March 26, 2014

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Subject:	**Structural Modification Report**	
Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	ME5306
	Carrier Site Name:	Sprint Portland
Crown Castle Designation:	**Crown Castle BU Number:**	878782
	Crown Castle Site Name:	Portland Warren Ave
	Crown Castle JDE Job Number:	253850
	Crown Castle Work Order Number:	727316
	Crown Castle Application Number:	207906 Rev. 8
Engineering Firm Designation:	**B+T Group Project Number:**	86959.004.01
Site Data:	**Warren Ave, Portland, ME, Cumberland County** **Latitude *43° 41' 15.16"*, Longitude *-70° 18' 14.96"*** **180 Foot - Monopole**	

Dear Mr. Bazinet,

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 626691, in accordance with application 207906, revision 8.

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:

LC4.7: 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 2009 International Building Code 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.

STATE OF MAINE
CHAD
E.
TUTTLE
10486
LICENSED
PROFESSIONAL ENGINEER
5/26/14

Braden Tabb, E.I.
Project Engineer

Chad E. Tuttle, P.E.
President

tnxTower Report - version 6.1.4.1

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1) INTRODUCTION

This is a 180 ft. monopole designed by Pittsburg Monopole in February of 1997. The monopole was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. This monopole has been modified by Crown Castle and B+T Group in 2012 and 2013 respectively and those modifications were incorporated in this analysis.

2) ANALYSIS CRITERIA

The structural analysis was performed for this monopole 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
161.0	162.0	6	CCI Antennas	HPA-65R-BUU-H6	4	5/8	--
		3	CCI Antennas	HPA-65R-BUU-H8			
		1	Ericsson	RRUS 11-700			
		3	Ericsson	WCS RRUS-32-B30			
		6	Ericsson	RRUS 12-B2			
		6	Ericsson	RRUS A2 MODULE			
		1	Ericsson	RRUS-11 800MHz			
		2	Raycap	DC6-48-60-18-8F			
	161.0	3	Communication Components Inc.	DTMABP7819VG12A			
		3	Ericsson	RRUS E2 B29			
		2	Ericsson	RRUS 11-700			
		2	Ericsson	RRUS-11 800MHz			
		1	Tower Mount	MTC3607R			

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	1	RFS Celwave	APXV9ERR18-C-A20	3	1 1/4	2
		2	RFS Celwave	APXVSPP18-C-A20			
		3	RFS Celwave	IBC1900BB-1			
		3	RFS Celwave	IBC1900HG-2A			
		6	Allgon	7184.15	6	1 5/8	1
	177.0	1	--	Platform Mount [LP 715-1]			
175.0	176.0	3	Alcatel Lucent	800MHz 2X50W RRH W/FILTER	--	--	2
		6	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz			
	175.0	1	--	Side Arm Mount [SO 102-3]			
171.0	171.0	6	Dapa	58010	6	1 5/8	1
		1	--	Platform Mount [LP 401-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
161.0	162.0	**2**	**KMW**	**AM-X-CD-16-65-00T-RET**	**6** **2**	**1 5/8** **3/4**	**3**
		1	**Powerwave**	**P65-17-XLH-RR**			
		3	**Powerwave**	**7770.00**			
	161.0	**6**	**Ericsson**	**RRUS-11**			
		6	**Powerwave**	**7020.00**			
		6	**Powerwave**	**LGP2140X**			
	162.0	3	Powerwave	7770.00	6 1 2	1 5/8 3/8 5/8	1
	161.0	1	Raycap	DC6-48-60-18-8F			
		1	--	T-Arm Mount [TA 602-3]			
159.0	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	AT&T Mobility Co-Locate, Rev#8	207906	CCI Sites
Tower Manufacturer Drawing	Pittsburg Monopole Division Date: 02/07/97	1451234	CCI Sites
Shop Drawing	Sabre Industries Drawing No. 81100-MR	Date: 06/19/13	CCI Sites
Tower Modification Drawing	B+T Group Project No: 86959.001.01	Date: 03/04/13	CCI Sites
	Crown Castle Date: 04/28/12	3160195	CCI Sites
Post Modification Inspection	TEP Project No: 127768	3360218	CCI Sites
Foundation Drawing	Pittsburg Monopole Division Date: 02/07/97	1480918	CCI Sites
Geo tech Report	Gemini Geotechnical Associates, Inc. Date: 09/12/96	1562092	CCI Sites
Antenna Configuration	Crown CAD Package	Date: 02/3/14	CCI Sites

3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) 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) - LC4.7

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	180 - 144.25	Pole	P24x3/8	1	-12.643	-	98.6	Pass[1]
L2	144.25 - 140	Pole	P24x3/8 [0.572786]	2	-13.545	-	79.6	Pass[1]
L3	140 - 106.75	Pole	P36x1/2	3	-22.106	-	91.2	Pass[1]
L4	106.75 - 100	Pole	P36x1/2 [0.808128]	4	-24.751	-	66.5	Pass[1]
L5	100 - 81.75	Pole	P42x1/2	5	-30.280	-	101.4	Pass (Note: 2)[1]
L6	81.75 - 60	Pole	P42x1/2 [0.703168]	6	-39.750	-	98.2	Pass[1]
L7	60 - 41.75	Pole	P48x5/8	7	-47.400	-	97.7	Pass[1]
L8	41.75 - 20	Pole	P48x5/8 [0.801196]	8	-59.424	-	96.3	Pass[1]
L9	20 - 0	Pole	P54x5/8 [0.778337]	9	-71.436	-	93.6	Pass[1]
							Summary	
						Pole (L5)	101.4	Pass (Note: 2)[1]
						RATING =	**101.4**	**Pass (Note: 2)[1]**

Table 6 - Tower Component Stresses vs. Capacity - LC4.7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Bridge Stiffeners	140	81.8	Pass
1	Flange Bolts	140	40.1	Pass
1	Flange Plate	140	27.7	Pass
1	Bridge Stiffeners	100	79.7	Pass
1	Flange Bolts	100	49.0	Pass
1	Flange Plate	100	21.6	Pass
1	Bridge Stiffeners	60	71.2	Pass
1	Flange Bolts	60	34.7	Pass
1	Flange Plate	60	16.0	Pass
1	Bridge Stiffeners	20	81.0	Pass
1	Flange Bolts	20	49.5	Pass
1	Flange Plate	20	21.6	Pass
1	Anchor Rods	Base	97.4	Pass
1	Base Plate	Base	40.6	Pass
1	Base Foundation	Base	97.9	Pass

Structure Rating (max from all components) =	**101.4.%**

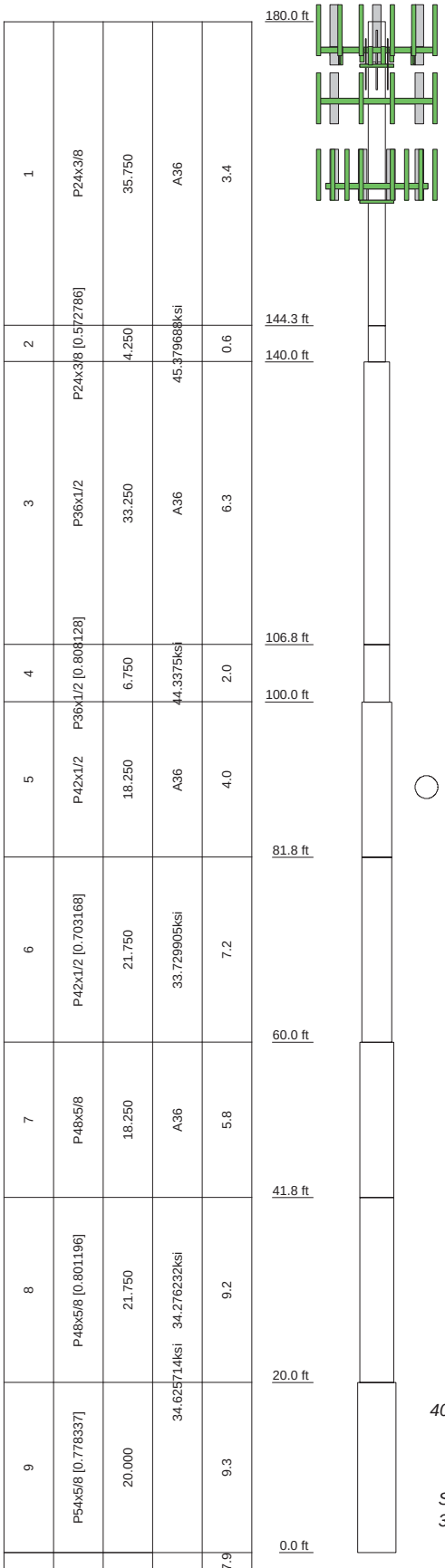
Notes:
1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.
2) Capacities up to 105% are considered acceptable based on analysis methods used.

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	35.750	A36	3.4
2	P24x3/8 [0.572786]	4.250	45.379688ksi	0.6
3	P36x1/2	33.250	A36	6.3
4	P36x1/2 [0.808128]	6.750	44.3375ksi	2.0
5	P42x1/2	18.250	A36	4.0
6	P42x1/2 [0.703168]	21.750	33.729905ksi	7.2
7	P48x5/8	18.250	A36	5.8
8	P48x5/8 [0.801196]	21.750	34.276232ksi	9.2
9	P54x5/8 [0.778337]	20.000	34.625714ksi	9.3
				47.9

ALL REACTIONS ARE FACTORED

AXIAL 123 K

SHEAR 8 K

MOMENT 1

TORQUE 0 kip-ft

40 mph WIND - 1.000 in

AXIAL 71 K

SHEAR 38 K

MOMENT 4958 kip-ft

TORQUE 1 kip-ft

REACTIONS - 100 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lighting Rod 3/4" x 5' (E)	183	(3) HPA-65R-BUU-H6 w/ Mount Pipe (P)	161
(2) 7184.15 w/ Mount Pipe (E)	177	(3) HPA-65R-BUU-H6 w/ Mount Pipe (P)	161
(2) 7184.15 w/ Mount Pipe (E)	177	DTMABP7819VG12A (P)	161
(2) 7184.15 w/ Mount Pipe (E)	177	DTMABP7819VG12A (P)	161
APXVSPP18-C-A20 w/ Mount Pipe (R)	177	DTMABP7819VG12A (P)	161
APXV9ERR18-C-A20 w/ Mount Pipe (R)	177	RRUS 11-700 (P)	161
APXVSPP18-C-A20 w/ Mount Pipe (R)	177	RRUS 11-700 (P)	161
IBC1900BB-1 (R)	177	RRUS 11-700 (P)	161
IBC1900BB-1 (R)	177	(2) RRUS 12-B2 (P)	161
IBC1900BB-1 (R)	177	(2) RRUS 12-B2 (P)	161
IBC1900HG-2A (R)	177	(2) RRUS 12-B2 (P)	161
IBC1900HG-2A (R)	177	(2) RRUS A2 MODULE (P)	161
IBC1900HG-2A (R)	177	(2) RRUS A2 MODULE (P)	161
4' x 2" Pipe Mount (E)	177	(2) RRUS A2 MODULE (P)	161
4' x 2" Pipe Mount (E)	177	RRUS-11 800MHz (P)	161
4' x 2" Pipe Mount (E)	177	RRUS-11 800MHz (P)	161
Platform Mount [LP 715-1] (E)	177	RRUS-11 800MHz (P)	161
800MHz 2X50W RRH W/FILTER (R)	175	DC6-48-60-18-8F (P)	161
800MHz 2X50W RRH W/FILTER (R)	175	DC6-48-60-18-8F (P)	161
800MHz 2X50W RRH W/FILTER (R)	175	RRUS E2 B29 (P)	161
(2) PCS 1900MHz 4x45W-65MHz (R)	175	RRUS E2 B29 (P)	161
(2) PCS 1900MHz 4x45W-65MHz (R)	175	RRUS E2 B29 (P)	161
(2) PCS 1900MHz 4x45W-65MHz (R)	175	WCS RRUS-32-B30 (P)	161
6' x 2" Mount Pipe (E)	175	WCS RRUS-32-B30 (P)	161
6' x 2" Mount Pipe (E)	175	WCS RRUS-32-B30 (P)	161
6' x 2" Mount Pipe (E)	175	T-Arm Mount [TA 602-3] (E)	161
Side Arm Mount [SO 102-3] (R)	175	Side Arm Mount [SO 701-3] (E)	159
(2) 58010 w/ Mount Pipe (E)	171	Bridge Stiffener (48"x1.25"x11.5") (E)	140
(2) 58010 w/ Mount Pipe (E)	171	Bridge Stiffener (48"x1.25"x11.5") (E)	140
(2) 58010 w/ Mount Pipe (E)	171	Bridge Stiffener (48"x1.25"x11.5") (E)	140
6' x 2" Mount Pipe (E)	171	Bridge Stiffener (144"x8.5"x1.25") (E)	60
6' x 2" Mount Pipe (E)	171	Bridge Stiffener (144"x8.5"x1.25") (E)	60
6' x 2" Mount Pipe (E)	171	Bridge Stiffener (144"x8.5"x1.25") (E)	60
Platform Mount [LP 401-1] (E)	171	Bridge Stiffener (144"x8.5"x1.25") (E)	20
7770.00 w/ Mount Pipe (E)	161	Bridge Stiffener (144"x8.5"x1.25") (E)	20
7770.00 w/ Mount Pipe (E)	161	Bridge Stiffener (144"x8.5"x1.25") (E)	20
7770.00 w/ Mount Pipe (E)	161		
DC6-48-60-18-8F (E)	161		
(3) HPA-65R-BUU-H8 w/ Mount Pipe (P)	161		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi	33.729905ksi	34 ksi	49 ksi
45.379688ksi	45 ksi	60 ksi	34.276232ksi	34 ksi	49 ksi
44.3375ksi	44 ksi	59 ksi	34.625714ksi	35 ksi	50 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: 101.4%

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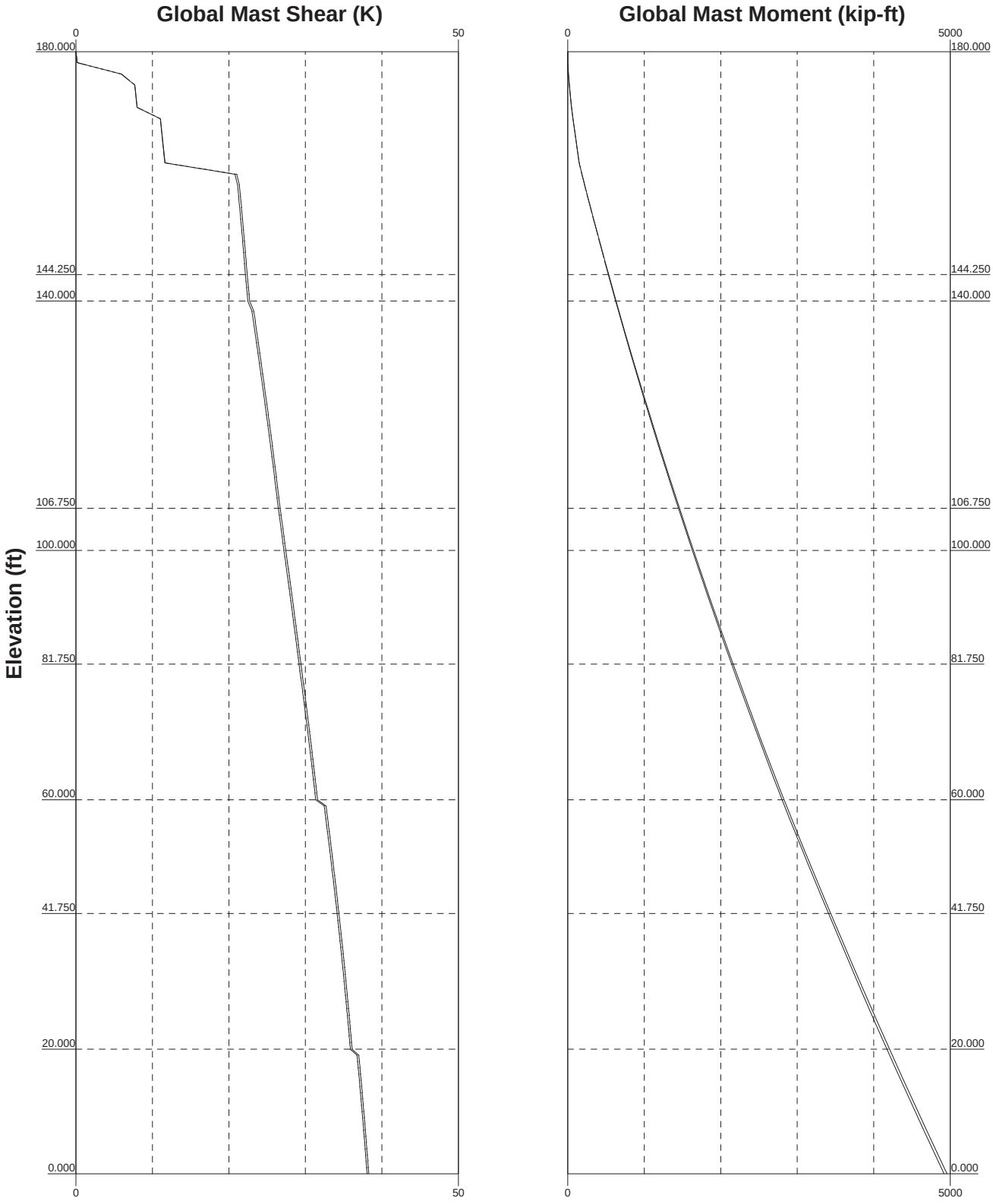
Job: 86959.004.01 - Portland Warren Ave, ME(BU# 878782			
Project:			
Client: Crown Castle	Drawn by: HKarande	App'd:	
Code: TIA-222-G	Date: 03/17/14	Scale: NTS	
Path:		Dwg No. E-1	

