March 4, 2013

Mr. Steve Tuttle
Crown Castle
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Pittsford, NY 14534
(585) 899-3445

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Subject:	**Structural Modification Report**	
Carrier Designation:	***Sprint PCS* Co-Locate**	
	Carrier Site Number:	NM03XC066
	Carrier Site Name:	NM03XC066
Crown Castle Designation:	**Crown Castle BU Number:**	878782
	Crown Castle Site Name:	188 Warren Ave
	Crown Castle JDE Job Number:	191399
	Crown Castle Work Order Number:	580875
	Crown Castle Application Number:	164923 Rev. 1
Engineering Firm Designation:	**B+T Group Project Number:**	86959.001.01
Site Data:	188 **Warren Ave, Portland, ME, Cumberland County** **Latitude *43° 41' 15.16"*, Longitude *-70° 18' 14.96"*** **180 Foot - Monopole**	

Dear Mr. Tuttle,

B+T Group is pleased to submit this **"Structural Modification 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 525004, in accordance with application 164923, 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:

LC4: TSA specified load case with proposed modifications **Sufficient Capacity**
Note: See Table 1 and Table 2 for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA-222-G standard and the local code requirements based upon a wind speed of 100 mph 3-second gust, exposure category C.

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

We at *B+T Group* 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:
B+T Engineering, Inc.

Kiran K. Maroju, E.I.
Project Engineer

Chad E. Tuttle, P.E.
President

STATE OF MAINE
CHAD E. TUTTLE
10488
LICENSED PROFESSIONAL ENGINEER
3/4/13

tnxTower Report - version 6.0.4.0

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 180 ft. Monopole designed by Pittsburg Monopole in February of 1997. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. This tower has been modified by Crown Castle in 2012 and those modifications were incorporated in this analysis.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 100 mph with no ice, 40 mph with 1 inch ice thickness and 60 mph under service loads, exposure category C.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
177.0	179.0	1	RFS Celwave	APXV9ERR18-C-A20	3	1-1/4	--
		2	RFS Celwave	APXVSPP18-C-A20			
		3	RFS Celwave	IBC1900BB-1			
		3	RFS Celwave	IBC1900HG-2A			
175.0	176.0	3	Alcatel Lucent	800MHz 2X50W RRH W/FILTER	--	--	
		6	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz			
	175.0	1	--	Side Arm Mount [SO 102-3]			

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
177.0	179.0	**6**	**Allgon**	**7184.15**	**6**	**1-5/8**	**3**
	177.0	1	--	Platform Mount [LP 715-1]	--	--	1
171.0	171.0	6	Dapa	58010	6	1-5/8	1
		1	--	Platform Mount [LP 401-1]			
161.0	162.0	2	KMW	AM-X-CD-16-65-00T-RET	2 1	3/4 3/8	2
		6	Powerwave	7020.00			
		1	Powerwave	P65-17-XLH-RR			
		1	Raycap	DC6-48-60-18-8F			
		6	Powerwave	7770.00	12	1-5/8	1
	161.0	6	Powerwave	LGP2140X			
		1	--	T-Arm Mount [TA 602-3]	--	--	2
159.0	160.0	6	Ericsson	RRUS-11			
	159.0	1	--	Side Arm Mount [SO 701-3]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be Removed

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)
180	180	12	Generic	Antenna (4 sq. ft)	--	--
170	170	2	Generic	6' Dish	--	--
160	160	12	Generic	Antenna (4 sq. ft)	--	--

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Sprint Co-Locate Revision# 1	164923	CCI Sites
Tower Manufacturing Drawing	Pittsburg Monopole Division,Date:2/7/97	1451234	CCI Sites
Tower Modification Drawing	Crown Castle, Date:04/24/12	3160195	CCI Sites
Modification Inspection Report	TEP, Project No:127768	3360128	CCI Sites
Foundation Drawing	Pittsburg Monopole Division,Date:2/7/97	1480918	CCI Sites
Geotech Report	Gemini Geotechnical Associates, Project No.96127ME	1562092	CCI Sites
Antenna Configuration	Previous SA by Crown Castle, Project No:539485	3353442	CCI Sites

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) Mount areas and weights are assumed based on photographs provided.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary) - LC4

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	180 - 140	Pole	P24x3/8	1	-12.287	901.775	91.2	Pass
L2	140 - 100	Pole	P36x1/2	2	-22.818	1806.730	80.2	Pass
L3	100 - 65	Pole	P42x1/2	3	-33.596	2112.090	99.1	Pass
L4	65 - 60	Pole	P42x.7333	4	-35.759	2891.950	71.9	Pass
L5	60 - 20	Pole	P48x5/8	5	-52.753	3013.870	95.7	Pass
L6	20 - 0	Pole	P54x5/8	6	-62.031	3395.570	90.9	Pass
							Summary	
						Pole (L3)	99.1	Pass
						RATING =	**99.1**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity - LC4

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Bridge Stiffeners	140	86.1	Pass
1,2	Flange Bolts	100	100.6	Pass
1	Flange Plate	100	42.9	Pass
1	Bridge Stiffeners	60	86.0	Pass
1	Flange Bolts	60	48.1	Pass
1	Flange Plate	60	21.4	Pass
1	Bridge Stiffeners	20	88.3	Pass
1	Flange Bolts	20	61.7	Pass
1	Flange Plate	20	26.3	Pass
1,2	Anchor Rods	Base	101.2	Pass
1	Base Plate	Base	42.3	Pass
1	Base Foundation	Base	50.7	Pass

Structure Rating (max from all components) =	**101.2%**

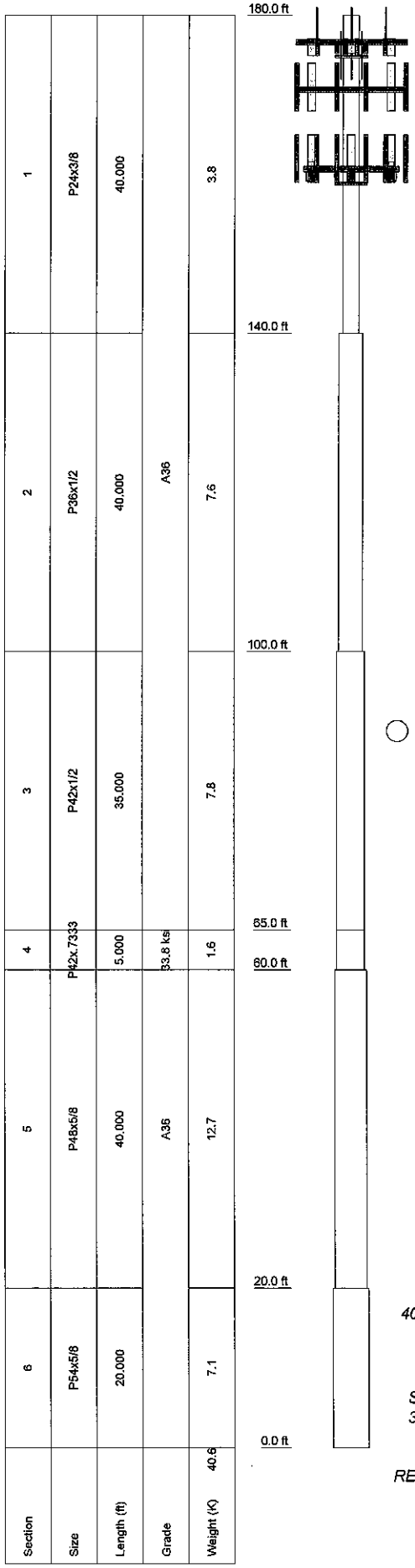
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
2) Capacities up to 105% are considered acceptable based on analysis methods used.

4.1) Recommendations

1) All modifications proposed in this report shall be installed in accordance with the attached drawings (Appendix D) for the determined available structural capacity to be effective.

APPENDIX A

tnxTOWER OUTPUT



Section	Size	Length (ft)	Grade	Weight (K)
1	P24x3/8	40.000	A36	3.8
2	P36x1/2	40.000		7.6
3	P42x1/2	35.000		7.8
4	P42x.7333	5.000	33.6 ksi	1.6
5	P48x5/8	40.000	A36	12.7
6	P54x5/8	20.000		7.1
				40.6

ALL REACTIONS ARE FACTORED

AXIAL 103 K

SHEAR 7 K *MOMENT 868 kip-ft*

TORQUE 0 kip-ft
40 mph WIND - 1.000 in ICE

AXIAL 62 K

SHEAR 31 K *MOMENT 3963 kip-ft*

TORQUE 1 kip-ft
REACTIONS - 100 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lighting Rod 3/4" x 5'	183	Side Arm Mount [SO 102-3] (P)	175
APXVSPP18-C-A20 w/ Mount Pipe (P)	177	6' x 2" Mount Pipe (E)	175
		6' x 2" Mount Pipe (E)	175
APXV9ERR18-C-A20 w/ Mount Pipe (P)	177	6' x 2" Mount Pipe (E)	175
		(2) 58010 w/ Mount Pipe (E)	171
APXVSPP18-C-A20 w/ Mount Pipe (P)	177	(2) 58010 w/ Mount Pipe (E)	171
		(2) 58010 w/ Mount Pipe (E)	171
IBC1900BB-1 (P)	177	Platform Mount [LP 401-1] (E)	171
IBC1900BB-1 (P)	177	(2) 7770.00 w/ Mount Pipe (E)	161
IBC1900BB-1 (P)	177	(2) 7770.00 w/ Mount Pipe (E)	161
IBC1900HG-2A (P)	177	(2) 7770.00 w/ Mount Pipe (E)	161
IBC1900HG-2A (P)	177	(2) LGP2140X (E)	161
IBC1900HG-2A (P)	177	(2) LGP2140X (E)	161
Platform Mount [LP 715-1] (E)	177	(2) LGP2140X (E)	161
4' x 2" Pipe Mount (E)	177	P65-17-XLH-RR w/ Mount Pipe (R)	161
4' x 2" Pipe Mount (E)	177	AM-X-CD-16-65-00T-RET w/ Mount Pipe (R)	161
4' x 2" Pipe Mount (E)	177	AM-X-CD-16-65-00T-RET w/ Mount Pipe (R)	161
800MHz 2X50W RRH W/FILTER (P)	175	(2) 7020.00 (R)	161
800MHz 2X50W RRH W/FILTER (P)	175	(2) 7020.00 (R)	161
800MHz 2X50W RRH W/FILTER (P)	175	(2) 7020.00 (R)	161
(2) PCS 1900MHz 4x45W-65MHz (P)	175	DC6-48-60-18-8F (R)	161
(2) PCS 1900MHz 4x45W-65MHz (P)	175	T-Arm Mount [TA 602-3] (R)	161
		(2) RRUS 11 (R)	159
(2) PCS 1900MHz 4x45W-65MHz (P)	175	(2) RRUS 11 (R)	159
		Side Arm Mount [SO 701-3] (R)	159
		(2) RRUS 11 (R)	159

