.25	-233.7	5794.8	-49.2	1220.0
14.70	-441.9	4977.2	-93.0	1047.8
17.15	-699.8	3588.7	-147.3	755.5
19.60	-682.0	1711.5	-143.6	360.3
22.05	-353.4	438.0	-74.4	92.2
24.50	-0.0	0.0	-0.0	0.0

Reinforcement and Capacity

Total Reinforcement Percent	Reinforcement Area (in^2)	Usable Axial Capacity (kips)	Usable Moment Capacity (ft-k)
0.32	15.29	17.0	2222.5

US Standard Re-Bars (Select one of the following)

Quantity	Name	Area (in^2)	Diameter (in)	Spacing (in)
77	#4	0.20	0.500	2.77
50	#5	0.31	0.625	4.27
35	#6	0.44	0.750	6.10
26	#7	0.60	0.875	8.22
20	#8	0.79	1.000	10.68
16	#9	1.00	1.128	13.35
13	#10	1.27	1.270	16.43
10	#11	1.56	1.410	21.36
7	#14	2.25	1.693	30.52

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

BU#: *878863*
Site Name:
App #:

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	49	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	48	in
Thick:	2.75	in
Grade:	50	ksi
Clip Distance:	5	in

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
Weld Type:	Fillet	**
Groove Depth:	0.375	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	24	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	42.56	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	1204	ft-kips
Unfactored Axial, P:	17	kips
Unfactored Shear, V:	13	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension	96.9	Kips
Allowable Tension:	195.0	Kips
Anchor Rod Stress Ratio:	49.7%	**Pass**

Base Plate Results Flexural Check

Base Plate Stress:	25.1	ksi
Allowable PL Bending Stress:	50.0	ksi
Base Plate Stress Ratio:	50.3%	**Pass**

PL Ref. Data	
Yield Line (in):	25.32
Max PL Length:	25.32

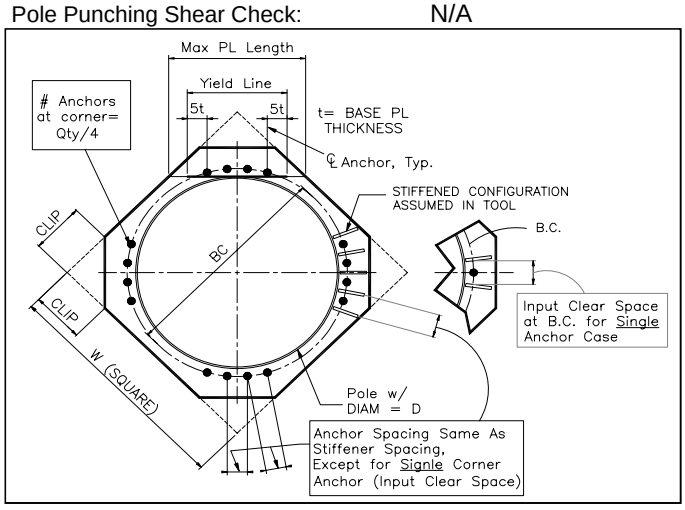
N/A - Unstiffened

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



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