TIA-222-G - 100 mph/40 mph 1.000 in Ice Exposure C Maximum Values

Vx Vz Mx Mz



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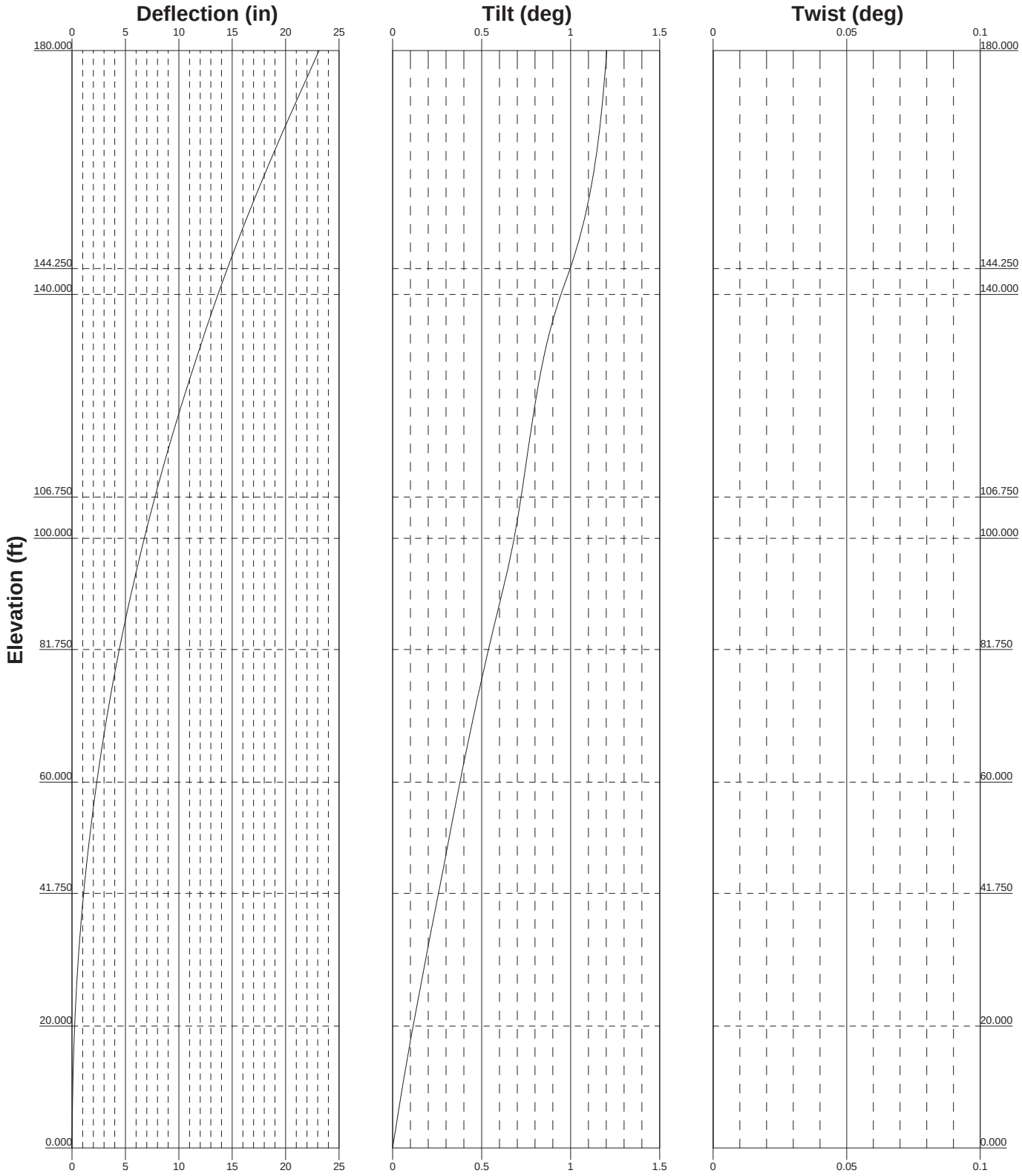
Job: 86959.004.01 - Portland Warren Ave, ME(BU# 878782		
Project:		
Client: Crown Castle	Drawn by: HKarande	App'd:
Code: TIA-222-G	Date: 03/17/14	Scale: NTS
Path:		Dwg No. E-4

TIA-222-G - Service - 60 mph

Maximum Values



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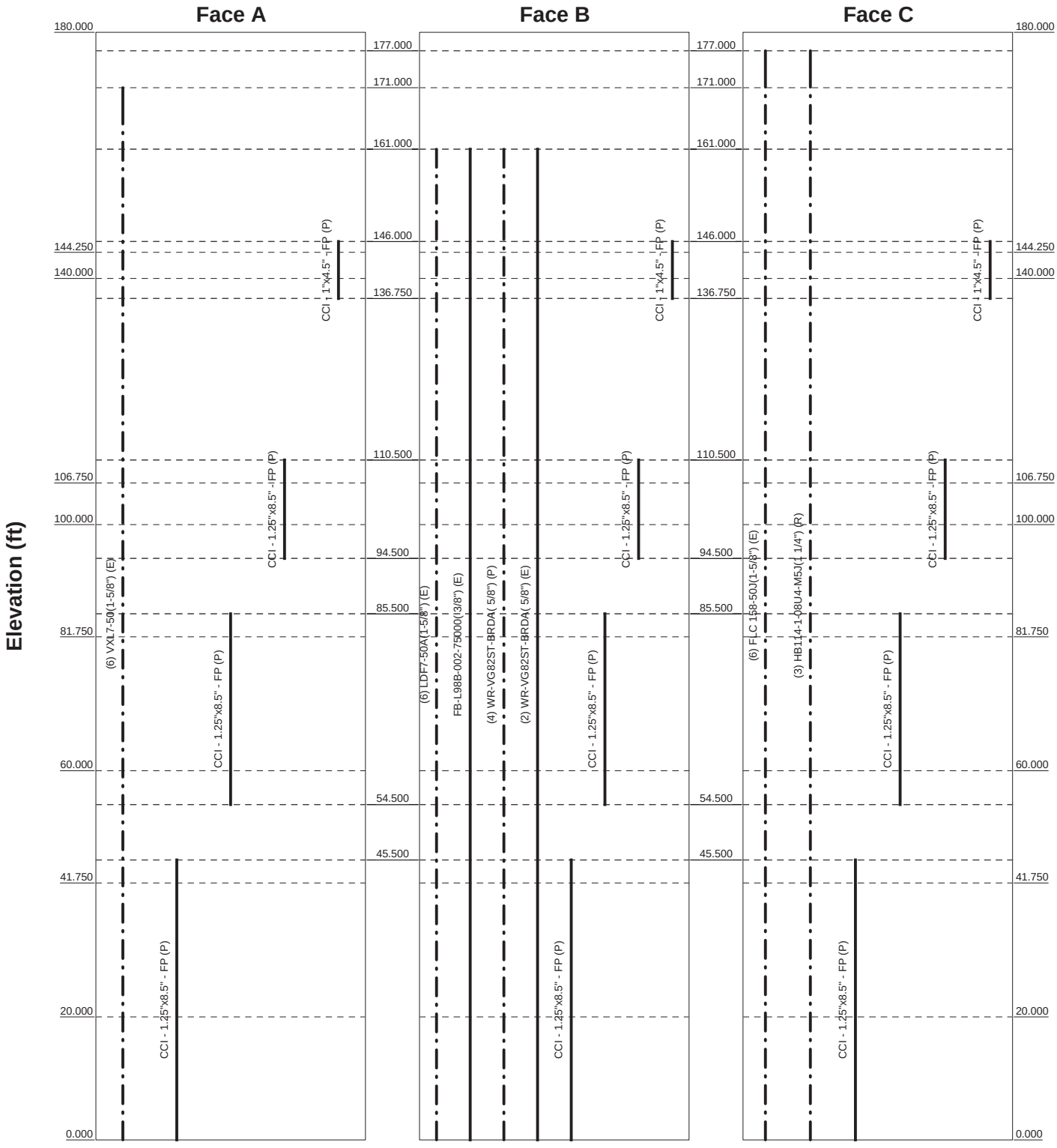
Job: 86959.004.01 - Portland Warren Ave, ME(BU# 878782		
Project:		
Client: Crown Castle	Drawn by: HKarande	App'd:
Code: TIA-222-G	Date: 03/17/14	Scale: NTS
Path:		Dwg No. E-5

Feed Line Distribution Chart
0' - 180'

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



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Phone: (918) 587-4630
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Job: 86959.004.01 - Portland Warren Ave, ME(BU# 878782		
Project:		
Client: Crown Castle	Drawn by: HKarande	App'd:
Code: TIA-222-G	Date: 03/17/14	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, feed line supports, and appurtenance mounts are not considered.

Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Pole Size*	*Pole Grade*	*Socket Length* *ft*
L1	180.000-144.250	35.750	P24x3/8	A36 (36 ksi)	
L2	144.250-140.000	4.250	P24x3/8 [0.572786]	45.379688ksi (45 ksi)	
L3	140.000-106.750	33.250	P36x1/2	A36 (36 ksi)	
L4	106.750-100.000	6.750	P36x1/2 [0.808128]	44.3375ksi (44 ksi)	
L5	100.000-81.750	18.250	P42x1/2	A36 (36 ksi)	
L6	81.750-60.000	21.750	P42x1/2 [0.703168]	33.729905ksi (34 ksi)	
L7	60.000-41.750	18.250	P48x5/8	A36 (36 ksi)	
L8	41.750-20.000	21.750	P48x5/8 [0.801196]	34.276232ksi (34 ksi)	
L9	20.000-0.000	20.000	P54x5/8 [0.778337]	34.625714ksi (35 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 180.000-144.250				1	1	1		
L2 144.250-140.000				1	1	0.980956		
L3 140.000-106.750				1	1	1		
L4 106.750-100.000				1	1	0.98139		
L5 100.000-81.750				1	1	1		
L6 81.750-60.000				1	1	1.06451		
L7 60.000-41.750				1	1	1		
L8 41.750-20.000				1	1	1.05184		
L9 20.000-0.000				1	1	1.05077		

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
FB-L98B-002-75000(3/8") (E)	B	Surface Ar (CaAa)	161.000 - 0.000	1	1	-0.060 -0.050	0.394		0.000
WR-VG82ST-BRDA(5/8") (E) *+*	B	Surface Ar (CaAa)	161.000 - 0.000	2	2	-0.150 -0.100	0.645		0.000
CCI - 1.25"x8.5" - FP (P)	A	Surface Af (CaAa)	45.500 - 0.000	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P)	B	Surface Af (CaAa)	45.500 - 0.000	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P) **@**	C	Surface Af (CaAa)	45.500 - 0.000	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P)	A	Surface Af (CaAa)	85.500 - 54.500	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P)	B	Surface Af (CaAa)	85.500 - 54.500	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P) **@**	C	Surface Af (CaAa)	85.500 - 54.500	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P)	A	Surface Af (CaAa)	110.500 - 94.500	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P)	B	Surface Af (CaAa)	110.500 - 94.500	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1.25"x8.5" - FP (P) **@**	C	Surface Af (CaAa)	110.500 - 94.500	1	1	0.000 0.000	8.500	19.500	0.000
CCI - 1"x4.5" - FP	A	Surface Af	146.000 - 136.750	1	1	0.000	4.500	11.000	0.000

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight klf
(P)		(CaAa)				0.000			
CCI - 1"x4.5" - FP	B	Surface Af	146.000 - 136.750	1	1	0.000	4.500	11.000	0.000
(P)		(CaAa)				0.000			
CCI - 1"x4.5" - FP	C	Surface Af	146.000 - 136.750	1	1	0.000	4.500	11.000	0.000
(P)		(CaAa)				0.000			
@									

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
FLC 158-50J(1-5/8")	C	No	Inside Pole	177.000 - 0.000	6	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
HB114-1-08U4-M5J(1 1/4")	C	No	Inside Pole	177.000 - 0.000	3	No Ice	0.000	0.001
(R)						1/2" Ice	0.000	0.001
+						1" Ice	0.000	0.001
VXL7-50(1-5/8")	A	No	Inside Pole	171.000 - 0.000	6	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
+								
LDF7-50A(1-5/8")	B	No	Inside Pole	161.000 - 0.000	6	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
WR-VG82ST-BRDA(5/8")	B	No	Inside Pole	161.000 - 0.000	4	No Ice	0.000	0.000
(P)						1/2" Ice	0.000	0.000
@						1" Ice	0.000	0.000

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	180.000-144.250	A	0.000	0.000	1.313	0.000	0.120
		B	0.000	0.000	4.133	0.000	0.114
		C	0.000	0.000	1.313	0.000	0.287
L2	144.250-140.000	A	0.000	0.000	3.188	0.000	0.019
		B	0.000	0.000	3.903	0.000	0.029
		C	0.000	0.000	3.188	0.000	0.037
L3	140.000-106.750	A	0.000	0.000	7.750	0.000	0.150
		B	0.000	0.000	13.348	0.000	0.227
		C	0.000	0.000	7.750	0.000	0.291
L4	106.750-100.000	A	0.000	0.000	9.563	0.000	0.030
		B	0.000	0.000	10.699	0.000	0.046
		C	0.000	0.000	9.563	0.000	0.059
L5	100.000-81.750	A	0.000	0.000	13.104	0.000	0.082
		B	0.000	0.000	16.177	0.000	0.124
		C	0.000	0.000	13.104	0.000	0.160
L6	81.750-60.000	A	0.000	0.000	30.813	0.000	0.098
		B	0.000	0.000	34.475	0.000	0.148
		C	0.000	0.000	30.813	0.000	0.191
L7	60.000-41.750	A	0.000	0.000	13.104	0.000	0.082

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
		B	0.000	0.000	16.177	0.000	0.124
		C	0.000	0.000	13.104	0.000	0.160
L8	41.750-20.000	A	0.000	0.000	30.813	0.000	0.098
		B	0.000	0.000	34.475	0.000	0.148
		C	0.000	0.000	30.813	0.000	0.191
L9	20.000-0.000	A	0.000	0.000	28.333	0.000	0.090
		B	0.000	0.000	31.701	0.000	0.136
		C	0.000	0.000	28.333	0.000	0.175

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	180.000-144.250	A	2.345	0.000	0.000	1.708	0.000	0.152
		B		0.000	0.000	22.746	0.000	0.441
		C		0.000	0.000	1.708	0.000	0.319
L2	144.250-140.000	A	2.314	0.000	0.000	4.136	0.000	0.095
		B		0.000	0.000	9.415	0.000	0.178
		C		0.000	0.000	4.136	0.000	0.113
L3	140.000-106.750	A	2.282	0.000	0.000	9.109	0.000	0.300
		B		0.000	0.000	49.927	0.000	0.936
		C		0.000	0.000	9.109	0.000	0.442
L4	106.750-100.000	A	2.242	0.000	0.000	10.696	0.000	0.195
		B		0.000	0.000	18.860	0.000	0.321
		C		0.000	0.000	10.696	0.000	0.224
L5	100.000-81.750	A	2.213	0.000	0.000	15.672	0.000	0.304
		B		0.000	0.000	37.509	0.000	0.637
		C		0.000	0.000	15.672	0.000	0.382
L6	81.750-60.000	A	2.159	0.000	0.000	40.204	0.000	0.603
		B		0.000	0.000	65.697	0.000	0.985
		C		0.000	0.000	40.204	0.000	0.696
L7	60.000-41.750	A	2.088	0.000	0.000	16.968	0.000	0.288
		B		0.000	0.000	37.781	0.000	0.593
		C		0.000	0.000	16.968	0.000	0.366
L8	41.750-20.000	A	1.987	0.000	0.000	39.455	0.000	0.552
		B		0.000	0.000	63.263	0.000	0.889
		C		0.000	0.000	39.455	0.000	0.645
L9	20.000-0.000	A	1.775	0.000	0.000	35.433	0.000	0.452
		B		0.000	0.000	55.420	0.000	0.716
		C		0.000	0.000	35.433	0.000	0.537

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	180.000-144.250	0.081	-0.075	0.392	-0.348
L2	144.250-140.000	0.085	-0.080	0.394	-0.350
L3	140.000-106.750	0.145	-0.136	0.688	-0.611
L4	106.750-100.000	0.076	-0.071	0.413	-0.367
L5	100.000-81.750	0.112	-0.105	0.573	-0.509
L6	81.750-60.000	0.083	-0.077	0.415	-0.369
L7	60.000-41.750	0.118	-0.110	0.581	-0.516
L8	41.750-20.000	0.089	-0.083	0.432	-0.385
L9	20.000-0.000	0.094	-0.088	0.436	-0.389