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi	33.8 ksi	34 ksi	65 ksi

TOWER DESIGN NOTES

1. Tower is located in Cumberland County, Maine.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 100 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 99.1%

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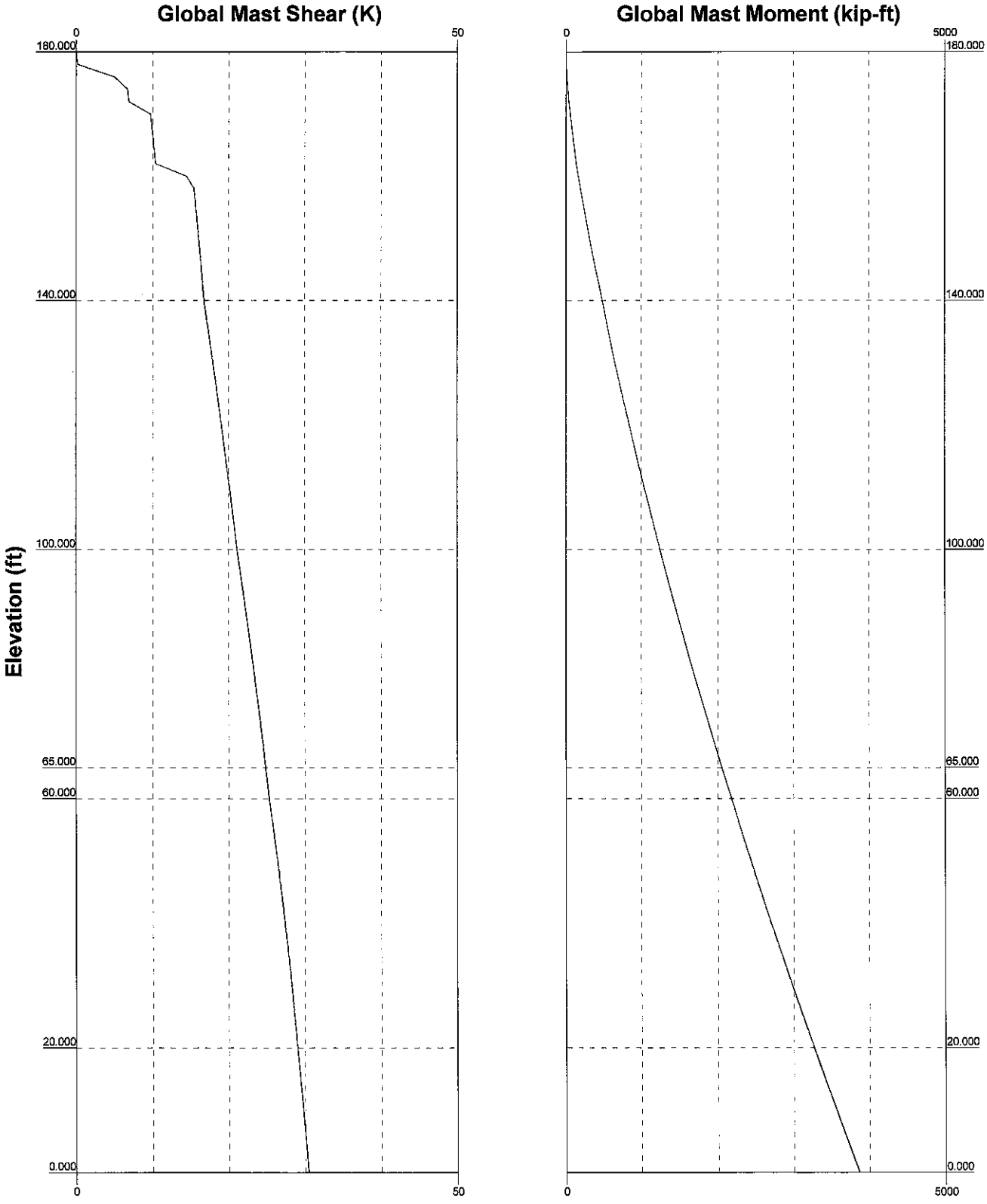
Job:	***86959.001.01 - Portland Warren Ave, ME(BU# 878***		
Project:	***180' Monopole / App Id:164923 Rev: 1***		
Client: Crown Castle	Drawn by: HKarande	App'd:	
Code: TIA-222-G	Date: 03/01/13	Scale: NTS	
Path:		Dwg No. E-1	

Vx Vz Mx Mz



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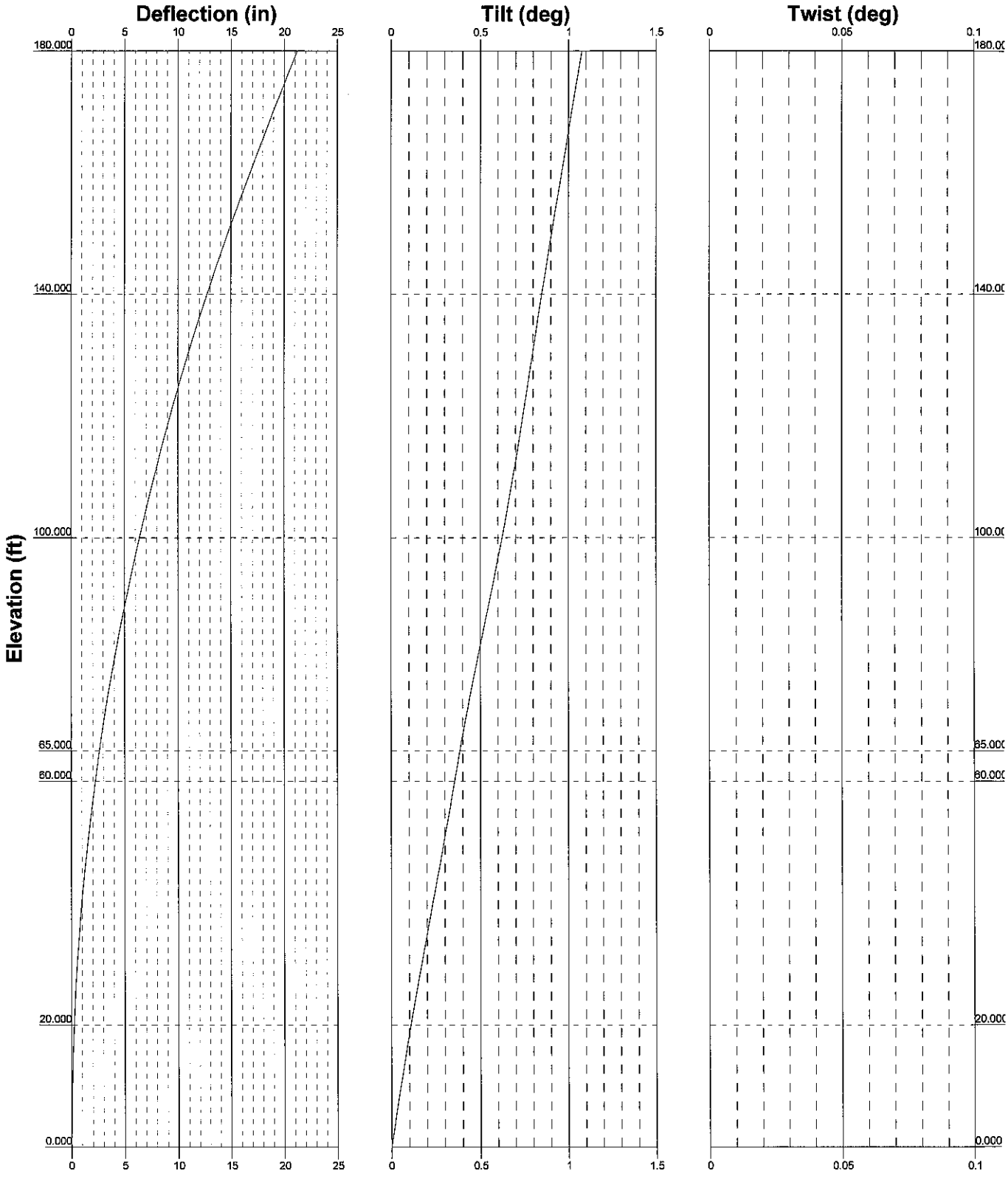
Code: TIA-222-G	Date: 03/01/13	Scale: NTS
Path:		Dwg No. E-4

TIA-222-G - Service - 60 mph **Maximum Values**



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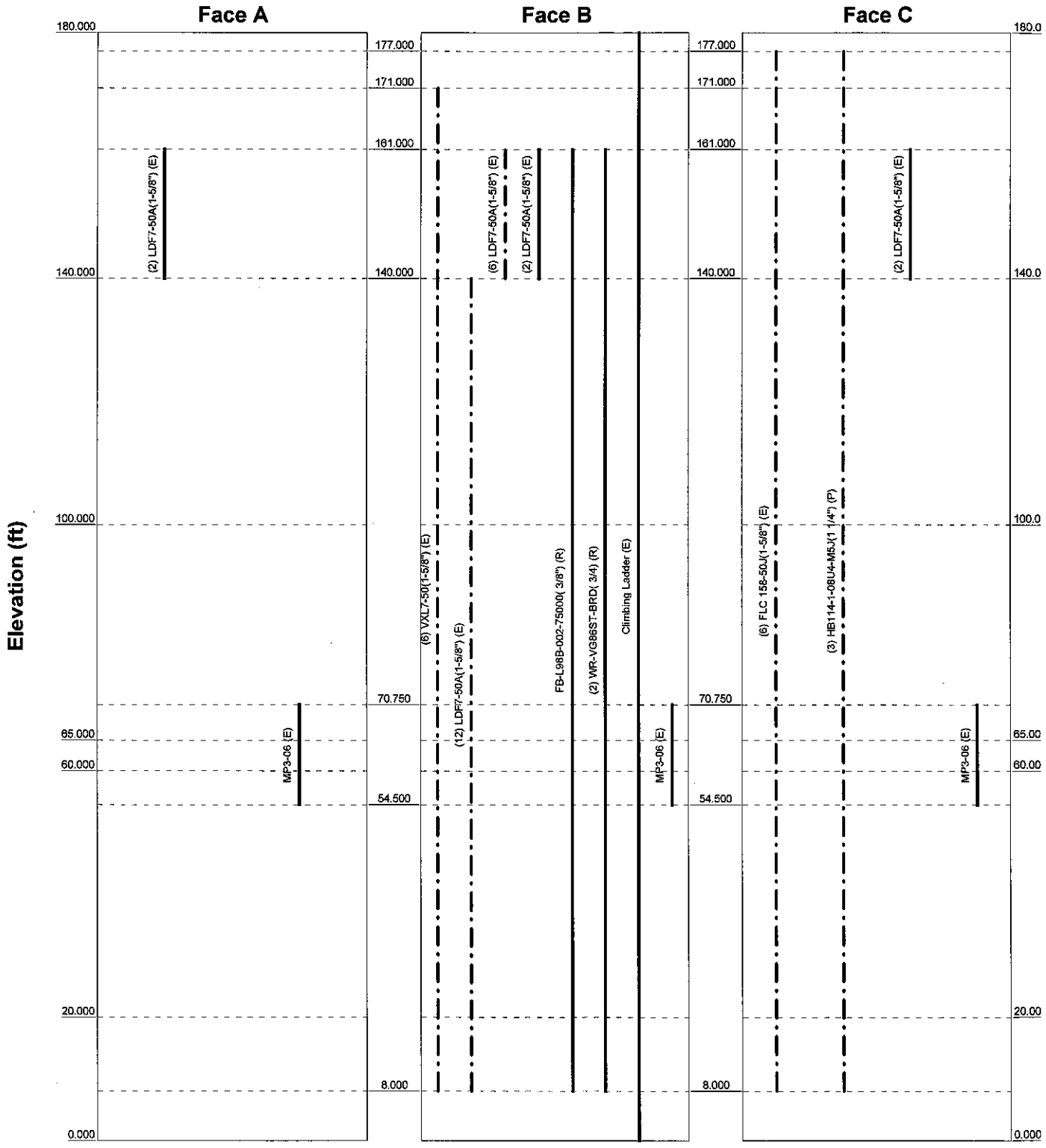
Client: Crown Castle	Drawn by: HKarande	App'd:
Code: TIA-222-G	Date: 03/01/13	Scale: NTS
Path:		Dwg No. E-5

0' - 180'

Round — Flat — App In Face — App Out Face — Truss Leg



B+T Group 1717 S. Boulder, Suite 300 Tulsa, OK Phone: (918) 587-4630 FAX: (918) 295-0265	Job: ***86959.001.01 - Portland Warren Ave, ME(BU# 878***		
	Project: ***180' Monopole / App Id:164923 Rev: 1***		
	Client: Crown Castle	Drawn by: HKarande	App'd:
	Code: TIA-222-G	Date: 03/01/13	Scale: NTS
	Path:		Dwg No. E-7

Tower Input Data

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

Tower is located in Cumberland County, Maine.
Basic wind speed of 100 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.000 ft.
Nominal ice thickness of 1.000 in.
Ice thickness is considered to increase with height.
Ice density of 56.000 pcf.
A wind speed of 40 mph is used in combination with ice.
Temperature drop of 50.000 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Pole Section Geometry

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	180.000-140.000	40.000	P24x3/8	A36 (36 ksi)	
L2	140.000-100.000	40.000	P36x1/2	A36 (36 ksi)	
L3	100.000-65.000	35.000	P42x1/2	A36 (36 ksi)	
L4	65.000-60.000	5.000	P42x.7333	33.8 ksi (34 ksi)	
L5	60.000-20.000	40.000	P48x5/8	A36 (36 ksi)	
L6	20.000-0.000	20.000	P54x5/8	A36 (36 ksi)	

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 180.000-140.000				1	1	1		
L2 140.000-100.000				1	1	1		
L3 100.000-65.000				1	1	1		
L4 65.000-60.000				1	1	1		

Tower Elevation ft	Gusset Area (per face) ft²	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
L5 60.000-20.000				1	1	1		
L6 20.000-0.000				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
LDF7-50A(1-5/8") (E)	A	Surface Ar (CaAa)	161.000 - 140.000	2	2	0.000 0.050	1.980		0.001
LDF7-50A(1-5/8") (E)	B	Surface Ar (CaAa)	161.000 - 140.000	2	2	0.000 0.050	1.980		0.001
LDF7-50A(1-5/8") (E)	C	Surface Ar (CaAa)	161.000 - 140.000	2	2	0.000 0.050	1.980		0.001
FB-L98B-002-75000(3/8") (R)	B	Surface Ar (CaAa)	161.000 - 8.000	1	1	-0.500 -0.480	0.394		0.000
WR-VG86ST-BRD(3/4) (R) **//**	B	Surface Ar (CaAa)	161.000 - 8.000	2	2	-0.480 -0.450	0.774		0.001
Climbing Ladder (E) **//**	B	Surface Ar (CaAa)	180.000 - 0.000	1	1	0.000 0.050	3.000		0.003
MP3-06 (E)	C	Surface Af (CaAa)	70.750 - 54.500	1	1	0.000 0.000	6.890	18.992	0.000
MP3-06 (E)	B	Surface Af (CaAa)	70.750 - 54.500	1	1	0.000 0.000	6.890	18.992	0.000
MP3-06 (E) **//**	A	Surface Af (CaAa)	70.750 - 54.500	1	1	0.000 0.000	6.890	18.992	0.000

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft²/ft	Weight klf
FLC 158-50J(1-5/8") (E)	C	No	Inside Pole	177.000 - 8.000	6	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
HB114-1-08U4-M5J(1 1/4") (P) **//**	C	No	Inside Pole	177.000 - 8.000	3	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
VXL7-50(1-5/8") (E) **//**	B	No	Inside Pole	171.000 - 8.000	6	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
LDF7-50A(1-5/8") (E)	B	No	Inside Pole	140.000 - 8.000	12	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
LDF7-50A(1-5/8") (E) **//**	B	No	Inside Pole	161.000 - 140.000	6	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 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	180.000-140.000	A	0.000	0.000	8.316	0.000	0.034
		B	0.000	0.000	24.394	0.000	0.423
		C	0.000	0.000	8.316	0.000	0.359
L2	140.000-100.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	19.767	0.000	0.743
		C	0.000	0.000	0.000	0.000	0.350
L3	100.000-65.000	A	0.000	0.000	6.603	0.000	0.000
		B	0.000	0.000	23.899	0.000	0.650
		C	0.000	0.000	6.603	0.000	0.307
L4	65.000-60.000	A	0.000	0.000	5.742	0.000	0.000
		B	0.000	0.000	8.213	0.000	0.093
		C	0.000	0.000	5.742	0.000	0.044
L5	60.000-20.000	A	0.000	0.000	6.316	0.000	0.000
		B	0.000	0.000	26.083	0.000	0.743
		C	0.000	0.000	6.316	0.000	0.350
L6	20.000-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	8.330	0.000	0.247
		C	0.000	0.000	0.000	0.000	0.105

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	180.000-140.000	A	2.342	0.000	0.000	22.692	0.000	0.377
		B		0.000	0.000	80.453	0.000	1.759
		C		0.000	0.000	22.692	0.000	0.701
L2	140.000-100.000	A	2.276	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	80.489	0.000	2.023
		C		0.000	0.000	0.000	0.000	0.350
L3	100.000-65.000	A	2.192	0.000	0.000	8.200	0.000	0.134
		B		0.000	0.000	76.728	0.000	1.839
		C		0.000	0.000	8.200	0.000	0.440
L4	65.000-60.000	A	2.132	0.000	0.000	7.102	0.000	0.112
		B		0.000	0.000	16.695	0.000	0.349
		C		0.000	0.000	7.102	0.000	0.156
L5	60.000-20.000	A	2.042	0.000	0.000	7.765	0.000	0.117
		B		0.000	0.000	82.160	0.000	1.938
		C		0.000	0.000	7.765	0.000	0.467
L6	20.000-0.000	A	1.775	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	25.479	0.000	0.590
		C		0.000	0.000	0.000	0.000	0.105

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	180.000-140.000	0.305	-0.256	0.336	-0.451
L2	140.000-100.000	0.389	-0.444	0.592	-1.224
L3	100.000-65.000	0.344	-0.395	0.564	-1.167