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	7	FB-L98B-002-75000(3/8")	144.25 - 161.00	1.0000	1.0000
L1	9	WR-VG82ST-BRDA(5/8")	144.25 - 161.00	1.0000	1.0000
L1	23	CCI - 1"x4.5" - FP	144.25 - 146.00	1.0000	1.0000
L1	24	CCI - 1"x4.5" - FP	144.25 - 146.00	1.0000	1.0000
L1	25	CCI - 1"x4.5" - FP	144.25 - 146.00	1.0000	1.0000
L2	7	FB-L98B-002-75000(3/8")	140.00 - 144.25	1.0000	1.0000
L2	9	WR-VG82ST-BRDA(5/8")	140.00 - 144.25	1.0000	1.0000
L2	23	CCI - 1"x4.5" - FP	140.00 - 144.25	1.0000	1.0000
L2	24	CCI - 1"x4.5" - FP	140.00 - 144.25	1.0000	1.0000
L2	25	CCI - 1"x4.5" - FP	140.00 - 144.25	1.0000	1.0000
L3	7	FB-L98B-002-75000(3/8")	106.75 - 140.00	1.0000	1.0000
L3	9	WR-VG82ST-BRDA(5/8")	106.75 - 140.00	1.0000	1.0000
L3	19	CCI - 1.25"x8.5" - FP	106.75 - 110.50	1.0000	1.0000
L3	20	CCI - 1.25"x8.5" - FP	106.75 - 110.50	1.0000	1.0000
L3	21	CCI - 1.25"x8.5" - FP	106.75 - 110.50	1.0000	1.0000
L3	23	CCI - 1"x4.5" - FP	136.75 - 140.00	1.0000	1.0000
L3	24	CCI - 1"x4.5" - FP	136.75 - 140.00	1.0000	1.0000
L3	25	CCI - 1"x4.5" - FP	136.75 - 140.00	1.0000	1.0000
L4	7	FB-L98B-002-75000(3/8")	100.00 - 106.75	1.0000	1.0000
L4	9	WR-VG82ST-BRDA(5/8")	100.00 - 106.75	1.0000	1.0000
L4	19	CCI - 1.25"x8.5" - FP	100.00 - 106.75	1.0000	1.0000
L4	20	CCI - 1.25"x8.5" - FP	100.00 - 106.75	1.0000	1.0000
L4	21	CCI - 1.25"x8.5" - FP	100.00 - 106.75	1.0000	1.0000
L5	7	FB-L98B-002-75000(3/8")	81.75 - 100.00	1.0000	1.0000
L5	9	WR-VG82ST-BRDA(5/8")	81.75 - 100.00	1.0000	1.0000
L5	15	CCI - 1.25"x8.5" - FP	81.75 - 85.50	1.0000	1.0000
L5	16	CCI - 1.25"x8.5" - FP	81.75 - 85.50	1.0000	1.0000
L5	17	CCI - 1.25"x8.5" - FP	81.75 - 85.50	1.0000	1.0000
L5	19	CCI - 1.25"x8.5" - FP	94.50 - 100.00	1.0000	1.0000
L5	20	CCI - 1.25"x8.5" - FP	94.50 - 100.00	1.0000	1.0000
L5	21	CCI - 1.25"x8.5" - FP	94.50 - 100.00	1.0000	1.0000
L6	7	FB-L98B-002-75000(3/8")	60.00 - 81.75	1.0000	1.0000
L6	9	WR-VG82ST-BRDA(5/8")	60.00 - 81.75	1.0000	1.0000
L6	15	CCI - 1.25"x8.5" - FP	60.00 - 81.75	1.0000	1.0000
L6	16	CCI - 1.25"x8.5" - FP	60.00 - 81.75	1.0000	1.0000
L6	17	CCI - 1.25"x8.5" - FP	60.00 - 81.75	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L7	7	FB-L98B-002-75000(3/8")	41.75 - 60.00	1.0000	1.0000
L7	9	WR-VG82ST-BRDA(5/8")	41.75 - 60.00	1.0000	1.0000
L7	11	CCI - 1.25"x8.5" - FP	41.75 - 45.50	1.0000	1.0000
L7	12	CCI - 1.25"x8.5" - FP	41.75 - 45.50	1.0000	1.0000
L7	13	CCI - 1.25"x8.5" - FP	41.75 - 45.50	1.0000	1.0000
L7	15	CCI - 1.25"x8.5" - FP	54.50 - 60.00	1.0000	1.0000
L7	16	CCI - 1.25"x8.5" - FP	54.50 - 60.00	1.0000	1.0000
L7	17	CCI - 1.25"x8.5" - FP	54.50 - 60.00	1.0000	1.0000
L8	7	FB-L98B-002-75000(3/8")	20.00 - 41.75	1.0000	1.0000
L8	9	WR-VG82ST-BRDA(5/8")	20.00 - 41.75	1.0000	1.0000
L8	11	CCI - 1.25"x8.5" - FP	20.00 - 41.75	1.0000	1.0000
L8	12	CCI - 1.25"x8.5" - FP	20.00 - 41.75	1.0000	1.0000
L8	13	CCI - 1.25"x8.5" - FP	20.00 - 41.75	1.0000	1.0000
L9	7	FB-L98B-002-75000(3/8")	0.00 - 20.00	1.0000	1.0000
L9	9	WR-VG82ST-BRDA(5/8")	0.00 - 20.00	1.0000	1.0000
L9	11	CCI - 1.25"x8.5" - FP	0.00 - 20.00	1.0000	1.0000
L9	12	CCI - 1.25"x8.5" - FP	0.00 - 20.00	1.0000	1.0000
L9	13	CCI - 1.25"x8.5" - FP	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' (E) *+*	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
(2) 7184.15 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	3.084 3.477 3.872	2.673 3.349 3.990	0.029 0.057 0.092
(2) 7184.15 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	3.084 3.477 3.872	2.673 3.349 3.990	0.029 0.057 0.092
(2) 7184.15 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	3.084 3.477 3.872	2.673 3.349 3.990	0.029 0.057 0.092
APXVSPP18-C-A20 w/ Mount Pipe (R)	A	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	8.498 9.149 9.767	6.946 8.127 9.021	0.083 0.151 0.227
APXV9ERR18-C-A20 w/ Mount Pipe (R)	B	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	8.498 9.149 9.767	7.471 8.656 9.556	0.088 0.158 0.237
APXVSPP18-C-A20 w/ Mount Pipe (R)	C	From Leg	4.000 0.000 2.000	0.000	177.000	No Ice 1/2" Ice 1" Ice	8.498 9.149 9.767	6.946 8.127 9.021	0.083 0.151 0.227
IBC1900BB-1 (R)	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	0.022 0.030 0.039
IBC1900BB-1 (R)	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	0.022 0.030 0.039
IBC1900BB-1 (R)	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	0.022 0.030 0.039

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
IBC1900HG-2A	A	From Leg	4.000	0.000	177.000	No Ice	1.127	0.533	0.022
(R)			0.000			1/2" Ice	1.273	0.647	0.030
			2.000			1" Ice	1.427	0.770	0.039
IBC1900HG-2A	B	From Leg	4.000	0.000	177.000	No Ice	1.127	0.533	0.022
(R)			0.000			1/2" Ice	1.273	0.647	0.030
			2.000			1" Ice	1.427	0.770	0.039
IBC1900HG-2A	C	From Leg	4.000	0.000	177.000	No Ice	1.127	0.533	0.022
(R)			0.000			1/2" Ice	1.273	0.647	0.030
			2.000			1" Ice	1.427	0.770	0.039
4' x 2" Pipe Mount	A	From Leg	4.000	0.000	177.000	No Ice	0.866	0.866	0.015
(E)			0.000			1/2" Ice	1.111	1.111	0.022
			0.000			1" Ice	1.365	1.365	0.032
4' x 2" Pipe Mount	B	From Leg	4.000	0.000	177.000	No Ice	0.866	0.866	0.015
(E)			0.000			1/2" Ice	1.111	1.111	0.022
			0.000			1" Ice	1.365	1.365	0.032
4' x 2" Pipe Mount	C	From Leg	4.000	0.000	177.000	No Ice	0.866	0.866	0.015
(E)			0.000			1/2" Ice	1.111	1.111	0.022
			0.000			1" Ice	1.365	1.365	0.032
Platform Mount [LP 715-1]	C	None		0.000	177.000	No Ice	44.210	44.210	1.775
(E)						1/2" Ice	53.970	53.970	2.323
						1" Ice	63.730	63.730	2.871
+									
800MHz 2X50W RRH	A	From Leg	1.000	0.000	175.000	No Ice	2.401	2.254	0.064
W/FILTER			0.000			1/2" Ice	2.613	2.460	0.086
(R)			1.000			1" Ice	2.833	2.675	0.111
800MHz 2X50W RRH	B	From Leg	1.000	0.000	175.000	No Ice	2.401	2.254	0.064
W/FILTER			0.000			1/2" Ice	2.613	2.460	0.086
(R)			1.000			1" Ice	2.833	2.675	0.111
800MHz 2X50W RRH	C	From Leg	1.000	0.000	175.000	No Ice	2.401	2.254	0.064
W/FILTER			0.000			1/2" Ice	2.613	2.460	0.086
(R)			1.000			1" Ice	2.833	2.675	0.111
(2) PCS 1900MHz	A	From Leg	1.000	0.000	175.000	No Ice	2.709	2.611	0.060
4x45W-65MHz			0.000			1/2" Ice	2.948	2.847	0.083
(R)			1.000			1" Ice	3.195	3.092	0.110
(2) PCS 1900MHz	B	From Leg	1.000	0.000	175.000	No Ice	2.709	2.611	0.060
4x45W-65MHz			0.000			1/2" Ice	2.948	2.847	0.083
(R)			1.000			1" Ice	3.195	3.092	0.110
(2) PCS 1900MHz	C	From Leg	1.000	0.000	175.000	No Ice	2.709	2.611	0.060
4x45W-65MHz			0.000			1/2" Ice	2.948	2.847	0.083
(R)			1.000			1" Ice	3.195	3.092	0.110
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
Side Arm Mount [SO 102-3]	C	None		0.000	175.000	No Ice	3.000	3.000	0.081
(R)						1/2" Ice	3.480	3.480	0.111
						1" Ice	3.960	3.960	0.141
+									
(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	0.063
			0.000			1" Ice	4.440	4.493	0.102
(2) 58010 w/ Mount Pipe	B	From Leg	4.000	0.000	171.000	No Ice	3.616	3.116	0.031

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(E)			0.000				1/2" Ice	4.029	3.826	0.063
			0.000				1" Ice	4.440	4.493	0.102
(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	0.063
			0.000				1" Ice	4.440	4.493	0.102
6' x 2" Mount Pipe	A	From Leg	4.000	0.000	171.000		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	4.000	0.000	171.000		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	4.000	0.000	171.000		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
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
+										
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	0.103
			1.000				1" Ice	7.128	5.711	0.157
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	0.103
			1.000				1" Ice	7.128	5.711	0.157
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	0.103
			1.000				1" Ice	7.128	5.711	0.157
DC6-48-60-18-8F	A	From Leg	4.000	0.000	161.000		No Ice	2.567	2.567	0.019
(E)			0.000				1/2" Ice	2.798	2.798	0.041
			0.000				1" Ice	3.038	3.038	0.067
(3) HPA-65R-BUU-H8 w/ Mount Pipe	A	From Leg	4.000	0.000	161.000		No Ice	13.533	9.582	0.100
			0.000				1/2" Ice	14.335	11.052	0.196
(P)			1.000				1" Ice	15.143	12.496	0.303
(3) HPA-65R-BUU-H6 w/ Mount Pipe	B	From Leg	4.000	0.000	161.000		No Ice	10.598	8.113	0.077
			0.000				1/2" Ice	11.268	9.304	0.158
(P)			1.000				1" Ice	11.906	10.209	0.248
(3) HPA-65R-BUU-H6 w/ Mount Pipe	C	From Leg	4.000	0.000	161.000		No Ice	10.598	8.113	0.077
			0.000				1/2" Ice	11.268	9.304	0.158
(P)			1.000				1" Ice	11.906	10.209	0.248
DTMABP7819VG12A	A	From Leg	4.000	0.000	161.000		No Ice	1.139	0.391	0.019
(P)			0.000				1/2" Ice	1.284	0.488	0.026
			0.000				1" Ice	1.437	0.595	0.036
DTMABP7819VG12A	B	From Leg	4.000	0.000	161.000		No Ice	1.139	0.391	0.019
(P)			0.000				1/2" Ice	1.284	0.488	0.026
			0.000				1" Ice	1.437	0.595	0.036
DTMABP7819VG12A	C	From Leg	4.000	0.000	161.000		No Ice	1.139	0.391	0.019
(P)			0.000				1/2" Ice	1.284	0.488	0.026
			0.000				1" Ice	1.437	0.595	0.036
RRUS 11-700	A	From Leg	4.000	0.000	161.000		No Ice	2.942	1.246	0.055
(P)			0.000				1/2" Ice	3.172	1.412	0.074
			1.000				1" Ice	3.410	1.587	0.097
RRUS 11-700	B	From Leg	4.000	0.000	161.000		No Ice	2.942	1.246	0.055
(P)			0.000				1/2" Ice	3.172	1.412	0.074
			0.000				1" Ice	3.410	1.587	0.097
RRUS 11-700	C	From Leg	4.000	0.000	161.000		No Ice	2.942	1.246	0.055
(P)			0.000				1/2" Ice	3.172	1.412	0.074
			0.000				1" Ice	3.410	1.587	0.097

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) RRUS 12-B2	A	From Leg	4.000	0.000	161.000	No Ice	3.667	1.483	0.058
(P)			0.000			1/2" Ice	3.924	1.668	0.081
			1.000			1" Ice	4.189	1.861	0.108
(2) RRUS 12-B2	B	From Leg	4.000	0.000	161.000	No Ice	3.667	1.483	0.058
(P)			0.000			1/2" Ice	3.924	1.668	0.081
			1.000			1" Ice	4.189	1.861	0.108
(2) RRUS 12-B2	C	From Leg	4.000	0.000	161.000	No Ice	3.667	1.483	0.058
(P)			0.000			1/2" Ice	3.924	1.668	0.081
			1.000			1" Ice	4.189	1.861	0.108
(2) RRUS A2 MODULE	A	From Leg	4.000	0.000	161.000	No Ice	1.867	0.423	0.021
(P)			0.000			1/2" Ice	2.051	0.532	0.031
			1.000			1" Ice	2.244	0.650	0.044
(2) RRUS A2 MODULE	B	From Leg	4.000	0.000	161.000	No Ice	1.867	0.423	0.021
(P)			0.000			1/2" Ice	2.051	0.532	0.031
			1.000			1" Ice	2.244	0.650	0.044
(2) RRUS A2 MODULE	C	From Leg	4.000	0.000	161.000	No Ice	1.867	0.423	0.021
(P)			0.000			1/2" Ice	2.051	0.532	0.031
			1.000			1" Ice	2.244	0.650	0.044
RRUS-11 800MHz	A	From Leg	4.000	0.000	161.000	No Ice	2.942	1.521	0.054
(P)			0.000			1/2" Ice	3.172	1.695	0.076
			1.000			1" Ice	3.410	1.877	0.100
RRUS-11 800MHz	B	From Leg	4.000	0.000	161.000	No Ice	2.942	1.521	0.054
(P)			0.000			1/2" Ice	3.172	1.695	0.076
			0.000			1" Ice	3.410	1.877	0.100
RRUS-11 800MHz	C	From Leg	4.000	0.000	161.000	No Ice	2.942	1.521	0.054
(P)			0.000			1/2" Ice	3.172	1.695	0.076
			0.000			1" Ice	3.410	1.877	0.100
DC6-48-60-18-8F	B	From Leg	4.000	0.000	161.000	No Ice	2.567	2.567	0.019
(P)			0.000			1/2" Ice	2.798	2.798	0.041
			1.000			1" Ice	3.038	3.038	0.067
DC6-48-60-18-8F	C	From Leg	4.000	0.000	161.000	No Ice	2.567	2.567	0.019
(P)			0.000			1/2" Ice	2.798	2.798	0.041
			1.000			1" Ice	3.038	3.038	0.067
RRUS E2 B29	A	From Leg	4.000	0.000	161.000	No Ice	3.669	1.488	0.060
(P)			0.000			1/2" Ice	3.926	1.673	0.083
			0.000			1" Ice	4.191	1.866	0.110
RRUS E2 B29	B	From Leg	4.000	0.000	161.000	No Ice	3.669	1.488	0.060
(P)			0.000			1/2" Ice	3.926	1.673	0.083
			0.000			1" Ice	4.191	1.866	0.110
RRUS E2 B29	C	From Leg	4.000	0.000	161.000	No Ice	3.669	1.488	0.060
(P)			0.000			1/2" Ice	3.926	1.673	0.083
			0.000			1" Ice	4.191	1.866	0.110
WCS RRUS-32-B30	A	From Leg	4.000	0.000	161.000	No Ice	3.866	2.762	0.077
(P)			0.000			1/2" Ice	4.151	3.021	0.105
			1.000			1" Ice	4.444	3.290	0.136
WCS RRUS-32-B30	B	From Leg	4.000	0.000	161.000	No Ice	3.866	2.762	0.077
(P)			0.000			1/2" Ice	4.151	3.021	0.105
			1.000			1" Ice	4.444	3.290	0.136
WCS RRUS-32-B30	C	From Leg	4.000	0.000	161.000	No Ice	3.866	2.762	0.077
(P)			0.000			1/2" Ice	4.151	3.021	0.105
			1.000			1" Ice	4.444	3.290	0.136
Side Arm Mount [SO 701-3]	C	None		0.000	159.000	No Ice	2.830	2.830	0.195
(E)						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
(E)						1/2" Ice	15.440	15.440	0.990
						1" Ice	19.290	19.290	1.206