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L4	65.000-60.000	0.211	-0.242	0.373	-0.769
L5	60.000-20.000	0.358	-0.412	0.595	-1.223
L6	20.000-0.000	0.398	-0.359	0.686	-0.991

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	8	LDF7-50A(1-5/8")	140.00 - 161.00	1.0000	1.0000
L1	9	LDF7-50A(1-5/8")	140.00 - 161.00	1.0000	1.0000
L1	10	LDF7-50A(1-5/8")	140.00 - 161.00	1.0000	1.0000
L1	11	FB-L98B-002-75000(3/8")	140.00 - 161.00	1.0000	1.0000
L1	12	WR-VG86ST-BRD(3/4)	140.00 - 161.00	1.0000	1.0000
L1	14	Climbing Ladder	140.00 - 180.00	1.0000	1.0000
L2	11	FB-L98B-002-75000(3/8")	100.00 - 140.00	1.0000	1.0000
L2	12	WR-VG86ST-BRD(3/4)	100.00 - 140.00	1.0000	1.0000
L2	14	Climbing Ladder	100.00 - 140.00	1.0000	1.0000
L3	11	FB-L98B-002-75000(3/8")	65.00 - 100.00	1.0000	1.0000
L3	12	WR-VG86ST-BRD(3/4)	65.00 - 100.00	1.0000	1.0000
L3	14	Climbing Ladder	65.00 - 100.00	1.0000	1.0000
L3	16	MP3-06	65.00 - 70.75	1.0000	1.0000
L3	17	MP3-06	65.00 - 70.75	1.0000	1.0000
L3	18	MP3-06	65.00 - 70.75	1.0000	1.0000
L4	11	FB-L98B-002-75000(3/8")	60.00 - 65.00	1.0000	1.0000
L4	12	WR-VG86ST-BRD(3/4)	60.00 - 65.00	1.0000	1.0000
L4	14	Climbing Ladder	60.00 - 65.00	1.0000	1.0000
L4	16	MP3-06	60.00 - 65.00	1.0000	1.0000
L4	17	MP3-06	60.00 - 65.00	1.0000	1.0000
L4	18	MP3-06	60.00 - 65.00	1.0000	1.0000
L5	11	FB-L98B-002-75000(3/8")	20.00 - 60.00	1.0000	1.0000
L5	12	WR-VG86ST-BRD(3/4)	20.00 - 60.00	1.0000	1.0000
L5	14	Climbing Ladder	20.00 - 60.00	1.0000	1.0000
L5	16	MP3-06	54.50 - 60.00	1.0000	1.0000
L5	17	MP3-06	54.50 - 60.00	1.0000	1.0000
L5	18	MP3-06	54.50 - 60.00	1.0000	1.0000
L6	11	FB-L98B-002-75000(3/8")	8.00 - 20.00	1.0000	1.0000
L6	12	WR-VG86ST-BRD(3/4)	8.00 - 20.00	1.0000	1.0000
L6	14	Climbing Ladder	0.00 - 20.00	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Lighting Rod 3/4" x 5'	C	None		0.000	183.000	No Ice	0.375	0.375	0.030
						1/2" Ice	0.890	0.890	0.034
						1" Ice	1.356	1.356	0.041
//									
APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.000 0.000	0.000	177.000	No Ice 1/2" Ice	8.498 9.149	6.946 8.127	0.083 0.148
(P)			2.000			1" Ice	9.767	9.021	0.225
APXV9ERR18-C-A20 w/ Mount Pipe	B	From Leg	4.000 0.000	0.000	177.000	No Ice 1/2" Ice	8.498 9.149	7.471 8.656	0.088 0.155
(P)			2.000			1" Ice	9.767	9.556	0.235
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.000 0.000	0.000	177.000	No Ice 1/2" Ice	8.498 9.149	6.946 8.127	0.083 0.148
(P)			2.000			1" Ice	9.767	9.021	0.225
IBC1900BB-1 (P)	A	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	1.127 1.273 1.427	0.533 0.647 0.770	0.020 0.030 0.039
IBC1900BB-1 (P)	B	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	1.127 1.273 1.427	0.533 0.647 0.770	0.020 0.030 0.039
IBC1900BB-1 (P)	C	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	1.127 1.273 1.427	0.533 0.647 0.770	0.020 0.030 0.039
IBC1900HG-2A (P)	A	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	1.127 1.273 1.427	0.533 0.647 0.770	0.020 0.030 0.039
IBC1900HG-2A (P)	B	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	1.127 1.273 1.427	0.533 0.647 0.770	0.020 0.030 0.039
IBC1900HG-2A (P)	C	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	1.127 1.273 1.427	0.533 0.647 0.770	0.020 0.030 0.039
Platform Mount [LP 715-1] (E)	C	None		0.000	177.000	No Ice 1/2" Ice 1" Ice	44.210 53.970 63.730	44.210 53.970 63.730	1.775 2.323 2.871
4' x 2" Pipe Mount (E)	A	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	0.866 1.111 1.365	0.866 1.111 1.365	0.015 0.022 0.032
4' x 2" Pipe Mount (E)	B	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	0.866 1.111 1.365	0.866 1.111 1.365	0.015 0.022 0.032
4' x 2" Pipe Mount (E)	C	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	0.866 1.111 1.365	0.866 1.111 1.365	0.015 0.022 0.032
//									
800MHz 2X50W RRH W/FILTER	A	From Leg	1.000 0.000	0.000	175.000	No Ice 1/2" Ice	2.401 2.613	2.254 2.460	0.064 0.086
(P)			1.000			1" Ice	2.833	2.675	0.111
800MHz 2X50W RRH W/FILTER	B	From Leg	1.000 0.000	0.000	175.000	No Ice 1/2" Ice	2.401 2.613	2.254 2.460	0.064 0.086
(P)			1.000			1" Ice	2.833	2.675	0.111
800MHz 2X50W RRH W/FILTER	C	From Leg	1.000 0.000	0.000	175.000	No Ice 1/2" Ice	2.401 2.613	2.254 2.460	0.064 0.086
(P)			1.000			1" Ice	2.833	2.675	0.111

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft / ft / ft	°	ft		ft^2	ft^2	K
(2) PCS 1900MHz 4x45W-65MHz	A	From Leg	1.000	0.000	175.000	No Ice	2.709	2.611	0.060
			0.000			1/2" Ice	2.948	2.847	0.083
(P)			1.000			1" Ice	3.195	3.092	0.110
(2) PCS 1900MHz 4x45W-65MHz	B	From Leg	1.000	0.000	175.000	No Ice	2.709	2.611	0.060
			0.000			1/2" Ice	2.948	2.847	0.083
(P)			1.000			1" Ice	3.195	3.092	0.110
(2) PCS 1900MHz 4x45W-65MHz	C	From Leg	1.000	0.000	175.000	No Ice	2.709	2.611	0.060
			0.000			1/2" Ice	2.948	2.847	0.083
(P)			1.000			1" Ice	3.195	3.092	0.110
Side Arm Mount [SO 102-3]	C	None		0.000	175.000	No Ice	3.000	3.000	0.081
(P)						1/2" Ice	3.480	3.480	0.111
						1" Ice	3.960	3.960	0.141
6' x 2" Mount Pipe	A	From Leg	0.500	0.000	175.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
6' x 2" Mount Pipe	B	From Leg	0.500	0.000	175.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
6' x 2" Mount Pipe	C	From Leg	0.500	0.000	175.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
//									
(2) 58010 w/ Mount Pipe	A	From Leg	4.000	0.000	171.000	No Ice	3.616	3.116	0.031
(E)			0.000			1/2" Ice	4.029	3.826	0.061
			0.000			1" Ice	4.440	4.493	0.101
(2) 58010 w/ Mount Pipe	B	From Leg	4.000	0.000	171.000	No Ice	3.616	3.116	0.031
(E)			0.000			1/2" Ice	4.029	3.826	0.061
			0.000			1" Ice	4.440	4.493	0.101
(2) 58010 w/ Mount Pipe	C	From Leg	4.000	0.000	171.000	No Ice	3.616	3.116	0.031
(E)			0.000			1/2" Ice	4.029	3.826	0.061
			0.000			1" Ice	4.440	4.493	0.101
Platform Mount [LP 401-1]	C	None		0.000	171.000	No Ice	24.330	24.330	1.645
(E)						1/2" Ice	30.220	30.220	2.030
						1" Ice	36.110	36.110	2.415
//									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.000	0.000	161.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.101
			1.000			1" Ice	7.128	5.711	0.155
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.000	0.000	161.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.101
			1.000			1" Ice	7.128	5.711	0.155
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.000	0.000	161.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.101
			1.000			1" Ice	7.128	5.711	0.155
(2) LGP2140X	A	From Leg	4.000	0.000	161.000	No Ice	1.260	0.378	0.014
(E)			0.000			1/2" Ice	1.416	0.493	0.021
			0.000			1" Ice	1.581	0.617	0.030
(2) LGP2140X	B	From Leg	4.000	0.000	161.000	No Ice	1.260	0.378	0.014
(E)			0.000			1/2" Ice	1.416	0.493	0.021
			0.000			1" Ice	1.581	0.617	0.030
(2) LGP2140X	C	From Leg	4.000	0.000	161.000	No Ice	1.260	0.378	0.014
(E)			0.000			1/2" Ice	1.416	0.493	0.021
			0.000			1" Ice	1.581	0.617	0.030
P65-17-XLH-RR w/ Mount Pipe	A	From Leg	4.000	0.000	161.000	No Ice	11.704	8.938	0.092
			0.000			1/2" Ice	12.424	10.450	0.174
(R)			1.000			1" Ice	13.153	11.986	0.271
AM-X-CD-16-65-00T-RET	B	From Leg	4.000	0.000	161.000	No Ice	8.498	6.304	0.074

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
w/ Mount Pipe			0.000			1/2" Ice	9.149	7.479	0.136
(R)			1.000			1" Ice	9.767	8.368	0.210
AM-X-CD-16-65-00T-RET	C	From Leg	4.000	0.000	161.000	No Ice	8.498	6.304	0.074
w/ Mount Pipe			0.000			1/2" Ice	9.149	7.479	0.136
(R)			1.000			1" Ice	9.767	8.368	0.210
(2) 7020.00	A	From Leg	4.000	0.000	161.000	No Ice	0.119	0.204	0.002
(R)			0.000			1/2" Ice	0.171	0.279	0.005
			1.000			1" Ice	0.232	0.363	0.009
(2) 7020.00	B	From Leg	4.000	0.000	161.000	No Ice	0.119	0.204	0.002
(R)			0.000			1/2" Ice	0.171	0.279	0.005
			1.000			1" Ice	0.232	0.363	0.009
(2) 7020.00	C	From Leg	4.000	0.000	161.000	No Ice	0.119	0.204	0.002
(R)			0.000			1/2" Ice	0.171	0.279	0.005
			1.000			1" Ice	0.232	0.363	0.009
DC6-48-60-18-8F	A	From Leg	4.000	0.000	161.000	No Ice	1.266	1.266	0.020
(R)			0.000			1/2" Ice	1.456	1.456	0.035
			1.000			1" Ice	1.658	1.658	0.053
(2) RRUS 11	A	From Leg	2.000	0.000	159.000	No Ice	3.249	1.373	0.048
(R)			0.000			1/2" Ice	3.491	1.551	0.068
			1.000			1" Ice	3.741	1.738	0.092
(2) RRUS 11	B	From Leg	2.000	0.000	159.000	No Ice	3.249	1.373	0.048
(R)			0.000			1/2" Ice	3.491	1.551	0.068
			1.000			1" Ice	3.741	1.738	0.092
(2) RRUS 11	C	From Leg	2.000	0.000	159.000	No Ice	3.249	1.373	0.048
(R)			0.000			1/2" Ice	3.491	1.551	0.068
			1.000			1" Ice	3.741	1.738	0.092
Side Arm Mount [SO 701-3]	C	None		0.000	159.000	No Ice	2.830	2.830	0.195
(R)						1/2" Ice	3.920	3.920	0.237
						1" Ice	5.010	5.010	0.279
T-Arm Mount [TA 602-3]	C	None		0.000	161.000	No Ice	11.590	11.590	0.774
(R)						1/2" Ice	15.440	15.440	0.990
						1" Ice	19.290	19.290	1.206
//									

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

Comb. No.	Description
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	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 140	21.207	50	1.076	0.001
L2	140 - 100	12.718	50	0.849	0.001
L3	100 - 65	6.410	50	0.623	0.000
L4	65 - 60	2.645	50	0.385	0.000
L5	60 - 20	2.258	50	0.354	0.000
L6	20 - 0	0.240	50	0.112	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
183.000	Lighting Rod 3/4" x 5'	50	21.207	1.076	0.001	54546
177.000	APXVSPP18-C-A20 w/ Mount Pipe	50	20.536	1.059	0.001	54546
175.000	800MHz 2X50W RRH W/FILTER	50	20.088	1.047	0.001	54546
171.000	(2) 58010 w/ Mount Pipe	50	19.197	1.024	0.001	30303
161.000	(2) 7770.00 w/ Mount Pipe	50	17.002	0.966	0.001	14354
159.000	(2) RRUS 11	50	16.572	0.955	0.001	12987

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 140	105.954	24	5.382	0.006
L2	140 - 100	63.582	24	4.248	0.003
L3	100 - 65	32.056	24	3.118	0.002
L4	65 - 60	13.229	24	1.924	0.001
L5	60 - 20	11.294	24	1.771	0.001
L6	20 - 0	1.200	24	0.557	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
183.000	Lighting Rod 3/4" x 5'	24	105.954	5.382	0.006	11117
177.000	APXVSPP18-C-A20 w/ Mount Pipe	24	102.602	5.295	0.006	11117
175.000	800MHz 2X50W RRH W/FILTER	24	100.370	5.237	0.006	11117
171.000	(2) 58010 w/ Mount Pipe	24	95.922	5.121	0.005	6175
161.000	(2) 7770.00 w/ Mount Pipe	24	84.969	4.834	0.004	2923
159.000	(2) RRUS 11	24	82.821	4.777	0.004	2644

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	180 - 140 (1)	P24x3/8	40.000	0.000	0.0	27.833	-12.287	901.775	0.014
L2	140 - 100 (2)	P36x1/2	40.000	0.000	0.0	55.763	-22.818	1806.730	0.013
L3	100 - 65 (3)	P42x1/2	35.000	0.000	0.0	65.188	-33.596	2112.090	0.016
L4	65 - 60 (4)	P42x.7333	5.000	0.000	0.0	95.067	-35.759	2891.950	0.012
L5	60 - 20 (5)	P48x5/8	40.000	0.000	0.0	93.021	-52.753	3013.870	0.018
L6	20 - 0 (6)	P54x5/8	20.000	0.000	0.0	104.802	-62.031	3395.570	0.018

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	180 - 140 (1)	P24x3/8	493.927	550.881	0.897	0.000	550.881	0.000
L2	140 - 100 (2)	P36x1/2	1279.750	1623.158	0.788	0.000	1623.158	0.000
L3	100 - 65 (3)	P42x1/2	2108.458	2162.842	0.975	0.000	2162.842	0.000
L4	65 - 60 (4)	P42x.7333	2237.017	3165.958	0.707	0.000	3165.958	0.000
L5	60 - 20 (5)	P48x5/8	3355.450	3573.958	0.939	0.000	3573.958	0.000
L6	20 - 0 (6)	P54x5/8	3963.267	4453.000	0.890	0.000	4453.000	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	180 - 140 (1)	P24x3/8	17.399	450.887	0.039	0.530	874.033	0.001
L2	140 - 100 (2)	P36x1/2	21.765	903.365	0.024	0.529	2635.858	0.000
L3	100 - 65 (3)	P42x1/2	25.459	1056.050	0.024	0.528	3609.208	0.000
L4	65 - 60 (4)	P42x.7333	25.990	1445.970	0.018	0.528	4887.275	0.000
L5	60 - 20 (5)	P48x5/8	29.675	1506.930	0.020	0.527	5872.808	0.000
L6	20 - 0 (6)	P54x5/8	31.108	1697.790	0.018	0.527	7465.225	0.000

Pole Interaction Design Data

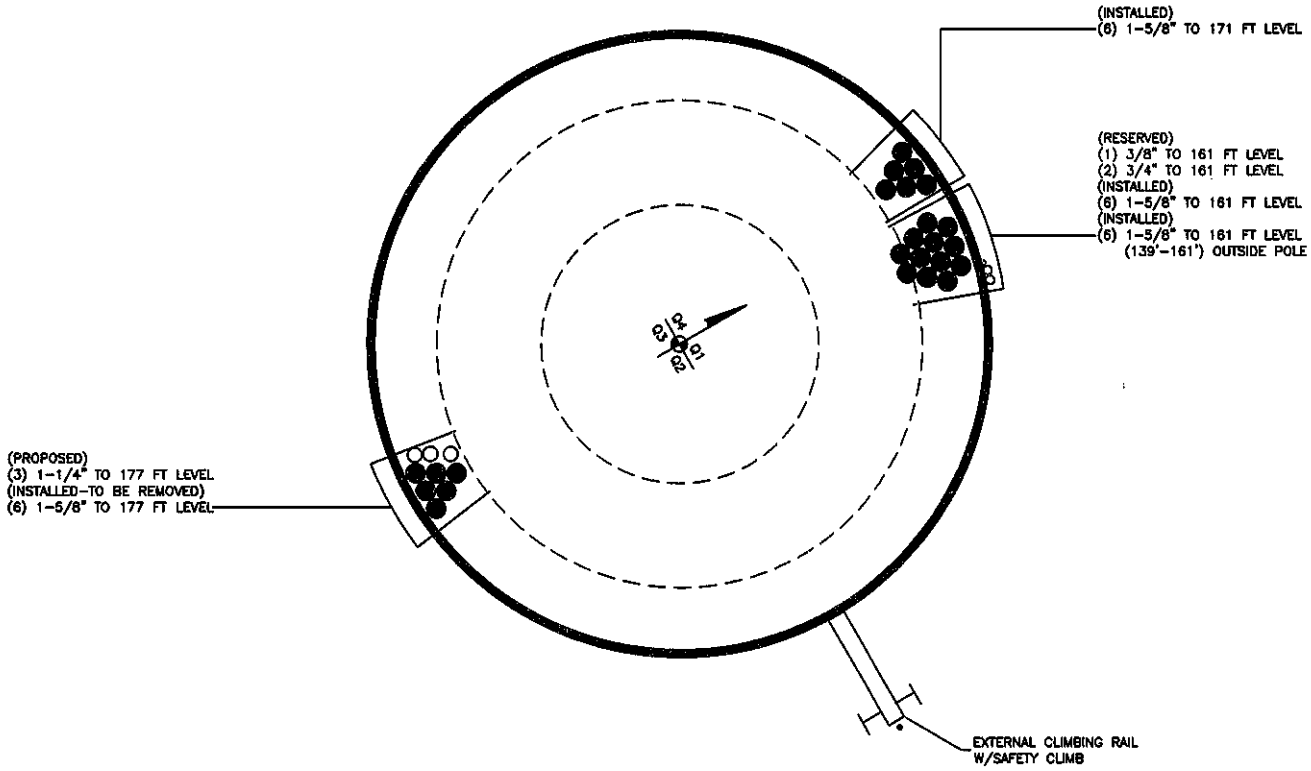
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	180 - 140 (1)	0.014	0.897	0.000	0.039	0.001	0.912 ✔	1.000	4.8.2 ✔
L2	140 - 100 (2)	0.013	0.788	0.000	0.024	0.000	0.802 ✔	1.000	4.8.2 ✔
L3	100 - 65 (3)	0.016	0.975	0.000	0.024	0.000	0.991 ✔	1.000	4.8.2 ✔
L4	65 - 60 (4)	0.012	0.707	0.000	0.018	0.000	0.719 ✔	1.000	4.8.2 ✔
L5	60 - 20 (5)	0.018	0.939	0.000	0.020	0.000	0.957 ✔	1.000	4.8.2 ✔
L6	20 - 0 (6)	0.018	0.890	0.000	0.018	0.000	0.909 ✔	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	180 - 140	Pole	P24x3/8	1	-12.287	901.775	91.2	Pass
L2	140 - 100	Pole	P36x1/2	2	-22.818	1806.730	80.2	Pass
L3	100 - 65	Pole	P42x1/2	3	-33.596	2112.090	99.1	Pass
L4	65 - 60	Pole	P42x.7333	4	-35.759	2891.950	71.9	Pass
L5	60 - 20	Pole	P48x5/8	5	-52.753	3013.870	95.7	Pass
L6	20 - 0	Pole	P54x5/8	6	-62.031	3395.570	90.9	Pass
							Summary	
						Pole (L3)	99.1	Pass
						RATING =	**99.1**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 878782 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