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
+									
Bridge Stiffener	A	From Leg	0.000	0.000	20.000	No Ice	14.717	2.500	0.002
(144"x8.5"x1.25")			0.000			1/2" Ice	15.589	3.851	0.052
(E)			0.000			1" Ice	16.468	5.215	0.113
Bridge Stiffener	B	From Leg	0.000	0.000	20.000	No Ice	14.717	2.500	0.002
(144"x8.5"x1.25")			0.000			1/2" Ice	15.589	3.851	0.052
(E)			0.000			1" Ice	16.468	5.215	0.113
Bridge Stiffener	C	From Leg	0.000	0.000	20.000	No Ice	14.717	2.500	0.002
(144"x8.5"x1.25")			0.000			1/2" Ice	15.589	3.851	0.052
(E)			0.000			1" Ice	16.468	5.215	0.113
Bridge Stiffener	A	From Leg	0.000	0.000	60.000	No Ice	14.717	2.500	0.002
(144"x8.5"x1.25")			0.000			1/2" Ice	15.589	3.851	0.052
(E)			0.000			1" Ice	16.468	5.215	0.113
Bridge Stiffener	B	From Leg	0.000	0.000	60.000	No Ice	14.717	2.500	0.002
(144"x8.5"x1.25")			0.000			1/2" Ice	15.589	3.851	0.052
(E)			0.000			1" Ice	16.468	5.215	0.113
Bridge Stiffener	C	From Leg	0.000	0.000	60.000	No Ice	14.717	2.500	0.002
(144"x8.5"x1.25")			0.000			1/2" Ice	15.589	3.851	0.052
(E)			0.000			1" Ice	16.468	5.215	0.113
Bridge Stiffener	A	From Leg	0.000	0.000	140.000	No Ice	0.833	4.200	0.002
(48"x1.25"x11.5")			0.000			1/2" Ice	1.296	4.574	0.020
(E)			0.000			1" Ice	1.596	4.956	0.042
Bridge Stiffener	B	From Leg	0.000	0.000	140.000	No Ice	0.833	4.200	0.002
(48"x1.25"x11.5")			0.000			1/2" Ice	1.296	4.574	0.020
(E)			0.000			1" Ice	1.596	4.956	0.042
Bridge Stiffener	C	From Leg	0.000	0.000	140.000	No Ice	0.833	4.200	0.002
(48"x1.25"x11.5")			0.000			1/2" Ice	1.296	4.574	0.020
(E)			0.000			1" Ice	1.596	4.956	0.042
+									

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice

Comb. No.	Description
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 - 144.25	23.137	39	1.204	0.001
L2	144.25 - 140	14.539	39	0.995	0.001
L3	140 - 106.75	13.675	39	0.946	0.001
L4	106.75 - 100	7.762	39	0.723	0.000
L5	100 - 81.75	6.770	39	0.680	0.000
L6	81.75 - 60	4.429	39	0.539	0.000
L7	60 - 41.75	2.319	39	0.380	0.000
L8	41.75 - 20	1.095	39	0.256	0.000
L9	20 - 0	0.244	39	0.113	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'	39	23.137	1.204	0.001	31516
177.000	(2) 7184.15 w/ Mount Pipe	39	22.367	1.194	0.001	31516
175.000	800MHz 2X50W RRH W/FILTER	39	21.855	1.188	0.001	31516
171.000	(2) 58010 w/ Mount Pipe	39	20.836	1.174	0.001	17509

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
161.000	7770.00 w/ Mount Pipe	39	18.347	1.129	0.001	8293
159.000	Side Arm Mount [SO 701-3]	39	17.864	1.118	0.001	7503
140.000	Bridge Stiffener (48"x1.25"x11.5")	39	13.675	0.946	0.001	8289
60.000	Bridge Stiffener (144"x8.5"x1.25")	39	2.319	0.380	0.000	7987
20.000	Bridge Stiffener (144"x8.5"x1.25")	39	0.244	0.113	0.000	7900

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 144.25	115.502	2	6.012	0.006
L2	144.25 - 140	72.628	2	4.971	0.004
L3	140 - 106.75	68.314	2	4.728	0.003
L4	106.75 - 100	38.784	2	3.612	0.002
L5	100 - 81.75	33.830	2	3.397	0.001
L6	81.75 - 60	22.135	2	2.694	0.001
L7	60 - 41.75	11.590	2	1.902	0.001
L8	41.75 - 20	5.472	2	1.279	0.000
L9	20 - 0	1.216	2	0.565	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'	2	115.502	6.012	0.006	6457
177.000	(2) 7184.15 w/ Mount Pipe	2	111.664	5.965	0.006	6457
175.000	800MHz 2X50W RRH W/FILTER	2	109.111	5.932	0.006	6457
171.000	(2) 58010 w/ Mount Pipe	2	104.030	5.863	0.006	3586
161.000	7770.00 w/ Mount Pipe	2	91.618	5.642	0.005	1696
159.000	Side Arm Mount [SO 701-3]	2	89.210	5.585	0.005	1534
140.000	Bridge Stiffener (48"x1.25"x11.5")	2	68.314	4.728	0.003	1686
60.000	Bridge Stiffener (144"x8.5"x1.25")	2	11.590	1.902	0.001	1601
20.000	Bridge Stiffener (144"x8.5"x1.25")	2	1.216	0.565	0.000	1581

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 - 144.25 (1)	P24x3/8	35.750	0.000	0.0	27.833	-12.643	901.775	0.014
L2	144.25 - 140 (2)	P24x3/8 [0.572786]	4.250	0.000	0.0	42.156	-13.545	1721.740	0.008
L3	140 - 106.75 (3)	P36x1/2	33.250	0.000	0.0	55.763	-22.106	1806.730	0.012
L4	106.75 - 100 (4)	P36x1/2 [0.808128]	6.750	0.000	0.0	89.345	-24.751	3565.220	0.007
L5	100 - 81.75 (5)	P42x1/2 4.8.2 (1.01 CR) - 5	18.250	0.000	0.0	65.188	-30.280	2112.090	0.014
L6	81.75 - 60 (6)	P42x1/2 [0.703168]	21.750	0.000	0.0	91.228	-39.750	2769.390	0.014
L7	60 - 41.75 (7)	P48x5/8	18.250	0.000	0.0	93.021	-47.400	3013.870	0.016
L8	41.75 - 20 (8)	P48x5/8 [0.801196]	21.750	0.000	0.0	118.801	-59.424	3664.840	0.016
L9	20 - 0 (9)	P54x5/8 [0.778337]	20.000	0.000	0.0	130.139	-71.436	4055.530	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 - 144.25 (1)	P24x3/8	535.724	550.881	0.972	0.000	550.881	0.000
L2	144.25 - 140 (2)	P24x3/8 [0.572786]	631.567	1070.150	0.590	0.000	1070.150	0.000
L3	140 - 106.75 (3)	P36x1/2	1460.758	1623.158	0.900	0.000	1623.158	0.000
L4	106.75 - 100 (4)	P36x1/2 [0.808128]	1643.442	3328.692	0.494	0.000	3328.692	0.000
L5	100 - 81.75 (5)	P42x1/2	2162.358	2162.842	1.000	0.000	2162.842	0.000
L6	81.75 - 60 (6)	P42x1/2 [0.703168]	2826.308	3033.967	0.932	0.000	3033.967	0.000
L7	60 - 41.75 (7)	P48x5/8	3437.783	3573.958	0.962	0.000	3573.958	0.000
L8	41.75 - 20 (8)	P48x5/8 [0.801196]	4205.100	4588.775	0.916	0.000	4588.775	0.000
L9	20 - 0 (9)	P54x5/8 [0.778337]	4957.542	5540.550	0.895	0.000	5540.550	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 - 144.25 (1)	P24x3/8	22.410	450.887	0.050	0.123	874.033	0.000
L2	144.25 - 140 (2)	P24x3/8 [0.572786]	22.712	860.869	0.026	0.123	1641.517	0.000
L3	140 - 106.75 (3)	P36x1/2	26.711	903.365	0.030	0.123	2635.858	0.000

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 $\frac{T_u}{\phi T_n}$
L4	106.75 - 100 (4)	P36x1/2 [0.808128]	27.436	1782.610	0.015	0.123	5113.125	0.000
L5	100 - 81.75 (5)	P42x1/2	29.416	1056.050	0.028	0.123	3609.208	0.000
L6	81.75 - 60 (6)	P42x1/2 [0.703168]	31.602	1384.690	0.023	0.123	4686.858	0.000
L7	60 - 41.75 (7)	P48x5/8	34.396	1506.930	0.023	0.122	5872.808	0.000
L8	41.75 - 20 (8)	P48x5/8 [0.801196]	36.128	1832.420	0.020	0.122	7089.083	0.000
L9	20 - 0 (9)	P54x5/8 [0.778337]	38.300	2027.760	0.019	0.122	8865.667	0.000

Pole Interaction Design Data

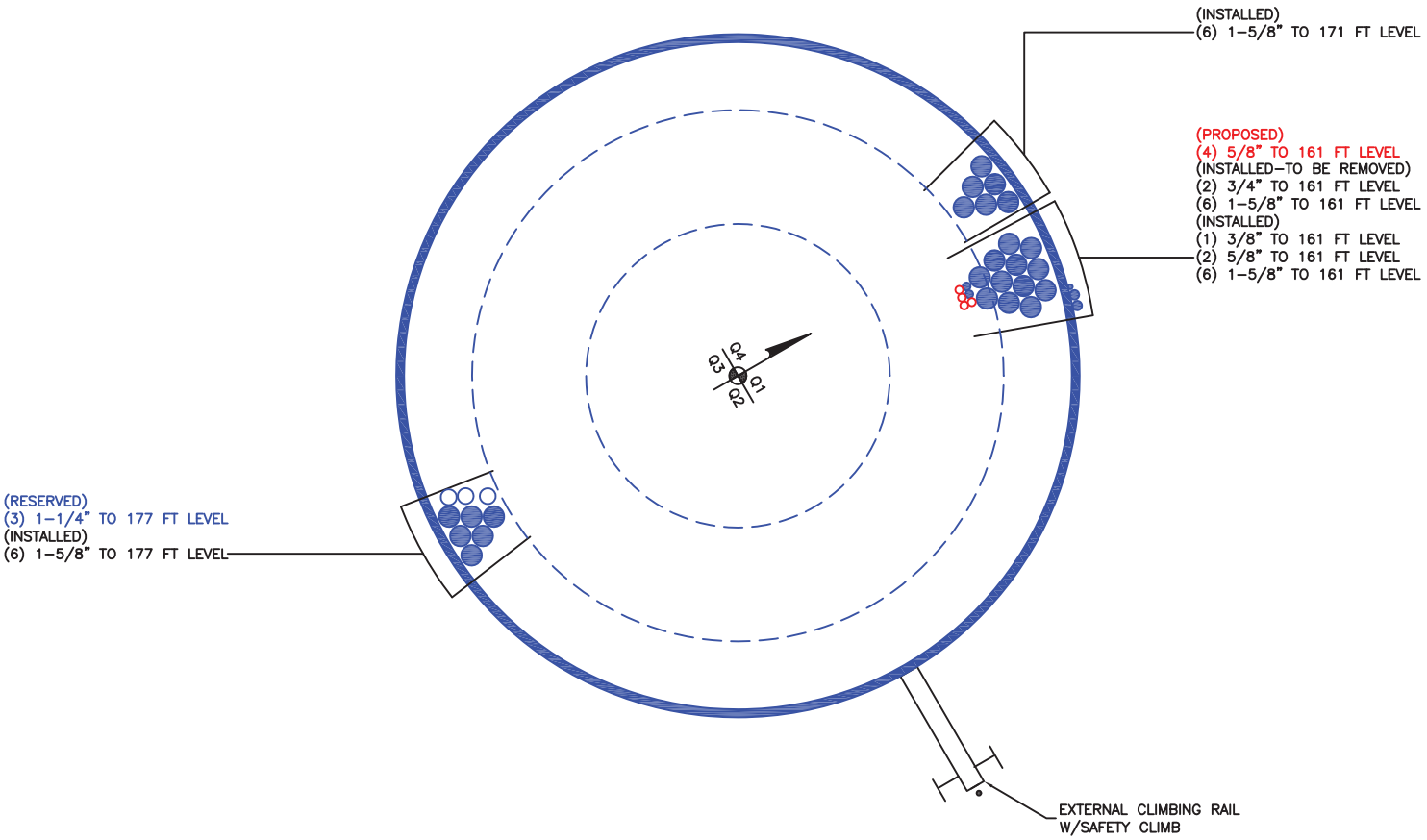
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	180 - 144.25 (1)	0.014	0.972	0.000	0.050	0.000	0.989 ✔	1.000	4.8.2 ✔
L2	144.25 - 140 (2)	0.008	0.590	0.000	0.026	0.000	0.599 ✔	1.000	4.8.2 ✔
L3	140 - 106.75 (3)	0.012	0.900	0.000	0.030	0.000	0.913 ✔	1.000	4.8.2 ✔
L4	106.75 - 100 (4)	0.007	0.494	0.000	0.015	0.000	0.501 ✔	1.000	4.8.2 ✔
L5	100 - 81.75 (5)	0.014	1.000	0.000	0.028	0.000	**1.015** ✘	1.000	4.8.2 ✘
L6	81.75 - 60 (6)	0.014	0.932	0.000	0.023	0.000	0.946 ✔	1.000	4.8.2 ✔
L7	60 - 41.75 (7)	0.016	0.962	0.000	0.023	0.000	0.978 ✔	1.000	4.8.2 ✔
L8	41.75 - 20 (8)	0.016	0.916	0.000	0.020	0.000	0.933 ✔	1.000	4.8.2 ✔
L9	20 - 0 (9)	0.018	0.895	0.000	0.019	0.000	0.913 ✔	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 - 144.25	Pole	P24x3/8	1	-12.643	901.775	98.6	Pass
L2	144.25 - 140	Pole	P24x3/8 [0.572786]	2	-13.545	1721.740	79.6	Pass
L3	140 - 106.75	Pole	P36x1/2	3	-22.106	1806.730	91.2	Pass
L4	106.75 - 100	Pole	P36x1/2 [0.808128]	4	-24.751	3565.220	66.5	Pass
L5	100 - 81.75	Pole	P42x1/2	5	-30.280	2112.090	101.4	Fail ✘
L6	81.75 - 60	Pole	P42x1/2 [0.703168]	6	-39.750	2769.390	98.2	Pass
L7	60 - 41.75	Pole	P48x5/8	7	-47.400	3013.870	97.7	Pass
L8	41.75 - 20	Pole	P48x5/8 [0.801196]	8	-59.424	3664.840	96.3	Pass
L9	20 - 0	Pole	P54x5/8 [0.778337]	9	-71.436	4055.530	93.6	Pass
							Summary	
						Pole (L5)	101.4	Fail ✘
						RATING =	**101.4**	**Fail** ✘

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 878782 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Reinforced Pole Stress
and Effective Thickness Check

AeroSolutions LLC
Optimizing Your Tower Infrastructure
1500 Fairtons Parkway, Suite 110
Boulder, CO 80301
720-304-6882

Section		Loads				Pole										Unreinforced Pole - Rev. G														Reinforced Pole					Rev. G					Reinforcement 1								Composite				Pole Stress			
Section	Elevation (ft)	Moment (ft-kip)	Compression (kip)	Shear (kip)	Torsion (kip-ft)	Number of Sides	OD (in)	Thickness (in)	Yield Strength (ksi)	Flat Width (in)	Area (in²)	Moment of Inertia (in⁴)	Percent of Composite Moment of Inertia	Angle Offset to Pole Flat	Distance to Extreme Fiber (in)	Section Modulus (in³)	Torsion Constant (in⁴)	Effective Yield Stress (ksi)	Nominal Bending Moment Strength (ft-kip)	Strength Reduction Factor	Design Bending Moment Strength (ft-kip)	Nominal Compressive Strength (kip)	Strength Reduction Factor	Design Compressive Strength (kip)	Nominal Shear Strength (kip)	Strength Reduction Factor	Design Shear Strength (kip)	Nominal Torsion Shear Strength (kip-ft)	Strength Reduction Factor	Design Torsion Shear Strength (kip-ft)	Stress Ratio	Moment in Pole when Reinforced	Bending Stress (ksi)	Axial Stress (ksi)	Shear Stress (ksi)	Torsion Shear Stress (ksi)	Allowable Bending Stress (ksi)	Allowable Compressive Stress (ksi)	Allowable Shear Stress (ksi)	Allowable Torsion Shear Stress (ksi)	Reinforced Pole Stress Ratio	Qty	Model	Position (F-Flat, C-Corner)	Gap Between Pole and Back of Rein. (in)	Tension only or Tension & Comp.	Total Moment of Inertia (in⁴)	Axial Force (kip)	Stress Ratio	Centroid Offset (in)	Area (in²)	Moment of Inertia (in⁴)	Controlling Stress Ratio	Thickness (in)	Weight Multiplier	Derated Yield Stress (ksi)	% Error in Derated Yield Stress
1	180	0.1	0.0	0.0	0.0	Round	24.0000	0.5000	36	0.00	36.9	2549	100%	TRUE	12.00	212	5099	36.0	828.5	0.9	745.7	1328.9	0.9	1196.0	664.4	0.9	598.0	15291.1	0.9	13766.5	**0.000**	0.1	0.0	0.00	0.00	42.1	32.4	32.4	32.4	**0.000**									0.000	36.9	25.49	**0.000**	**0.5000**	**1.00**	**36.0**	**0.0%**
2	144.25	515.3	12.6	22.4	0.1	Round	24.0000	0.3750	36	0.00	27.8	1942	100%	TRUE	12.00	162	3885	36.0	612.1	0.9	550.9	1002.0	0.9	901.8	501.0	0.9	450.9	11653.8	0.9	10488.4	**0.918**	535.3	39.7	0.45	0.00	0.00	40.8	32.4	32.4	32.4	**0.986**									0.000	27.8	19.42	**0.986**	**0.3750**	**1.00**	**36.0**	**0.0%**
3	140	611.1	13.5	22.7	0.1	Round	24.0000	0.3750	36	0.00	27.8	1943	67%	TRUE	12.19	159	3885	36.0	603.0	0.9	542.7	1002.0	0.9	901.8	501.0	0.9	450.9	11674.3	0.9	10216.9	**1.211**	421.7	31.9	0.49	0.00	0.00	40.8	32.4	32.4	32.4	**0.796**	3	CO-1at1.5	F	0	T&C	951	140.8	**0.729**	0.188	41.3	28.94	**0.796**	**0.5728**	**0.93**	**45.4**	**24.8%**
4	106.75	1499.9	22.1	26.7	0.1	Round	36.0000	0.5000	36	0.00	55.8	8786	100%	TRUE	18.00	488	17572	36.0	1803.5	0.9	1623.2	2007.5	0.9	1806.7	1003.7	0.9	903.4	35144.8	0.9	31630.1	**0.913**	1499.9	35.9	0.40	0.00	0.00	39.9	32.4	32.4	32.4	**0.912**									0.000	55.8	8786	**0.912**	**0.5000**	**1.00**	**36.0**	**0.1%**
5	100	1642.5	24.8	27.4	0.1	Round	36.0000	0.5000	36	0.00	55.8	8790	64%	TRUE	18.26	481	17572	36.0	1778.5	0.9	1600.6	2007.5	0.9	1806.7	1003.7	0.9	903.4	34642.0	0.9	31177.8	**1.041**	1643.0	36.0	0.44	0.00	0.00	39.9	32.4	32.4	32.4	**0.665**	3	CC-1.25x8.5	F	0	T&C	5052	266.1	**0.491**	-0.261	87.6	13842	**0.665**	**0.8081**	**0.98**	**44.3**	**24.8%**
6	81.75	2161.2	30.3	29.4	0.1	Round	42.0000	0.5000	36	0.00	65.2	14036	100%	TRUE	21.00	668	28072	36.0	2459.2	0.9	2213.8	2346.8	0.9	2112.1	1173.4	0.9	1056.0	48122.7	0.9	43310.5	**1.014**	2161.2	38.8	0.46	0.00	0.00	38.8	32.4	32.4	32.4	**1.014**									0.000	65.2	14016	**1.014**	**0.5000**	**1.00**	**36.0**	**0.1%**
7	60	2824.9	39.8	31.6	0.1	Round	42.0000	0.5000	36	0.00	65.2	14059	72%	TRUE	21.46	655	28072	36.0	2413.5	0.9	2172.1	2346.8	0.9	2112.1	1173.4	0.9	1056.0	47080.3	0.9	42372.2	**1.336**	2039.2	37.4	0.61	0.00	0.00	38.8	32.4	32.4	32.4	**0.982**	3	CC-1.25x8.5	F	0	T&C	5413	336.2	**0.621**	-0.465	97.1	13983	**0.982**	**0.7032**	**1.05**	**33.7**	**3.0%**
8	41.75	3436.1	47.4	34.4	0.1	Round	48.0000	0.6250	36	0.00	93.0	26101	100%	TRUE	24.00	1088	52203	36.0	3971.1	0.9	3574.0	3348.7	0.9	3013.9	1674.4	0.9	1506.9	78304.1	0.9	70473.7	**0.978**	3436.1	37.9	0.51	0.00	0.00	39.4	32.4	32.4	32.4	**0.977**									0.000	93.0	26101	**0.977**	**0.6250**	**1.00**	**36.0**	**0.1%**
9	20	4203.2	59.4	36.1	0.1	Round	48.0000	0.6250	36	0.00	93.0	26117	79%	TRUE	24.41	1070	52203	36.0	3906.5	0.9	3515.8	3348.7	0.9	3013.9	1674.4	0.9	1506.9	76984.1	0.9	69283.7	**1.214**	3335.7	37.2	0.64	0.00	0.00	39.4	32.4	32.4	32.4	**0.963**	3	CC-1.25x8.5	F	0	T&C	6930	336.1	**0.621**	-0.412	126.9	13927	**0.963**	**0.8012**	**1.05**	**34.3**	**3.1%**
10	0	4955.4	71.4	38.3	0.1	Round	54.0000	0.6250	36	0.00	104.8	37345	81%	TRUE	27.42	1362	74652	36.0	4874.1	0.9	4386.7	3772.9	0.9	3395.6	1886.4	0.9	1697.8	98005.1	0.9	88204.6	**1.151**	4013.1	35.4	0.68	0.00	0.00	38.7	32.4	32.4	32.4	**0.936**	3	CC-1.25x8.5	F	0	T&C	8769	397.7	**0.590**	-0.422	136.7	46113	**0.936**	**0.7783**	**1.05**	**34.6**	**2.5%**
																														1.353															**0.729**				**1.014**			

Rein1

Bottom	Top	Qty	Model	Position	T or T&C
0	20	3	CCI-1.25x8.5	F	T&C
20	41.75	3	CCI-1.25x8.5	F	T&C
60	81.75	3	CCI-1.25x8.5	F	T&C
100	106.75	3	CCI-1.25x8.5	F	T&C
140	144.25	3	CCI-1x4.5	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Flats (Used for relative orientation only. Actual flat numbers may vary.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1	1															
1	1	1															
1	1	1															
1	1	1															
1	1	1															

Rein2

Bottom	Top	Qty	Model	Position	T or T&C
0				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Rein3

Bottom	Top	Qty	Model	Position	T or T&C
0				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Reinforcement Capacity

AeroSolutions LLC
Optimizing Your Tower Infrastructure
5500 Flatirons Parkway, Suite 100
Boulder, CO 80301
720-304-6882

Dimensions and Properties														Compression				Axial				
																		ASD-9			LRFD	
Model	Weight (lb/ft)	Area (in^2)	Moment of Inertia (in^4)	Moment of Inertia (in^4)	Centroid from Mating Edge (in)	Centroid from Bolt Hole Center (in)	Web Thickness (in)	Width (in)	Flange Width (in)	Flange Thickness (in)	Hole Diameter (in)	Yield Stress (ksi)	Ultimate Stress (ksi)	Slender. Ratio Coefficient	Unbraced Length (in)	Slender. Ratio Coefficient	Unbraced Length (in)	Allowable Axial (kip)	Allowable Axial w/ increase (kip)	Governing Axial	Design Axial Strength (kip)	Governing Axial
CCI-1x4.5	15.3	4.50	0.38	7.59	0.5	0	1	4.5	0	0	1.21875	65	80	0.80	20	1.00	20	128.8	171.7	Rupture	193.1	Rupture
CCI-1.25x8.5	36.2	10.63	1.38	63.97	0.625	0	1.25	8.5	0	0	1.21875	65	80	0.80	17	1.00	17	350.9	467.9	Compress.	541.4	Rupture

PROJECT	**86959.004.01 - Portland Warren Ave, ME**		
SUBJECT	**Flat Plate Bridge Stiffeners @ 140'**		
DATE	**03/25/14**	PAGE 1 OF 1	

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

0

Determine Load to Bridge Stiffener:

M =	631.6 k-ft	From Risa Model
I =	3921.7 in^4	From AutoCAD Sketch
ybar =	18.500 in	
S =	211.98 in^3	I/y
fc =	35.75 ksi	M/S
Ag =	6.000 in^2	
Pu =	214.51 k	fc x Ag

Stiffener Width	**6.000 in**
Stiffener Thickness	**1.000 in**
Stiffener Height	**110.000 in**
Fy	**65 ksi**
Fu	**80 ksi**
Step Width	**6.00 in**
Bolt Circle	**29.50 in**
Number of Bolts	**24**
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 =	.500 in^4	Local Weak Axis Moment of Intertia
Ag =	6.000 in^2	Stiffener Cross Sectional Area
ry =	.289 in	Radius of Gyration (Weak Axis)
kl/r =	55.43	
4.71 x √(E/Fy) =	99.49	Limit State Equation for Flexural Buckling - AISC 13th Edition, Section E3.
Fe =	93.17 ksi	Eqn E3-4 - AISC 13th Edition, Section E3. Elastic Critical Buckling Stress
Fcr =	48.54 ksi	Eqn E3-2, AISC 13th Edition, Section E3 Critical Buckling Stress
Pn =	291.24 k	Nominal Compressive Strength
ΦPn =	262.12 k	Allowable Compressive Strength

Unity% = 81.8 %

Tension Rupture Check:

AISC 13th Edition, Chapter J4.1

Hole Size	1.25	
U =	1	Shear Lag Factor - Table D3.1 and TIA222-G
Ag =	6.000 in^2	Gross Area
An =	4.750 in^2	Net Area
Ae =	4.750 in^2	Effective Area
ΦRn =	351.00 k	Tension Yielding: Eqn J4-1
ΦRn =	285.00 k	Tension Rupture: Eqn J4-2
ΦRn(Equiv)	285.00 ksi	

Unity% 75.27 %

Moment to Existing Bolt Group:

S_{BG} =	265.88 in^3	# Bolts Acting	6
ft =	28.50 ksi		
Ab =	.442 in^2		
T =	75.56 k		
Arm =	29.50 ksi		
M_{EQ} =	185.7 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 #: *207906, Rev 8*

Reactions		
Mu	185.7	ft-kips
Axial, Pu:	13.545	kips
Shear, Vu:	22.712	kips
Elevation:	140	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:	24		
Diameter (in.):	0.75	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle (in.):	29.5		

Plate Data		
Diam:	34.75	in
Thick, t:	1.875	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	3.14	in

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

Pole Data		
Diam:	24	in
Thick:	0.375	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**:	30.03	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	12.03	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	1.318	in	
Min PL "treq" for actual **T w/ Pry**:	0.632	in	
Min PL "t1" for actual **T w/o Pry**:	0.834	in	
T allowable w/o Prying:	30.06	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	12.03	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	40.0%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	7.4	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	22.7%	**Pass**	Comp. Y.L. Length:
No Prying			17.15
Tension Side Stress Ratio, (treq/t)^2:	11.4%	**Pass**	

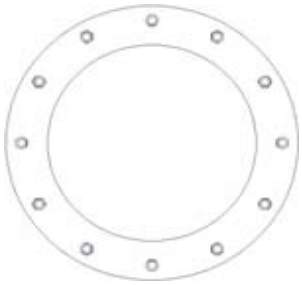
n/a

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 #: *207906, Rev 8*

Manufacturer:	Other

Reactions		
Moment:	185.7	ft-kips
Axial:	13.545	kips
Shear:	22.712	kips
Exterior Flange Run, T+q:	12.03	kips

Elevation: 140 feet

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

Bolt Data			
Qty:	24		
Diam:	0.75	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:		<-- Disregard	
N/A:		<-- Disregard	
Circle:	29.5	in	

Plate Data		
Plate Outer Diam:	35	in
Plate Inner Diam:	24.25	in (Hole @ Ctr)
Thick:	1.875	in
Grade:	36	ksi
Effective Width:	4.58	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		
Pole OuterDiam:	36	in
Thick:	0.5	in
Pole Inner Diam:	35	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	58	ksi

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	12.0	Kips, Ext. Flange Tu+q
Adjusted φ*Tn (due to Vu=Vu/Qty),	30.0	Kips
Bolt Stress Ratio:	40.1%	**Pass**

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	13.2	Kips, Ext. Cu=Interior Cu
Plate Stress:	9.0	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	27.7%	**Pass**

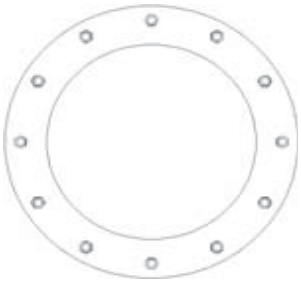
n/a

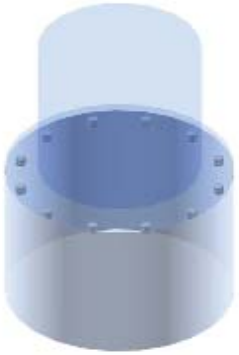
Stiffener Results

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

PROJECT	**86959.004.01 - Portland Warren Ave, ME**				
SUBJECT	**Flat Plate Bridge Stiffeners @ 100'**				
DATE	**03/17/14**	PAGE	1	OF	1

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

SSC

Determine Load to Bridge Stiffener:

M =	1643.4 k-ft	From Risa Model
I =	11028.9 in^4	From AutoCAD Sketch
ybar =	21.625 in	
S =	510.01 in^3	I/y
fc =	38.67 ksi	M/S
Ag =	10.625 in^2	
Pu =	410.85 k	fc x Ag

Stiffener Width	**8.500 in**
Stiffener Thickness	**1.250 in**
Stiffener Height	**195.000 in**
Fy	**65 ksi**
Fu	**80 ksi**
Step Width	**3.00 in**
Bolt Circle	**38.50 in**
Number of Bolts	**52**
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% = 79.7 %

Tension Rupture Check: AISC 13th Edition, Chapter J4.1

Hole Size	1.25	
U =	1	Shear Lag Factor - Table D3.1 and TIA222-G
Ag =	10.625 in^2	Gross Area
An =	9.063 in^2	Net Area
Ae =	9.063 in^2	Effective Area
ΦRn =	621.56 k	Tension Yielding: Eqn J4-1
ΦRn =	543.75 k	Tension Rupture: Eqn J4-2
ΦRn(Equiv)	543.75 ksi	

Unity% 75.56 %

Moment to Existing Bolt Group:

S_{BG} =	572.93 in^3	# Bolts Acting	13
ft =	34.42 ksi		
Ab =	.442 in^2		
T =	197.69 k		
Arm =	38.50 ksi		
M_{EQ} =	634.3 k-ft	**<-------Insert into Crown Spreadsheet**	

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

Reactions		
Mu	634.3	ft-kips
Axial, Pu:	24.751	kips
Shear, Vu:	27.436	kips
Elevation:	100	feet

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave,ME*
App #: *207906 Revision # 8*

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:	14.73	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	0.962	in	
Min PL "treq" for actual **T w/ Pry**:	0.528	in	
Min PL "t1" for actual **T w/o Pry**:	0.674	in	
T allowable w/o Prying:	30.06	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	14.73	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	49.0%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	5.1	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	15.7%	**Pass**	Comp. Y.L. Length:
No Prying			13.65
Tension Side Stress Ratio, (treq/t)^2:	6.2%	**Pass**	

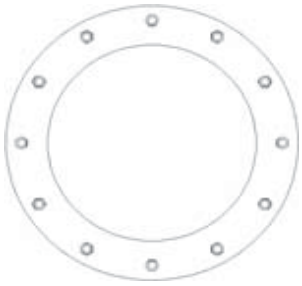
n/a

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 #: *207906 Revision # 8*

Manufacturer:	Other

Reactions		
Moment:	634.3	ft-kips
Axial:	24.751	kips
Shear:	27.436	kips
Exterior Flange Run, T+q:	14.73	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	

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

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		
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

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	14.7	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty),	30.1	Kips
Bolt Stress Ratio:	49.0%	**Pass**

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	15.7	Kips, Ext. Cu=Interior Cu
Plate Stress:	7.0	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	21.6%	**Pass**