PROJECT	**86959.001.01 - Portland, ME - Crown Castle**				
SUBJECT	**Bridge Stiffeners @ 140'**				
DATE	**03/01/13**	PAGE	1	OF	2

B&T Engineering, Inc.
1325 E. 15th St., Suite 202
Tulsa, OK 74120
(918) 587-4630

SSC

Global Section Properties: **Assumes Moment to Pole Face**

Axial Load	12.29 k	
Number of BS	3	
Bolted Plate t	1.25	
Top Pole t	0.38 in	
Bottom Pole t	0.38 in	
Top Pole Dia.	24.00 in	
Bottom Pole Dia.	36.00 in	
Pole Grade	36.00 ksi	
BS Material Grade	65.00 ksi	
BS Width	5.50 in	Width of Bottom Section of BS
BS Thickness	1.25 in	Plate Thickness of BS
BS Height	48.00 in	
Weld Size	3/8 in	
Weld Grade	70 exx	
Gap	8.00 in	Distance Between BS Welded Sections
I	4467.52 in^4	Global MOI, Taken from AutoCAD
Mu	493.93 k-ft	Moment at Flange Under Consideration
Step Width	6.00 in	
Ybar	22.00 in	Dist. CL Pole to CL BS
S	203.07 in^3	Global Section Modulus; I/Ybar
fb	29.19 ksi	M/S
Area	6.88 in^2	BS Cross Sectional Area Below Flange
Pu (BS)	200.67 k	Load to BS

Bottom Bridge Stiffener Section:

V = P	204.76 k	Shear to BS	
Arm	2.75 in	Incidental Moment Arm (BS Plate)	
Incidental Moment	563.09 k-in	Moment at Pole Face	
Lb	2.75 in		
d	20.00 in	(BS Height - Gap)/2	
Lbd/t^2	35.2		
Phi*Mn	7304.61 k-in	AISC 13th, F11	
		Unity% =	**7.71%**
kv	5	AISC 13th, G2	
Cv	1		
Phi*Vn	877.5	**Unity% =**	**23.33%**

B&T Engineering, Inc.
1325 E. 15th St., Suite 202
Tulsa, OK 74120
(918) 587-4630

SSC

Top Bridge Stiffener Section:

V = P	204.76 k		
Arm	8.75 in		
Incidental Moment	1791.66 k-in		
Lb	8.75 in		
d	20.00 in		
Lbd/t^2	112.00		
Phi*Mn	7074.68 k-in	AISC 13th, F11	
		Unity% =	**25.33%**
kv	5	AISC 13th, G2	
Cv	1		
Phi*Vn	877.5	**Unity% =**	**23.33%**

Check Weld Between BS and Connection Plate:

Leg Size	3/8 in		
Aw/in	0.53 in^2		
Load From Moment	26.87 k/in		
Load From Shear	10.24 k/in		
Resultant Load	14.38 k/in	Load to one inch of one weld	
Phi*Rn	16.70 ksi		
		Unity% =	**86.09%**

Check Bridge Stiffener Span:

Lu	37.00 in		
b/t	4.4		
Qs	1		
ry	0.3608 in		
Kl/r	66.65	AISC 13th, E3 and E7	
4.71*sqrt(E/QFy)	99.49		
Fe	64.43 ksi		
Fcr	42.61 ksi		
Phi*Rn	263.6657562		
		Unity% =	**77.66%**

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave,ME*
App #: *164923, Rev 1*

Reactions		
Mu	1279.75	ft-kips
Axial, Pu:	22.818	kips
Shear, Vu:	21.765	kips
Elevation:	100	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
21.87

Pole Manufacturer:	Other

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

Bolt Data			
Qty:	52		
Diameter (in.):	0.75	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle (in.):	38.5		

Plate Data		
Diam:	40.75	in
Thick, t:	2.125	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	2.17	in

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

Pole Data		
Diam:	36	in
Thick:	0.5	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	30.06	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	30.05	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	30.24	Kips	
Min. PL "tc" for **B** cap. **w/o Pry**: Tu>B	N/A	in	
Min PL "treq" for actual **T w/ Pry**:	0.965	in	
Min PL "t1" for actual **T w/o Pry**: Tu>B	N/A	in	
T allowable w/o Prying:	30.06	kips	
Prying Force, q:	0.00	kips T>B	Case
Total Bolt Tension=Tu+q:	30.24	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	100.6%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	10.1	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	31.1%	Pass	Comp. Y.L. Length:
No Prying Check for Tu>B			13.65
Tension Side Stress Ratio, (treq/t)^2:	20.6%	**Pass**	

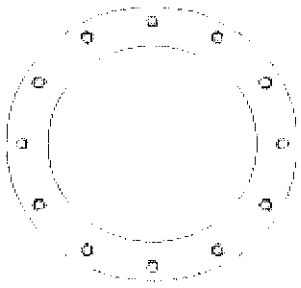
n/a

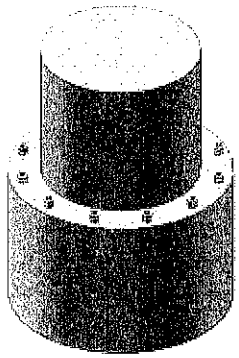
Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a





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

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

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave,ME*
App #: *164923, Rev 1*

Manufacturer:	Other

Reactions		
Moment:	1279.75	ft-kips
Axial:	22.818	kips
Shear:	21.765	kips
Exterior Flange Run, T+q:	30.24	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
21.87

Elevation: 100 feet

Bolt Data			
Qty:	52		
Diam:	0.75	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle:	38.5	in	

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	30.2	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty),	30.1	Kips
Bolt Stress Ratio:	100.6%	**Pass**

Plate Data		
Plate Outer Diam:	41	in
Plate Inner Diam:	36.25	in (Hole @ Ctr)
Thick:	2.125	in
Grade:	36	ksi
Effective Width:	2.48	in

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	31.1	Kips, Ext. Cu=Interior Cu
Plate Stress:	13.9	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	42.9%	**Pass**

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

n/a

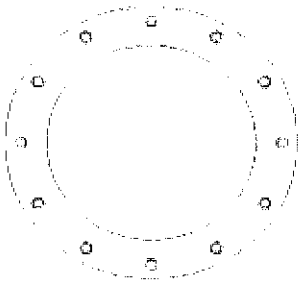
Stiffener Results

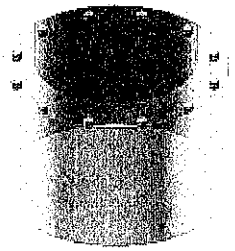
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Pole OuterDiam:	42	in
Thick:	0.5	in
Pole Inner Diam:	41	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi





* 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

PROJECT	**86959.001.01 - Portland Warren Ave, ME**				
SUBJECT	**Sabre Bridge Stiffeners @ 60'**				
DATE	**03/01/13**	PAGE	1	OF	1

B&T Engineering, Inc.
1325 E. 15th St., Suite 202
Tulsa, OK 74120
(918) 587-4630

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Determine Load to Bridge Stiffener:

M =	2239.2 k-ft	From Risa Model
I =	15852.8 in^4	From AutoCAD Sketch
ybar =	24.625 in	
S =	643.77 in^3	I/y
fc =	41.74 ksi	M/S
Ag =	10.625 in^2	
Pu =	443.49 k	fc x Ag

Stiffener Width	**8.500 in**
Stiffener Thickness	**1.250 in**
Stiffener Height	**48.000 in**
Fy	**65 ksi**
Step Width	**3.00 in**
Bolt Circle	**44.38 in**
Number of Bolts	**56**
Bolt Size	**3/4**
Gap @ Flange	**6.00 in**

Determine ΦPn (Allowable Axial Load):

Pn = Fcr x Ag		Eqn E3-1, AISC 13th Edition, Section E3.
K =	1	
l =	16.000 in	Unsupported Length
Iy =	1.383 in^4	Local Weak Axis Moment of Intertia
Ag =	10.625 in^2	Stiffener Cross Sectional Area
ry =	.361 in	Radius of Gyration (Weak Axis)
kl/r =	44.34	
4.71 x √(E/Fy) =	99.49	Limit State Equation for Flexural Buckling - AISC 13th Edition, Section E3.
Fe =	145.58 ksi	Eqn E3-4 - AISC 13th Edition, Section E3. Elastic Critical Buckling Stress
Fcr =	53.92 ksi	Eqn E3-2, AISC 13th Edition, Section E3 Critical Buckling Stress
Pn =	572.90 k	Nominal Compressive Strength
ΦPn =	515.61 k	Allowable Compressive Strength