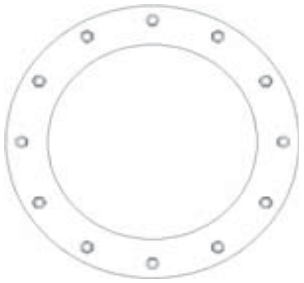
n/a

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

PROJECT	**86959.004.01 - Portland Warren Ave, ME**				
SUBJECT	**Existing Sabre MS850 Bridge Stiffeners @ 60'**				
DATE	**03/17/14**	PAGE	1	OF	1

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

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Determine Load to Bridge Stiffener:

M =	2826.3 k-ft	From Risa Model	**Stiffener Width**	**8.500 in**
I =	24160.0 in^4	From AutoCAD Sketch	**Stiffener Thickness**	**1.250 in**
ybar =	24.625 in		**Stiffener Height**	**144.000 in**
S =	981.12 in^3	I/y	**Fy**	**65 ksi**
fc =	34.57 ksi	M/S	**Step Width**	**3.00 in**
Ag =	10.625 in^2			
Pu =	367.29 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 =	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% = 71.2 %

Moment to Existing Bolt Group:

S_{BG} =	1088.90 in^3	# Bolts Acting	14
ft =	31.15 ksi		
Ab =	.442 in^2		
T =	192.64 k		
Arm =	44.38 ksi		
M_{EQ} =	712.4 k-ft	**<-------Insert into Crown Spreadsheet**	

PROJECT	**86959.004.01 - Portland Warren Ave, ME**				
SUBJECT	**Flat Plate Bridge Stiffeners @ 60'**				
DATE	**03/17/14**	PAGE	1	OF	1

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SSC

Determine Load to Bridge Stiffener:

M =	2826.3 k-ft	From Risa Model
I =	24160.0 in^4	From AutoCAD Sketch
ybar =	24.625 in	
S =	981.12 in^3	I/y
fc =	34.57 ksi	M/S
Ag =	10.625 in^2	
Pu =	367.29 k	fc x Ag

Stiffener Width	**8.500 in**
Stiffener Thickness	**1.250 in**
Stiffener Height	**195.000 in**
Fy	**65 ksi**
Fu	**80 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% = 71.2 %

Tension Rupture Check: AISC 13th Edition, Chapter J4.1

Hole Size	1.25	
U =	1	Shear Lag Factor - Table D3.1 and TIA222-G
Ag =	10.625 in^2	Gross Area
An =	9.063 in^2	Net Area
Ae =	9.063 in^2	Effective Area
ΦRn =	621.56 k	Tension Yielding: Eqn J4-1
ΦRn =	543.75 k	Tension Rupture: Eqn J4-2
ΦRn(Equiv)	543.75 ksi	

Unity% 67.55 %

Moment to Existing Bolt Group:

S_{BG} =	1088.90 in^3	# Bolts Acting	14
ft =	31.15 ksi		
Ab =	.442 in^2		
T =	192.64 k		
Arm =	44.38 ksi		
M_{EQ} =	712.4 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 #: *207906 Revision #8*

Reactions		
Mu	712.4	ft-kips
Axial, Pu:	39.75	kips
Shear, Vu:	31.602	kips
Elevation:	60	feet

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

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

			Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	37.58	kips	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:	13.05	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	0.996	in	
Min PL "treq" for actual **T w/ Pry**:	0.456	in	
Min PL "t1" for actual **T w/o Pry**:	0.587	in	
T allowable w/o Prying:	37.58	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	13.05	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	34.7%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	3.7	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	11.4%	**Pass**	Comp. Y.L. Length:
No Prying			14.32
Tension Side Stress Ratio, (treq/t)^2:	4.1%	**Pass**	

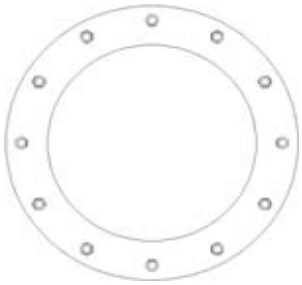
n/a

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 #: *207906 Revision # 5*

Manufacturer:	Other

Reactions		
Moment:	712.4	ft-kips
Axial:	39.75	kips
Shear:	31.602	kips
Exterior Flange Run, T+q:	13.05	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:	13.1	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty),	37.6	Kips
Bolt Stress Ratio:	34.7%	**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:	14.5	Kips, Ext. Cu=Interior Cu
Plate Stress:	5.2	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	16.0%	**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

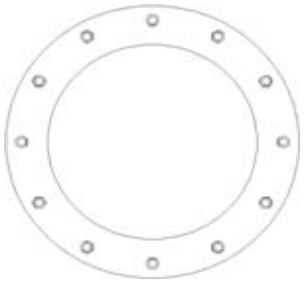
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

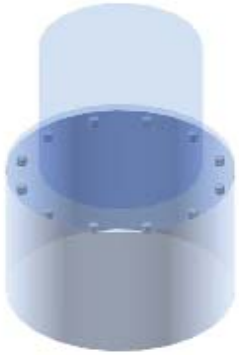
Pole Data

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

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

PROJECT	**86959.004.01 - Portland Warren Ave, ME**			
SUBJECT	**Existing Sabre MS850 Bridge Stiffeners @ 20'**			
DATE	**03/17/14**	PAGE	1	OF 1

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

SSC

Determine Load to Bridge Stiffener:

M =	4205.1 k-ft	From Risa Model	**Stiffener Width**	**8.500 in**
I =	35474.7 in^4	From AutoCAD Sketch	**Stiffener Thickness**	**1.250 in**
ybar =	27.625 in		**Stiffener Height**	**144.000 in**
S =	1284.15 in^3	I/y	**Fy**	**65 ksi**
fc =	39.30 ksi	M/S	**Step Width**	**3.00 in**
Ag =	10.625 in^2			
Pu =	417.51 k	fc x Ag	**Bolt Circle**	**50.38 in**
			Number of Bolts	**52**
Determine ΦPn (Allowable Axial Load):			**Bolt Size**	**1**
			Gap @ Flange	**6.00 in**

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} =	1408.43 in^3	# Bolts Acting	13
ft =	35.83 ksi		
Ab =	.785 in^2		
T =	365.81 k		
Arm =	50.38 ksi		
M_{EQ} =	1535.6 k-ft	**<-------Insert into Crown Spreadsheet**	

PROJECT	**86959.004.01 - Portland Warren Ave, ME**				
SUBJECT	**Flat Plate Bridge Stiffeners @ 20'**				
DATE	**03/17/14**	PAGE	1	OF	1

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

0

Determine Load to Bridge Stiffener:

M =	4205.1 k-ft	From Risa Model
I =	35474.7 in^4	From AutoCAD Sketch
ybar =	27.625 in	
S =	1284.15 in^3	I/y
fc =	39.30 ksi	M/S
Ag =	10.625 in^2	
Pu =	417.51 k	fc x Ag

Stiffener Width	**8.500 in**
Stiffener Thickness	**1.250 in**
Stiffener Height	**195.000 in**
Fy	**65 ksi**
Fu	**80 ksi**
Step Width	**3.00 in**
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 %

Tension Rupture Check:

AISC 13th Edition, Chapter J4.1

Hole Size	1.25	
U =	1	Shear Lag Factor - Table D3.1 and TIA222-G
Ag =	10.625 in^2	Gross Area
An =	9.063 in^2	Net Area
Ae =	9.063 in^2	Effective Area
ΦRn =	621.56 k	Tension Yielding: Eqn J4-1
ΦRn =	543.75 k	Tension Rupture: Eqn J4-2
ΦRn(Equiv)	543.75 ksi	

Unity% 76.78 %

Moment to Existing Bolt Group:

S_{BG} =	1408.43 in^3	# Bolts Acting	13
ft =	35.83 ksi		
Ab =	.785 in^2		
T =	365.81 k		
Arm =	50.38 ksi		
M_{EQ} =	1535.6 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 #: *207906 Revision # 8*

Reactions		
Mu	1535.6	ft-kips
Axial, Pu:	59.424	kips
Shear, Vu:	36.128	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

			Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	54.54	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	54.53	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	27.00	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	0.995	in	
Min PL "treq" for actual **T w/ Pry**:	0.548	in	
Min PL "t1" for actual **T w/o Pry**:	0.700	in	
T allowable w/o Prying:	54.54	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	27.00	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	49.5%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	5.0	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	15.4%	**Pass**	Comp. Y.L. Length: 15.29
No Prying			
Tension Side Stress Ratio, (treq/t)^2:	4.8%	**Pass**	

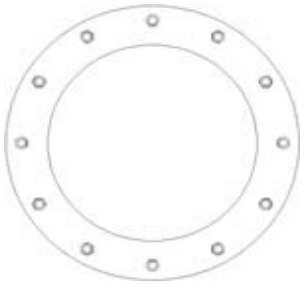
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878782*
Site Name: *Portland Warren Ave, ME*
App #: *207906 Revision # 5*

Manufacturer:	Other

Reactions		
Moment:	1535.6	ft-kips
Axial:	59.424	kips
Shear:	36.128	kips
Exterior Flange Run, T+q:	27	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	

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

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		
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

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	27.0	Kips, Ext. Flange Tu+q
Adjusted φ*Tn (due to Vu=Vu/Qty),	54.5	Kips
Bolt Stress Ratio:	49.5%	**Pass**

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	29.3	Kips, Ext. Cu=Interior Cu
Plate Stress:	7.0	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	21.6%	**Pass**

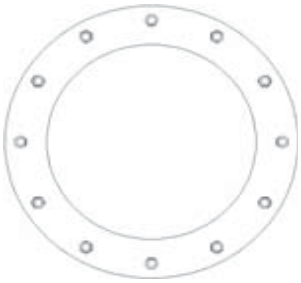
n/a

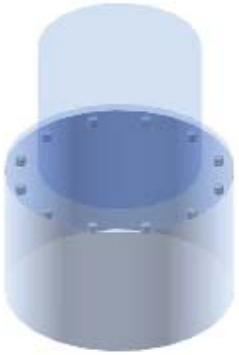
Stiffener Results

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

Anchor Rod Information for TIA/EIA-222-F and TIA-222-G-2

Site Information	
ID:	878782
Name:	PORTLAND WARREN AVE
App. #:	207906; Rev: 8

AeroSolutions LLC
Optimizing Your Tower Infrastructure

Base Reactions		
Moment:	4955	ft-kip
Axial:	71	kip
Shear:	38	kip
Base Plate Type:	Circular	

Design Information	
TIA Code:	G
ASIF:	1.000
Failure:	100%
eta Factor:	0.55

Original Anchor Rod Data		
Quantity:	28	
Diameter:	2.00	in
Material:	A36	
Bolt Circle:	60.1	in
Bolt Spacing:		in
Bolt Group Area:	87.96	in^2
Bolt Group MOIx:	39750	in^4

Reactions Seen by Original AR Group		
Moment:	3786.8	kip-ft
Axial:	71.4	kip
Shear:	38.3	kip

Original AR Capacity Check		
Combined Load:	108.2	kip
Allowable load:	115.9	kip
AR Capacity:	93.3%	Pass

First Added Anchor Rod Data		
Quantity:	8	
Diameter:	1.75	in
Material:	F1554 GR 55	
Bolt Circle:	74.0	in
Bolt Group Area:	19.24	in^2
Bolt Group MOIx:	12266	in^4

Reactions Seen by First Added AR Group		
Moment:	1168.5	kip-ft
Axial:	0.0	kip
Shear:	0.0	kip

First Added AR Capacity Check		
Combined Load:	96.1	kip
Allowable load:	114.0	kip
AR Capacity:	84.3%	Pass

Second Added Anchor Rod Data		
Quantity:		
Diameter:		in
Material:		
Bolt Circle:		in
Bolt Group Area:	0.00	in^2
Bolt Group MOIx:	0	in^4

Reactions Seen by Second Added AR Group		
Moment:	0.0	kip-ft
Axial:	0.0	kip
Shear:	0.0	kip

Second Added AR Capacity Check		
Combined Load:	0.0	kip
Allowable load:	0.0	kip
AR Capacity:	0.0%	

Third Added Anchor Rod Data		
Quantity:		
Diameter:		in
Material:		
Bolt Circle:		in
Bolt Group Area:	0.00	in^2
Bolt Group MOIx:	0	in^4

Reactions Seen by Second Added AR Group		
Moment:	0.0	kip-ft
Axial:	0.0	kip
Shear:	0.0	kip

Second Added AR Capacity Check		
Combined Load:	0.0	kip
Allowable load:	0.0	kip
AR Capacity:	0.0%	

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 AV*
App #: *207906; Rev: 8*

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:	3786.8	ft-kips
Axial, Pu:	71.4358	kips
Shear, Vu:	38.288002	kips
Eta Factor, η	0.55	TIA G (Fig. 4-4)

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

Anchor Rod Results

		Rigid
Max Rod (Cu+ Vu/ή):	113.0 Kips	AISC LRFD
Allowable Axial, Φ*Fu*Anet:	116.0 Kips	φ*Tn
Anchor Rod Stress Ratio:	97.4% **Pass**	

Base Plate Results Flexural Check

		Rigid
Base Plate Stress:	13.2 ksi	AISC LRFD
Allowable Plate Stress:	32.4 ksi	φ*Fy
Base Plate Stress Ratio:	40.6% **Pass**	Y.L. Length: 26.44

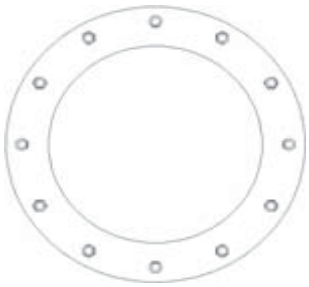
n/a

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

PROJECT **86959.004.01 - Portland Warren Ave, ME**
SUBJECT **Foundation Analysis**
DATE **03/26/14** PAGE 1 OF 1

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

Weight of Concrete

Wc= γ*w1*w2*D

= .15*12*12*5

= 108 kips

MOI of Anchor Group

I/A= Σn*d^2

= [2*14*5.6'^2+2*2*(4.7'^2+3.9'^2+3.0'^2+2.15'^2+1.3'^2+0.43'^2)]*144

= 156854.82 in^4/in^2

Effective Moment at Anchors

Me= M+V*D

= 4958 + 38 * 5

= 5148 k-ft

Max Comp. in Anchor

Cu= (P+ϕWc)/N+ Me*c/(I/A)

= (71k+1*108k)/52 + (5148*12)k-in * (7.95*12)in / (156854in^4/in^2)

= 41.0 kips

Max Tension in Anchor

Tu= (-P+ϕWc)/N+ Me*c/(I/A)

= (-71k+.9*108k)/52 + (5148*12)k-in * (7.95*12)in / (156854in^4/in^2)

= 38.1 kips

Axial Capacity of Anchor

ϕPn= ϕFy*Ay

= 0.9*60ksi*1.0in^2

= 54.0 kips

% Capacity

= 75.9%

Factored Loads

M	4958	k-ft
P	71	k
V	38	k

Block

W1	12	ft
W2	12	ft
D	5	ft

Anchor

Size	1.128	
Qty	14	per face
Spacing	10.77	in
Grade	60	ksi
Hole Size	2.5	in

Rock to Grout Bond

P_{RG}= ϕ*SA*Fb

= 0.5*2.5in*π * (.075ksi*5ft*12 + 0.150ksi*3ft*12)

= 38.9 kips

Allowable Bond Stength

0.075ksi 0 to 5 ft depth

0.150ksi >5ft of depth

% Capacity

= 97.9%

Rock Group Forces

Moment Resistance from Concrete Weigth

ϕMc= 0.9 * 108k * 2.8284ft

= 274.9 k-ft (Diagonal)

ϕMc= 0.9 * 108k * 6ft

= 583.2 k-ft (Orthogonal)

Group Uplift Force

Diagonal

Ugd= 551.9 kips

Orthogonal

Ugo= 455.5 kips

Rock Group Weight

ϕRw= ϕ*Vol*γ_{rock} γ_{rock}

= 0.75 * 581.6 ft′ * 0.16kcf

= 69.8 kips

Rock Shear Strength ϕ 0.75

ϕRs= ϕ*SA*v_{rock}*cos(30) SA 222 ft^2

= 576.8 kips v_{rock} 4 ksf

% Capacity

= 85.4%

Soil Bearing

σ= P/A+M/S

= 71 / 12^2 + 4958 / 203.6

= 24.8 ksf

S=(12^3/6/sqrt(2))

q_{all} 30 ksf = 203.6 ft^3

% Capacity

= 82.8%

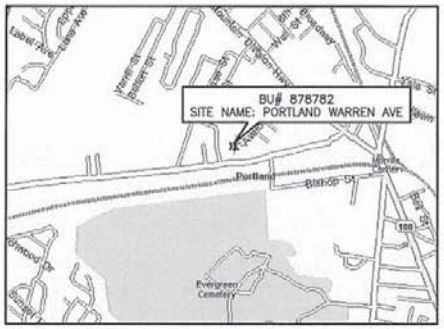
APPENDIX D

TOWER MODIFICATION DRAWINGS

TOWER MODIFICATION DRAWINGS PREPARED FOR: CROWN CASTLE

SITE NAME: PORTLAND WARREN AVE
BU NUMBER: 878782

SITE ADDRESS:
WARREN AVE,
PORTLAND, ME 04103
CUMBERLAND COUNTY, USA



MAP

DIRECTIONS

ROUTE 95 NORTH MAINE TURNPIKE TO EXIT 8 WESTBROOK. AFTER TOLL MAKE A RIGHT ON RIVERSIDE DRIVE. GO ABOUT 3/4 OF A MILE TO LIGHT AT WARREN AVENUE. MAKE A RIGHT ON WARREN AVENUE. TOWER IS ABOUT 1 MILE ON WARREN AVE. ON THE RIGHT. TOWER IS A MONOPOLE.

PROJECT CONTACTS:

1. CROWN TOWER STRUCTURAL ANALYST
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   EAST ROCHESTER, NY 14445

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   (518) 433-6264
   ROY.PYPTIUK@CROWNCASTLE.COM
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   ALBANY, NY 12204

3. CROWN CONSTRUCTION MANAGER
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   (508) 789-7023
   MICHEAL.RULEY@CROWNCASTLE.COM

4. B+T GROUP PROJECT ENGINEER
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   (918) 587-4630
   BTABB@BTGRP.COM
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   TULSA, OK 74119

5. B+T GROUP ENGINEER (EOR)
   CHAD E TUTTLE, P.E.
   (918) 587-4630
   CTUTTLE@BTGRP.COM
   1717 S BOULDER AVENUE, SUITE 300
   TULSA, OKLA. 74119

TOWER INFORMATION

TOWER MANUFACTURER / DWG #:	PITTSBURG MONOPOLE DIV. / 96088-88
TOWER HEIGHT / TYPE:	180' MONOPOLE
TOWER LOCATION: DATUM: (NAD 1983)	LAT. 43° 41' 15.16" LONG. -70° 18' 14.96" ELEV. 92 FT AMSL
STRUCTURAL DESIGN DRAWING REPORT:	B+T GROUP / WO. # 727316
STRUCTURAL ANALYSIS REPORT:	B+T GROUP / WO # 707745
STRUCTURAL ANALYSIS DATE:	02/04/14
APPLICATION ID / REVISION #:	207906 / 8
CCISITES DOCUMENT ID:	4431927

CODE COMPLIANCE

THIS REINFORCEMENT DESIGN IS BASED ON 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.

DRAWINGS INCLUDED

SHEET NUMBER	DESCRIPTION
S1	TITLE SHEET
S2	MODIFICATION INSPECTION NOTES AND CHECKLIST
S3	GENERAL NOTES, AJAX BOLT NOTES AND DETAIL
S4	TOWER ELEV., SCHEDULE AND TX LINE DIST. DIAGRAM
S5	TOWER SECTION (0'–19.5') AND ANCHOR ROD BRACKET DETAIL
S6	FLAT PLATE BRIDGE STIFFENER DETAIL, SCHEDULE AND TOWER SECTION (20')
S7	FLAT PLATE BRIDGE STIFFENER DETAIL, SCHEDULE AND TOWER SECTION (60')
S8	FLAT PLATE BRIDGE STIFFENER DETAIL, SCHEDULE AND TOWER SECTIONS (100' AND 140')
D1	PART DETAILS
D2	PART DETAILS

B+T GRP
1717 S. BOULDER
SUITE 300
TULSA, OK 74119
PH: (918) 587-4630
www.btgrp.com

CROWN CASTLE

ISSUED FOR:

REV	DATE	DESCRIPTION
0	03/26/14	ISSUED FOR CONSTRUCTION

PROJECT NO:	86959.004.01
PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
CHECKED BY:	SSC

B+T ENGINEERING, INC.

STATE OF MAINE
CHAD E. TUTTLE
10488
LICENSED
PROFESSIONAL ENGINEER
03/26/2014

PORTLAND WARREN AVE
878782

WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

SHEET TITLE
TITLE SHEET

SHEET NUMBER:	REVISION:
S1	0

MI CHECKLIST

REQUIRED	REPORT ITEM	BRIEF DESCRIPTION
	PRE-CONSTRUCTION	
X	MI CHECKLIST DRAWING	THIS CHECKLIST SHALL BE INCLUDED IN THE MI REPORT.
X	EOR APPROVED SHOP DRAWINGS	FABRICATION DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW. THE CONTRACTOR SHALL PROVIDE APPROVED SHOP DRAWINGS TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	ASSEMBLY DRAWINGS	ONCE THE PRE-MODIFICATION MAPPING IS COMPLETE, PRIOR TO FABRICATION, THE CONTRACTOR SHALL PROVIDE DETAILED ASSEMBLY DRAWINGS. THESE ARE TO INCLUDE, BUT ARE NOT LIMITED TO, A VISUAL LAYOUT OF NEW REINFORCEMENT, EXISTING REINFORCEMENT CONFIGURATION, PORTHOLES, MOUNTS, STEP PEGS, SAFETY CLIMBS AND ANY OTHER MISCELLANEOUS ITEMS WHICH MAY AFFECT SUCCESSFUL INSTALLATION OF MODIFICATIONS ON THE TOWER. THESE DRAWINGS SHALL BE SUBMITTED TO THE EOR FOR APPROVAL. APPROVED ASSEMBLY DRAWINGS SHALL BE SUBMITTED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATION INSPECTION	A LETTER FROM THE FABRICATOR, STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THE CONTRACT DOCUMENTS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR CERTIFIED WELD INSPECTION	A VISUAL OBSERVATION BY A CWI OF A PORTION OF WELDING ON THE PROPOSED STRUCTURAL MEMBERS IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	MATERIAL TEST REPORT (MTR)	MILL CERTIFICATION SHALL BE PROVIDED FOR ALL STEEL AS SPECIFIED IN THE MODIFICATION DRAWINGS AND THIS DOCUMENTATION SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR NDE INSPECTION	CRITICAL SHOP WELDS THAT REQUIRE TESTING (PER ENG-STD-10069) ARE NOTED ON THESE CONTRACT DRAWINGS. A CERTIFIED WELD INSPECTOR SHALL PERFORM NON-DESTRUCTIVE EXAMINATION AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	NDE REPORT OF MONOPOLE BASE PLATE	A NDE (PER ENG-SOW-10033) OF THE POLE TO BASE PLATE CONNECTION IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PACKING SLIPS	THE MATERIAL SHIPPING LIST SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
	CONSTRUCTION (PERFORMED BY CONTRACTOR)	
X	CONSTRUCTION INSPECTIONS	A LETTER FROM THE GENERAL CONTRACTOR STATING THAT THE WORKMANSHIP WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THESE CONTRACT DRAWINGS.
N/A	FOUNDATION INSPECTIONS	A VISUAL OBSERVATION OF THE EXCAVATION AND REBAR SHALL BE PERFORMED BEFORE PLACING THE CONCRETE. A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	CONCRETE COMP. STRENGTH AND SLUMP TESTS	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	POST INSTALLED ANCHOR ROD VERIFICATION	POST INSTALLED ANCHOR ROD VERIFICATION SHALL BE PERFORMED IN ACCORDANCE WITH CROWN REQUIREMENTS AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	BASE PLATE GROUT VERIFICATION	THE GENERAL CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE MI INSPECTOR THAT CERTIFIES THAT THE GROUT WAS INSTALLED IN ACCORDANCE WITH CROWN ENG-PRC-10012 FOR INCLUSION IN THE MI REPORT.
X	CONTRACTOR'S CERTIFIED WELD INSPECTION	A CERTIFIED WELD INSPECTOR SHALL INSPECT AND TEST AS NECESSARY ALL FIELD WELDS. CWI SHALL FOLLOW ALL THE PROCEDURES SPECIFIED IN CROWN STANDARD DOCUMENTS ENG-SOW-10066, ENG-STD-10069 AND SRV-STD-10159. A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT. FULL PENETRATION WELDS IN THE VICINITY OF BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY UT IN ACCORDANCE WITH AWS D1.1. PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MP IN ACCORDANCE WITH AWS D1.1.
N/A	EARTHWORK: LIFT AND DENSITY	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY A GEOTECHNICAL ENGINEER AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	ON SITE COLD GALVANIZING VERIFICATION	THE GENERAL CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE MI INSPECTOR VERIFYING THAT ANY ON-SITE COLD GALVANIZING WAS APPLIED IN ACCORDANCE WITH ENG-BUL-10149.
N/A	GUY WIRE TENSION REPORT	THE GENERAL CONTRACTOR SHALL PROVIDE A REPORT TO THE MI INSPECTOR INDICATING THE TEMPERATURE AND TENSION IN EVERY GUY CABLE AS PART OF PLUMB AND TENSION PROCEDURE FOR INCLUSION IN THE MI REPORT.
X	GC AS-BUILT DOCUMENTS	THE GENERAL CONTRACTOR SHALL SUBMIT A COPY OF THE CONTRACT DRAWINGS EITHER STATING "INSTALLED AS DESIGNED" OR NOTING ANY CHANGES THAT WERE REQUIRED AND APPROVED BY THE ENGINEER OF RECORD.
	POST-CONSTRUCTION	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)	THE MI INSPECTOR SHALL OBSERVE AND REPORT ANY DISCREPANCIES BETWEEN THE CONTRACTORS REDLINE DRAWING AND THE ACTUAL COMPLETED INSTALLATION.
X	POST INSTALLED ANCHOR ROD PULL-OUT TESTING	POST-INSTALLED ANCHOR RODS SHALL BE TESTED IN ACCORDANCE WITH ENG-PRC-10119 AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PHOTOGRAPHS	PHOTOGRAPHS SHALL BE SUBMITTED TO THE MI WHICH DOCUMENT ALL PHASES OF THE CONSTRUCTION. THE PHOTOS SHALL BE ORGANIZED IN A MANNER THAT EASILY IDENTIFIES THE EXACT LOCATION OF THE PHOTO.
ADDITIONAL TESTING AND INSPECTIONS:		

NOTE: X DENOTES A DOCUMENT NEEDED FOR THE MI REPORT AND N/A DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE MI REPORT

MODIFICATION INSPECTION NOTES:

GENERAL

THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, NOR DOES THE MI INSPECTOR TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.

ALL MI'S SHALL BE CONDUCTED BY A CROWN ENGINEERING VENDOR (AEV) OR ENGINEERING SERVICE VENDOR (AESV) THAT IS APPROVED TO PERFORM ELEVATED WORK FOR CROWN. SEE ENG-BUL-10173 LIST OF APPROVED MI VENDORS.

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PO IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN, CONTACT YOUR CROWN POINT OF CONTACT (POC).

REFER TO ENG-SOW-10007 : MODIFICATION INSPECTION SOW FOR FURTHER DETAILS AND REQUIREMENTS.

MI INSPECTOR

THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS

THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GENERAL CONTRACTOR (GC) INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO CROWN.

GENERAL CONTRACTOR

THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE MI INSPECTOR TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE MI INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS
- BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS

THE GC SHALL PERFORM AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST AND ENG-SOW-10007.

RECOMMENDATIONS

THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING A MI REPORT:

- IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLY 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS.
- IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE FOUNDATION INSPECTIONS TO ALLOW FOUNDATION AND MI INSPECTION(S) TO COMMENCE WITH ONE SITE VISIT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE.

CANCELLATION OR DELAYS IN SCHEDULED MI

IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, CROWN SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF CROWN CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

CORRECTION OF FAILING MI'S

IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI ("FAILED MI"), THE GC SHALL WORK WITH CROWN TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:

- CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI.
- OR, WITH CROWN'S APPROVAL, THE GC MAY WORK WITH THE EOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION

MI VERIFICATION INSPECTIONS

CROWN RESERVES THE RIGHT TO CONDUCT A MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTION(S) ON TOWER MODIFICATION PROJECTS.

ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS AND IN ACCORDANCE WITH ENG-SOW-10007.

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT AEV/AESV FIRM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "PASSING MI" OR "PASS AS NOTED MI" REPORT FOR THE ORIGINAL PROJECT.

REQUIRED PHOTOS

BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

- PRE-CONSTRUCTION GENERAL SITE CONDITION
- PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION
  - RAW MATERIALS
  - PHOTOS OF ALL CRITICAL DETAILS
  - FOUNDATION MODIFICATIONS
  - WELD PREPARATION
  - BOLT INSTALLATION AND TORQUE
  - FINAL INSTALLED CONDITION
  - SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
  - FINAL INFIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.

THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS, PLEASE REFER TO ENG-SOW-10007.

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TULSA, OK 74119
PH: (918) 587-4630
www.btgrp.com

CROWN CASTLE

ISSUED FOR:

REV	DATE	DESCRIPTION
0	03/26/14	ISSUED FOR CONSTRUCTION

PROJECT NO:	86959.004.01
PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
CHECKED BY:	SSC

B+T ENGINEERING, INC.

STATE OF MAINE
CHAD E. TUTTLE
10488
LICENSED
PROFESSIONAL ENGINEER

PORTLAND WARREN AVE
878782

WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

SHEET TITLE

MODIFICATION INSPECTION NOTES AND CHECKLIST

SHEET NUMBER:	REVISION:
S2	0

NOTES:

1. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRE-TENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.

2. ALL STRUCTURAL BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.

3. ALL AJAX M20 BOLTS WITH SHEAR SLEEVES SHALL BE PRE-TENSIONED AND TIGHTENED UNTIL THE DIRECT TENSION INDICATOR (DTI) WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED. SEE NOTES AND DETAIL BELOW FOR THE USE OF DIRECT TENSION INDICATOR (DTI) WASHERS WITH THE AJAX M20 BOLTS.

4. ALL AJAX BOLTS SHALL BE INSTALLED USING DIRECT TENSION INDICATORS (DTI'S) AND HARDENED WASHERS. DTI'S SHALL BE THE SQUIRTER® STYLE, MADE TO ASTM F959 LATEST REVISION; AND HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A HARDNESS OF RC 38 OF HIGHER.

NOTES FOR AJAX M20 'ONE-SIDE' BOLTS WITH DIRECT TENSION INDICATORS (DTI'S):

DTI'S REQUIRED: DTI'S SHALL BE "SELF-INDICATING" SQUIRTER® STYLE DTI'S MADE WITH SILICONE EMBEDDED IN THEM, INSPECTED BY MEANS OF THE VISUAL EJECTION OF SILICONE AS THE DTI PROTRUSIONS COMPRESS. SQUIRTER® DTI'S SHALL BE CALIBRATED PER MANUFACTURES'S INSTRUCTIONS PRIOP TO USE.

THE DIRECT TENSION INDICATOR (DTI) WASHERS SHALL BE THE "SQUIRTER® STYLE" AS MANUFACTURED BY:

APPLIED BOLTING TECHNOLOGY PRODUCTS, INC.
1413 ROCKINGHAM ROAD
BELLOWS FALLS, VERMONT 05101, USA
PHONE 1-800-552-1999
WEBSITE: WWW.APPLIEDBOLTING.COM

DISTRIBUTORS OF SQUIRTER® DTI'S:
HTTP://WWW.APPLIEDBOLTING.COM/APPLIED-BOLTING-DISTRUBUTORS.HTML

DTI: USE DIRECT TENSION INDICATOR (DTI) WASHERS COMPATIBLE WITH 3/4" NOMINAL A325 BOLTS FOR THE AJAX M20 BOLTS. DTI'S SHALL NOT BE HOT-DIP GALVANIZED. DTI'S SHALL BE MECHANICALLY GALVANIZED (MG) BY THE COLD MECHANICAL PROCESS ONLY AS PROVIDED BY THE DTI MANUFACTURER.

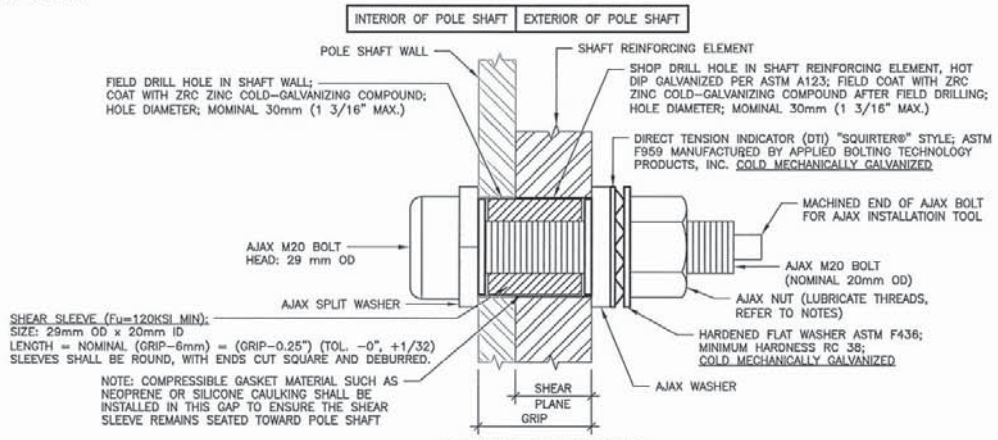
HARDENED WASHERS REQUIRED: USE A HARDENED WASHER FOR A 3/4" NOMINAL BOLT BETWEEN THE TOP OF THE DIRECT TENSION INDICATOR (DTI) WASHER AND THE NUT OF THE AJAX M20 BOLT. HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A MINIMUM HARDNESS OF RE 38 OR HIGHER. THE HARDENED WASHERS SHALL BE MECHANICALLY GALVANIZED BY THE COLD MECHANICAL PROCESS. ALTERNATIVELY, CORRECTLY MADE HOT DIP GALVANIZED HARDENED FLAT WASHERS HAVING A MINIMUM HARDNESS OF RC 38 CAN BE USED; CONTRACTOR SHALL PROVIDE DOCUMENTATION OF WASHER SPECIFICATION AND HARDNESS.