Unity% = 86.0 %

Moment to Existing Bolt Group:

S_{BG} =	714.49 in^3	# Bolts Acting	14
ft =	37.61 ksi		
Ab =	.442 in^2		
T =	232.61 k		
Arm =	44.38 ksi		
M_{EQ} =	860.2 k-ft	**<-------Insert into Crown Spreadsheet**	

PROJECT	**86959.001.01 - Portland Warren Ave, ISSC**		
SUBJECT	**AeroSolutions Bridge Stiffeners @ 60'**		
DATE	**03/01/13**	PAGE 1 OF 1	

B&T Engineering, Inc.
1325 E. 15th St., Suite 202
Tulsa, OK 74120
(918) 587-4630

Determine Load to Bridge Stiffener:

M =	2239.2 k-ft	From Risa Model	**MP3 Type**	**MP3-06**
I =	14086.1 in^4	From AutoCAD Sketch		
ybar =	24.930 in			
S =	565.03 in^3	I/y	**Fy**	**65 ksi**
fc =	47.56 ksi	M/S	**Step Width**	**3.00 in**
Ag =	8.570 in^2			
Pu =	407.56 k	fc x Ag	**Bolt Circle**	**44.38 in**
			Number of Bolts	**56**
			Bolt Size	**3/4**
			Gap @ Flange	**6.00 in**

Determine ΦPn (Allowable Axial Load):

Pn = Fcr x Ag		Eqn E3-1, AISC 13th Edition, Section E3.
K =	1	
l =	18.000 in	Unsupported Length
Iy =	4.950 in^2	Local Weak Axis Moment of Intertia
Ag =	8.570 in^2	Stiffener Cross Sectional Area
ry =	.760 in	Radius of Gyration (Weak Axis)
kl/r =	23.68	
4.71 x √(E/Fy) =	99.49	Limit State Equation for Flexural Buckling - AISC 13th Edition, Section E3.
Fe =	510.25 ksi	Eqn E3-4 - AISC 13th Edition, Section E3. Elastic Critical Buckling Stress
Fcr =	61.63 ksi	Eqn E3-2, AISC 13th Edition, Section E3 Critical Buckling Stress
Pn =	528.13 k	Nominal Compressive Strength
ΦPn =	475.31 k	Allowable Compressive Strength

Unity% = 85.7 %

Moment to Existing Bolt Group:

S_{BG} =	634.87 in^3	# Bolts Acting	14
ft =	42.33 ksi		
Ab =	.442 in^2		
T =	261.78 k		
Arm =	44.38 ksi		
M_{EQ} =	968.0 k-ft	**<--------Insert into Crown Spreadsheet**	

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

Reactions		
Mu	968	ft-kips
Axial, Pu:	35.759	kips
Shear, Vu:	25.99	kips
Elevation:	60	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
27.34

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave, ME*
App #: *164923, Rev 1*

Pole Manufacturer:	Other

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

Bolt Data			
Qty:	56		
Diameter (in.):	0.75	Bolt Fu:	150
Bolt Material:	A490	Bolt Fy:	130
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle (in.):	44.375		

Plate Data		
Diam:	46.5	in
Thick, t:	2.25	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	2.36	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:	42	in
Thick:	0.5	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

Bolt Tension Capacity, φ*Tn,**B1**:	37.58	kips	Rigid: φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	37.57	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	18.06	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	0.996	in	
Min PL "treq" for actual **T w/ Pry:**	0.537	in	
Min PL "t1" for actual **T w/o Pry:**	0.690	in	
T allowable w/o Prying:	37.58	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	18.06	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	48.1%	**Pass**	

Exterior Flange Plate Results Flexural Check — Rigid: TIA G

Compression Side Plate Stress:	5.0	ksi	φ*Fy
Allowable Plate Stress:	32.4	ksi	
Compression Plate Stress Ratio:	15.3%	**Pass**	Comp. Y.L. Length: 14.32
No Prying			
Tension Side Stress Ratio, (treq/t)^2:	5.7%	**Pass**	

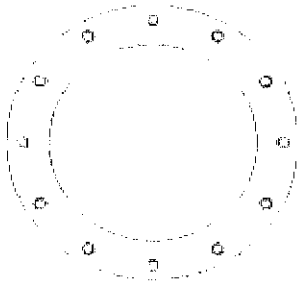
n/a

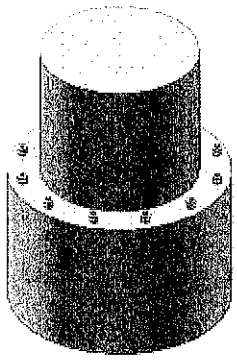
Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a





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

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

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave, ME*
App #: *164923, Rev 1*

Manufacturer:	Other

Reactions		
Moment:	968	ft-kips
Axial:	35.759	kips
Shear:	25.99	kips
Exterior Flange Run, T+q:	18.06	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
27.34

Elevation: 60 feet

Bolt Data			
Qty:	56		
Diam:	0.75	Bolt Fu:	150
Bolt Material:	A490	Bolt Fy:	130
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle:	44.375	in	

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	18.1	Kips, Ext. Flange Tu+q
Adjusted φ*Tn (due to Vu=Vu/Qty),	37.6	Kips
Bolt Stress Ratio:	48.1%	**Pass**

Plate Data		
Plate Outer Diam:	46.75	in
Plate Inner Diam:	42.25	in (Hole @ Ctr)
Thick:	2.25	in
Grade:	36	ksi
Effective Width:	2.62	in

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	19.3	Kips, Ext. Cu=Interior Cu
Plate Stress:	6.9	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	21.4%	**Pass**

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

n/a

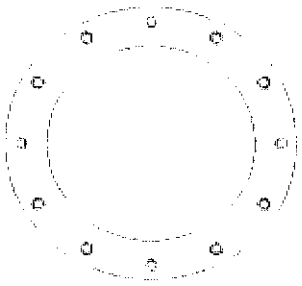
Stiffener Results

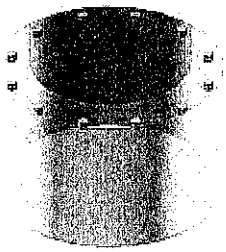
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Pole OuterDiam:	48	in
Thick:	0.625	in
Pole Inner Diam:	46.75	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi





* 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

PROJECT	**86959.001.01 - Portland Warren Ave, ME**
SUBJECT	**Sabre Bridge Stiffeners @ 20'**
DATE	**03/01/13** PAGE 1 OF 1

B&T Engineering, Inc.
1325 E. 15th St., Suite 202
Tulsa, OK 74120
(918) 587-4630

SSC

Determine Load to Bridge Stiffener:

M =	3355.1 k-ft	From Risa Model	**Stiffener Width**	**8.500 in**
I =	25218.0 in^4	From AutoCAD Sketch	**Stiffener Thickness**	**1.250 in**
ybar =	24.625 in		**Stiffener Height**	**48.000 in**
S =	1024.08 in^3	I/y	**Fy**	**65 ksi**
fc =	39.31 ksi	M/S	**Step Width**	**3.00 in**
Ag =	10.625 in^2			
Pu =	417.72 k	fc x Ag	**Bolt Circle**	**50.38 in**
			Number of Bolts	**52**
			Bolt Size	**1**
			Gap @ Flange	**6.00 in**

Determine ΦPn (Allowable Axial Load):

Pn = Fcr x Ag		Eqn E3-1, AISC 13th Edition, Section E3.
K =	1	
l =	16.000 in	Unsupported Length
Iy =	1.383 in^4	Local Weak Axis Moment of Intertia
Ag =	10.625 in^2	Stiffener Cross Sectional Area
ry =	.361 in	Radius of Gyration (Weak Axis)
kl/r =	44.34	
4.71 x √(E/Fy) =	99.49	Limit State Equation for Flexural Buckling - AISC 13th Edition, Section E3.
Fe =	145.58 ksi	Eqn E3-4 - AISC 13th Edition, Section E3. Elastic Critical Buckling Stress
Fcr =	53.92 ksi	Eqn E3-2, AISC 13th Edition, Section E3 Critical Buckling Stress
Pn =	572.90 k	Nominal Compressive Strength
ΦPn =	515.61 k	Allowable Compressive Strength

Unity% = 81.0 %

Moment to Existing Bolt Group:

S_{BG} =	1001.21 in^3	# Bolts Acting	13
ft =	40.21 ksi		
Ab =	.785 in^2		
T =	410.58 k		
Arm =	50.38 ksi		
M_{EQ} =	1723.6 k-ft	**<-------Insert into Crown Spreadsheet**	

PROJECT	**86959.001.01 - Portland Warren Ave, ISSC**		
SUBJECT	**AeroSolutions Bridge Stiffeners @ 20'**		
DATE	**03/01/13**	PAGE 1 OF 1	

B&T Engineering, Inc.
1325 E. 15th St., Suite 202
Tulsa, OK 74120
(918) 587-4630

Determine Load to Bridge Stiffener:

M =	3355.1 k-ft	From Risa Model	**MP3 Type**	**MP3-06**
I =	22971.6 in^4	From AutoCAD Sketch		
ybar =	27.930 in			
S =	822.47 in^3	I/y	**Fy**	**65 ksi**
fc =	48.95 ksi	M/S	**Step Width**	**3.00 in**
Ag =	8.570 in^2			
Pu =	419.52 k	fc x Ag	**Bolt Circle**	**50.38 in**
			Number of Bolts	**52**
			Bolt Size	**1**
			Gap @ Flange	**6.00 in**

Determine ΦPn (Allowable Axial Load):

Pn = Fcr x Ag		Eqn E3-1, AISC 13th Edition, Section E3.
K =	1	
l =	18.000 in	Unsupported Length
Iy =	4.950 in^2	Local Weak Axis Moment of Intertia
Ag =	8.570 in^2	Stiffener Cross Sectional Area
ry =	.760 in	Radius of Gyration (Weak Axis)
kl/r =	23.68	
4.71 x √(E/Fy) =	99.49	Limit State Equation for Flexural Buckling - AISC 13th Edition, Section E3.
Fe =	510.25 ksi	Eqn E3-4 - AISC 13th Edition, Section E3. Elastic Critical Buckling Stress
Fcr =	61.63 ksi	Eqn E3-2, AISC 13th Edition, Section E3 Critical Buckling Stress
Pn =	528.13 k	Nominal Compressive Strength
ΦPn =	475.31 k	Allowable Compressive Strength

Unity% = 88.3 %

Moment to Existing Bolt Group:

S_{BG} =	912.02 in^3	# Bolts Acting	13
ft =	44.15 ksi		
Ab =	.785 in^2		
T =	450.73 k		
Arm =	50.38 ksi		
M_{EQ} =	1892.1 k-ft	**<-------Insert into Crown Spreadsheet**	

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave, ME*
App #: *164923, Rev 1*

Reactions		
Mu	1892.1	ft-kips
Axial, Pu:	52.753	kips
Shear, Vu:	29.675	kips
Elevation:	20	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
38.88

Pole Manufacturer:	Other

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

Bolt Data			
Qty:	52		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle (in.):	50.375		

Plate Data		
Diam:	52.5	in
Thick, t:	2.5	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	2.90	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:	48	in
Thick:	0.625	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

Bolt Tension Capacity, φ*Tn,**B1**:	54.54	kips	Rigid
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	54.53	kips	φ*Tn
Max Bolt directly applied Tu:	33.66	Kips	φTn[(1-(Vu/φVn)^2]^0.5
Min. PL "tc" for **B** cap. **w/o** Pry:	0.995	in	
Min PL "treq" for actual **T w/ Pry**:	0.611	in	
Min PL "t1" for actual **T w/o Pry**:	0.782	in	
T allowable w/o Prying:	54.54	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	33.66	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	61.7%	**Pass**	

Exterior Flange Plate Results Flexural Check

Compression Side Plate Stress:	6.1	ksi	Rigid
Allowable Plate Stress:	32.4	ksi	TIA G
Compression Plate Stress Ratio:	18.8%	**Pass**	φ*Fy
No Prying			Comp. Y.L. Length:
Tension Side Stress Ratio, (treq/t)^2:	6.0%	**Pass**	15.29

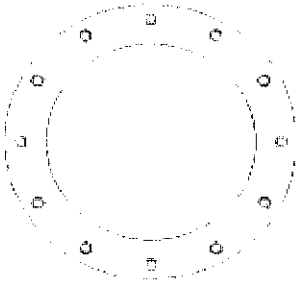
n/a

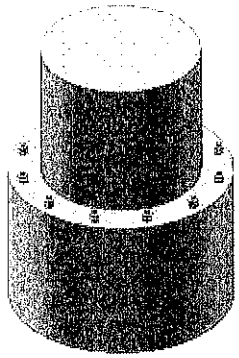
Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a





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

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

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave, ME*
App #: *164923, Rev 1*

Manufacturer:	Other

Reactions		
Moment:	1892.1	ft-kips
Axial:	52.753	kips
Shear:	29.675	kips
Exterior Flange Run, T+q:	33.6	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
38.88

Elevation: 20 feet

Bolt Data			
Qty:	52		
Diam:	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle:	50.375	in	

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	33.7	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty),	54.5	Kips
Bolt Stress Ratio:	61.7%	**Pass**

Plate Data		
Plate Outer Diam:	52.75	in
Plate Inner Diam:	48.25	in (Hole @ Ctr)
Thick:	2.5	in
Grade:	36	ksi
Effective Width:	3.19	in

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	35.7	Kips, Ext. Cu=Interior Cu
Plate Stress:	8.5	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	26.3%	**Pass**

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

n/a

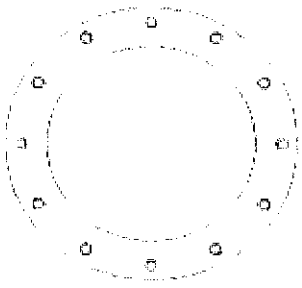
Stiffener Results

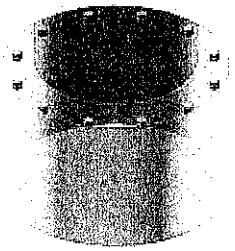
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Pole OuterDiam:	54	in
Thick:	0.625	in
Pole Inner Diam:	52.75	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi





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

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

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

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave, ME*
App #: *164923, Rev 1*

Pole Manufacturer:	*Other*

Anchor Rod Data		
Qty:	28	
Diam:	2	in
Rod Material:	Other	
Strength (Fu):	58	ksi
Yield (Fy):	36	ksi
Bolt Circle:	60.125	in

Plate Data		
Diam:	66	in
Thick:	3.25	in
Grade:	36	ksi
Single-Rod B-eff:	6.06	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:	54	in
Thick:	0.625	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions		
Mu:	3963	ft-kips
Axial, Pu:	62	kips
Shear, Vu:	31	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

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

Anchor Rod Results

Max Rod (Cu+ Vu/ή):	117.4 Kips	Rigid
Allowable Axial, Φ*Fu*Anet:	116.0 Kips	AISC LRFD
Anchor Rod Stress Ratio:	101.2% **Pass**	φ*Tn

Base Plate Results Flexural Check

Base Plate Stress:	13.7 ksi	Rigid
Allowable Plate Stress:	32.4 ksi	AISC LRFD
Base Plate Stress Ratio:	42.3% Pass	φ*Fy
		Y.L. Length: 26.44

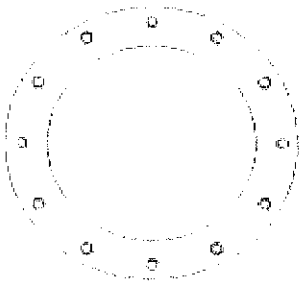
n/a

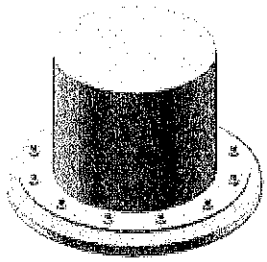
Stiffener Results

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

(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)

Site Data

BU#: *878782*
Site Name: *Portland Waren Ave, ME*
App #: *164923, Rev 1*
(14)#9, 2.5" dia holes, rock anchors x8'

Monopole Base Reaction Forces		
TIA Revision:	G	<--Pull Down
Factored DL Axial, PDu:	62	kips
Factored WL Axial, PWu:	0	kips
Factored WL Shear, Vu:	31	kips
Factored WL Moment, Mu:	370.7459	ft-kips
Factored WL Moment, Mu:	3963	ft-kips

Rock anchor uplift capacity @75psi for 5' & 150psi for below 5' bond= 77.75442 Kips
Moment capacity of Rock anchors 3592.254 ft-kips

Loads Already Factored		
For P (DL)	1.2	<----Disregard
For P,V, and M (WL)	1.35	<----Disregard

Load Factor	Shaft Factored Loads		
1.00	1.2D+1.6W, Pu:	62	kips
0.90	0.9D+1.6W, Pu:	46.5	kips
1.00	Vu:	31	kips
	Mu:	370.7459	ft-kips

Pad & Pier Data		
Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	0	in
Pad Bearing Depth, D:	5	ft
Pad Thickness, T:	5	ft
Pad Width=Length, L:	12	ft
Pier Cross Section Shape:	Round	<--Pull Down
Enter Pier Diameter:	3	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	7.07	ft^2
Pier Height:	0.00	ft
Soil (above pad) Height:	0.00	ft

Soil Parameters		
Unit Weight, γ:	125.0	pcf
Ultimate Bearing Capacity, qn:	40.00	ksf
Strength Reduct. factor, ϕ:	0.75	
Angle of Friction, Φ:	30.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: ϕ*qn:	30.00	ksf
Passive Pres. Coeff., Kp	3.00	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	31.0	kips
Pad Force Location Above D:	1.67	ft
ϕ(Passive Pressure Moment):	51.67	ft-kips
Factored O.T. M(WL), "1.6W":	525.7	ft-kips
Factored OT (MW-Msoil), M1	474.08	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	0.00	ft
Sum of Soil Wedges Wt:	0.00	kips
Soil Wedges ecc, K1:	0.00	ft
Ftg+Soil above Pad wt:	108.0	kips
Unfactored (Total ftg-soil Wt):	108.00	kips
1.2D. **No Soil Wedges.**	191.60	kips
0.9D. **With Soil Wedges**	143.70	kips

Resistance due to Cohesion (Vertical)		
ϕ*(1/2*Cu)(Total Vert. Planes)	0.00	kips

1.2D+1.6W Load Combination, Bearing Results:

(No Soil Wedges) [Reaction+Conc+Soil]	191.60	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	474.08	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 =	2.47	ft
Orthogonal qu=	2.43	ksf
qu/ϕ*qn Ratio=	**8.09%**	**Pass**

Diagonal Direction:

ecc2 = (0.707M1)/P1 =	1.75	ft
Diagonal qu=	2.65	ksf
qu/ϕ*qn Ratio=	**8.84%**	**Pass**

Run <-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(w/ Soil Wedges) [Reaction+Conc+Soil]	143.70	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	474.08	ft-kips

Orthogonal ecc3 = M2/P2 =	3.30	ft
Ortho Non Bearing Length,NBL=	6.60	ft
Orthogonal qu=	2.22	ksf
Diagonal qu=	2.67	ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	370.75		
M Orthogonal:	730.19	**50.77%**	**Pass**

Cohesion Force Eccentricity, K2	0.00	ft	M Diagonal:	730.19	**50.77%**	**Pass**

APPENDIX D

TOWER MODIFICATION DRAWINGS