NUT LUBRICATION REQUIRED: PROPERLY LUBRICATE THE THREADS OF THE NUT OF THE AJAX BOLT SO THAT IT CAN BE PROPERLY TIGHTENED WITHOUT GALLING AND/OR LOCKING UP ON THE BOLT THREADS. CONTRACTOR SHALL FOLLOW DTI MANUFACTURER INSTRUCTIONS FOR PROPER LUBRICATION AND TIGHTENING.

NOTE: COMPLETELY COMPRESSED DTI'S SHOWING NO VISIBLE REMAINING GAP ARE ACCEPTABLE. DTI WASHERS SHALL BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE DTI BUMPS FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND AJAX NUT. THE DTI BUMPS SHALL BEAR AGAINST THE UNDERSIDE OF A HARDENED FLAT WASHER, NEVER DIRECTLY AGAINST THE NUT.

CONTRACTOR SHALL FOLLOW DTI MANUFACTURES'S INSTRUCTIONS FOR INSTALLATION, LUBRICATION, TIGHTENING AND INSPECTION.

INSPECTION REQUIRED: ALL AJAX BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 32, 2009, BY A QUALIFIED BOLT INSPECTOR. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENTI THE SHOP-DRILLED AND FIELD-DRILLED HOE SIZES; THE INSTALLATION OF THE AJAX BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION AND THE CONTRACTOR'S TENSIONING PROCEDURE. IN ADDITION, ALL AJAX BOLTS AND DTI'S SHALL BE VISUALLY INSPECTED ACCORDING TO THE DTI MANUFACTURER'S INSTRUCTIONS. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE PHOTO DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THE CONDITION OF THE DTI'S.



1 TYPICAL AJAX BOLT DETAIL
SCALE: N.T.S.

GENERAL NOTES

1.1 ALL WORK SHALL COMPLY WITH THE TIA-222-G STANDARD AS WELL AS ANY OTHER GOVERNING BUILDING CODES.
1.2 FIELD WORK WILL BE DONE AROUND EXISTING COAXIAL CABLE AND EQUIPMENT. ALL WORK SHALL BE DONE IN A MANNER SUCH THAT NO DAMAGE OCCURS TO THE EXISTING EQUIPMENT OR THE STRUCTURE.
1.3 A MINIMUM OF TWO COATS OF ZINGA COLD GALVANIZING COMPOUND (OR APPROVED EQUIVALENT) SHALL BE APPLIED TO ANY FIELD CUTS OR FIELD DRILLED HOLES.
1.4 THE USE OF A GAS TORCH OR WELDER WILL NOT BE PERMITTED ON THE TOWER WITHOUT THE CONSENT OF THE OWNER.
1.5 IN LIEU OF TEMPORARY BRACING CONTRACTOR MAY HAVE A STABILITY ANALYSIS PERFORMED BY AN ENGINEER LICENSED IN THE STATE THE TOWER IS LOCATED. THE ANALYSIS SHALL USE A MINIMUM WIND SPEED OF 45 mph (3-SEC) PER TIA-1019.

FABRICATION

2.1 ALL WORK SHALL BE DONE IN ACCORDANCE WITH A.I.S.C. "SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS.
2.2 STRUCTURAL STEEL SHALL MEET THE FOLLOWING SPECIFICATIONS:

	YIELD	ASTM SPECS
A. STEEL SHAPES AND PLATES, U.N.O.	65ksi	A572
B. STEEL PIPE	35ksi	A53-B

2.3 ALL NEW MATERIAL INCLUDING STRUCTURAL STEEL AND FASTENERS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND A153.
2.4 WELDING SHALL MEET ANSI/AWS D1.1 STRUCTURAL WELDING CODE (LATEST REVISION). ELECTRODES SHALL BE E80 SERIES.
2.5 CONTRACTOR SHALL PROVIDE SHOP FABRICATION DRAWINGS TO B+T GROUP 2 WEEKS PRIOR TO FABRICATION.

KEY NOTES

(#) TOWER MODIFICATION I.D.

B+T GRP
1717 S. BOULDER
SUITE 300
TULSA, OK 74119
PH: (918) 587-4630
www.btgrp.com

CROWN CASTLE

ISSUED FOR:

REV	DATE	DESCRIPTION
0	03/26/14	ISSUED FOR CONSTRUCTION

PROJECT NO:	86959.004.01
PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
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B+T ENGINEERING, INC.

STATE OF MAINE
CHAD E. TUTTLE
10488
LICENSED
PROFESSIONAL ENGINEER

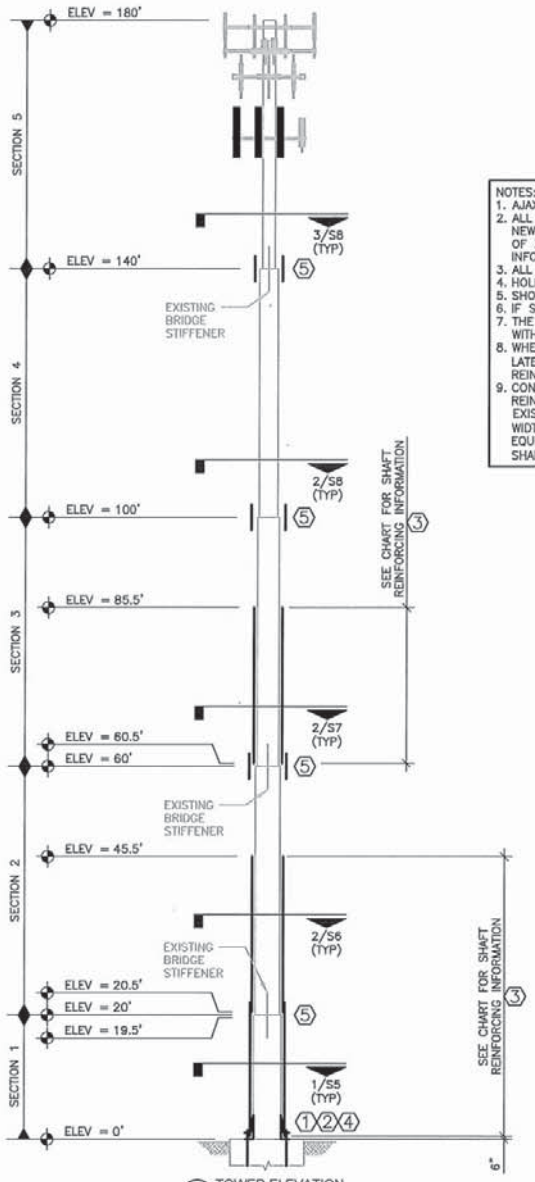
PORTLAND WARREN AVE
878782

WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

SHEET TITLE
GENERAL NOTES, AJAX BOLT NOTES AND DETAIL

SHEET NUMBER:	REVISION:
S3	0



1 TOWER ELEVATION
SCALE: N.T.S.

CCI: FLAT PLATE-BILL OF MATERIALS (65KSI)

BOTTOM ELEVATION	TOP ELEVATION	FLAT PLATE DESIGNATION	FLAT PLATE LENGTH	FLAT PLATE QUANTITY	AJAX BOLTS PER PLATE	TOTAL AJAX BOLT QTY	TERMINATION BOLTS (BOTTOM)	TERMINATION BOLTS (TOP)	MAXIMUM INTERMEDIATE BOLT SPACING	TOTAL STEEL WEIGHT	
0'-6"	25'-11 1/2"	FP1**	25'-5 1/2"	3	46	138	15	20	17"	2761	LBS.
20.5'	45.5'	FP2**	25'-0"	3	46	138	20	15	17"	2712	LBS.
60.5'	85.5'	FP2**	25'-0"	3	46	138	20	15	17"	2712	LBS.
** UNIQUE PART. SEE DETAILS SHEET D1						414				8185	LBS.

NOTES:
1. AJAX BOLTS ARE TO BE 20mm DIAMETER WITH CORRESPONDING 29mm DIAMETER SLEEVE WITH MATCHING STEEL GRADE.
2. ALL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATOR IN ACCORDANCE WITH ASTM A123. ALTERNATIVELY, ALL NEW STIFFENER PLATE STEEL REINFORCING MAY BE COLD GALVANIZED AS FOLLOWS: APPLY A MINIMUM OF TWO COATS OF ZRC-BRAND ZINC-RICH COLD GALVANIZING COMPOUND. FILM THICKNESS. 1-800-831-3275 FOR PRODUCT INFORMATION.
3. ALL SHIMS SHALL BE ASTM A36.
4. HOLES FOR AJAX BOLTS AND SHEAR SLEEVES ARE 30mm UNLESS NOTED OTHERWISE.
5. SHOP WELDS ARE ASSUMED EBOXX OR GREATER, PER STANDARD SPLICE DETAIL.
6. IF SCOPE OF MODIFICATION REQUIRES REMOVAL OF TOWER ID TAG, IT MUST BE REPLACED.
7. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE ENGINEER OF RECORD OR TOWER OWNER.
8. WHERE POSSIBLE, CLIMBING HARDWARE SHOULD REMAIN IN-LINE ALONG THE POLE. IF AN OBSTRUCTION CAUSES A LATERAL OFFSET OF 2'-0" OR MORE, CLIMBING ANCHORS SHALL BE PROVIDED AT EACH CHANGE IN ALIGNMENT. IF NEW REINFORCEMENT REQUIRES STEP BOLT BRACKETS, INSTALL PRIOR TO GALVANIZATION OF STEEL.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER FITTING OF REINFORCEMENT ON MONOPOLES. SHIMS FOR MONOPOLE REINFORCEMENT MEMBER SHALL BE REQUIRED WHERE GAPS BETWEEN THE POLE SHAFT AND REINFORCING MEMBER EXIST AT FASTENER LOCATIONS. FOR INTERMEDIATE CONNECTIONS, THE MINIMUM SHIM LENGTH AND WIDTH SHALL BE THE WIDTH OF THE REINFORCING MEMBER. FOR TERMINATION CONNECTIONS, A CONTINUOUS SHIM PLATE (PREFERRED) OR EQUIVALENT INDIVIDUAL SHIM PLATES THE WIDTH OF THE REINFORCING MEMBER MAY BE USED. SHIM THICKNESSES SHALL BE NO LESS THAN 1/16". STACKING OF SHIMS IS PERMITTED.

NEW CCI FLAT PLATE (65KSI) REINFORCING ELEMENTS

START ELEVATION	END ELEVATION	QTY	FLAT #	FLAT PLATE *
0'-6"	25'-11 1/2"	3	----	FP1**
20'-6"	45'-6"	3	----	FP2**
60'-6"	85'-6"	3	----	FP2**

** UNIQUE PART. SEE DETAILS SHEET D1 AND D2

ALL BOLTS SHALL BE AJAX M20 BOLTS WITH HIGH STRENGTH SHEAR SLEEVES (ASTM A519 WITH MIN. FU=120 KSI). CONTACT SUPPLIER FOR MATERIAL (PLATE AND BOLTS) AND INSTALLATION PROCEDURES.

EXISTING MEMBER SCHEDULE

SECTION	DIAMETER
1	54"ø x 5/8" PIPE
2	48"ø x 5/8" PIPE
3	42"ø x 1/2" PIPE
4	36"ø x 1/2" PIPE
5	24"ø x 3/8" PIPE

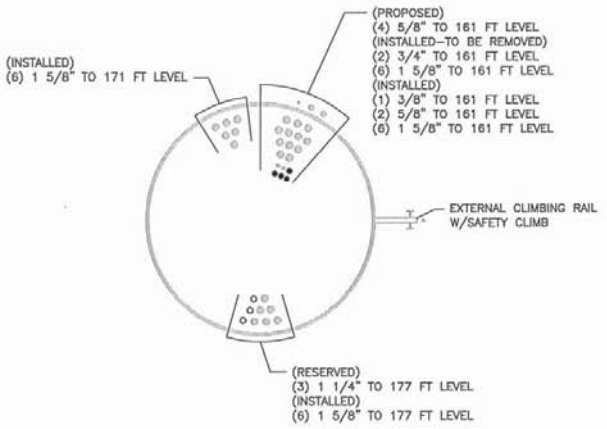
EXISTING TOWER HAS BEEN PREVIOUSLY MODIFIED.
REFERENCE DRAWINGS BY CROWN CASTLE DATED 04/28/12

EXISTING TOWER HAS BEEN PREVIOUSLY MODIFIED.
REFERENCE DRAWINGS BY B+T GROUP DATED 03/04/13

TOWER MODIFICATIONS:

1. CONTRACTOR SHALL BUDGET A SITE VISIT TO CHECK CRITICAL DIMENSIONS AND VERIFY UNKNOWN CONDITIONS PRIOR TO STEEL FABRICATION.
2. THE NEW AND EXISTING TRANSMISSION LINES MUST BE DISTRIBUTED AS SHOWN IN THE TX LINE DIST. DIAGRAM RE: DETAIL 2/S4.
3. INSTALL NEW REINFORCEMENT ELEMENTS RE: SHEET S5 THRU S7.
4. INSTALL NEW ANCHOR RODS AND ANCHOR ROD BRACKETS WITH FOOT PADS RE: SHEET S5.
5. INSTALL NEW BRIDGE STIFFENERS RE: SHEET S6 THRU S8.

* CONTRACTOR SHALL PROVIDE TEMPORARY BRACING FOR ALL REMOVE AND REPLACE PROCEDURES.
** MODIFICATIONS SHALL BE COMPLETED PRIOR TO ADDING THE PROPOSED APPURTENANCES.



2 TX LINE DISTRIBUTION DIAGRAM
SCALE: N.T.S.

B+T GRP
1717 S. BOULDER
SUITE 300
TULSA, OK 74119
PH: (918) 587-4630
www.btgrp.com

CROWN CASTLE

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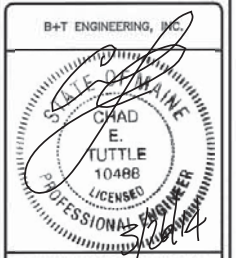
B+T ENGINEERING, INC.



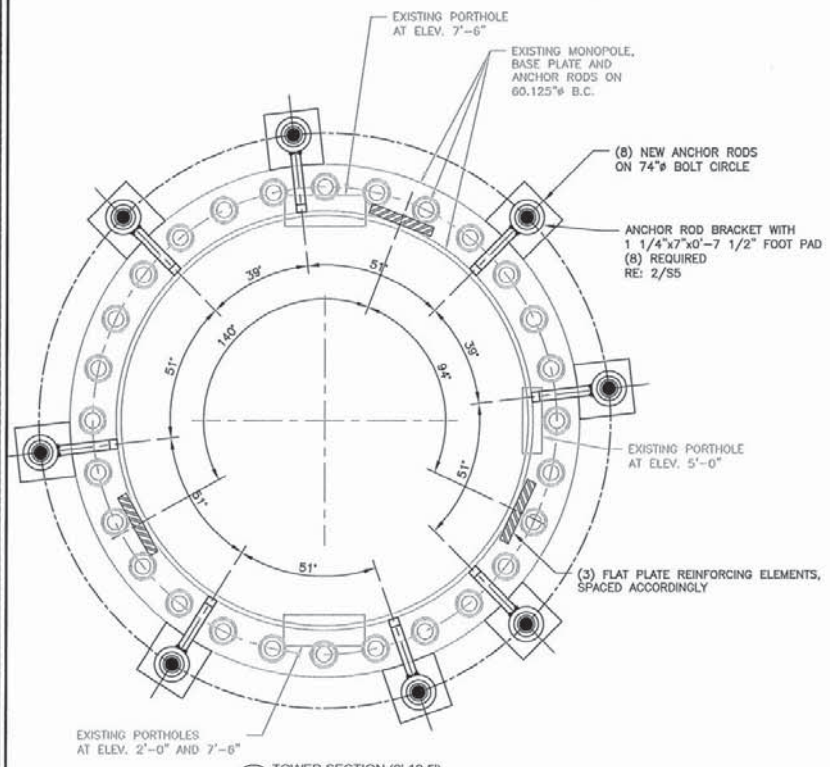
PORTLAND WARREN AVE
878782

WARREN AVE,
PORTLAND, ME

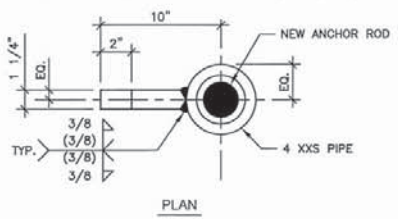
EXISTING 180' MONOPOLE

SHEET TITLE
TOWER ELEV., SCHEDULE AND TX LINE DIST. DIAGRAM

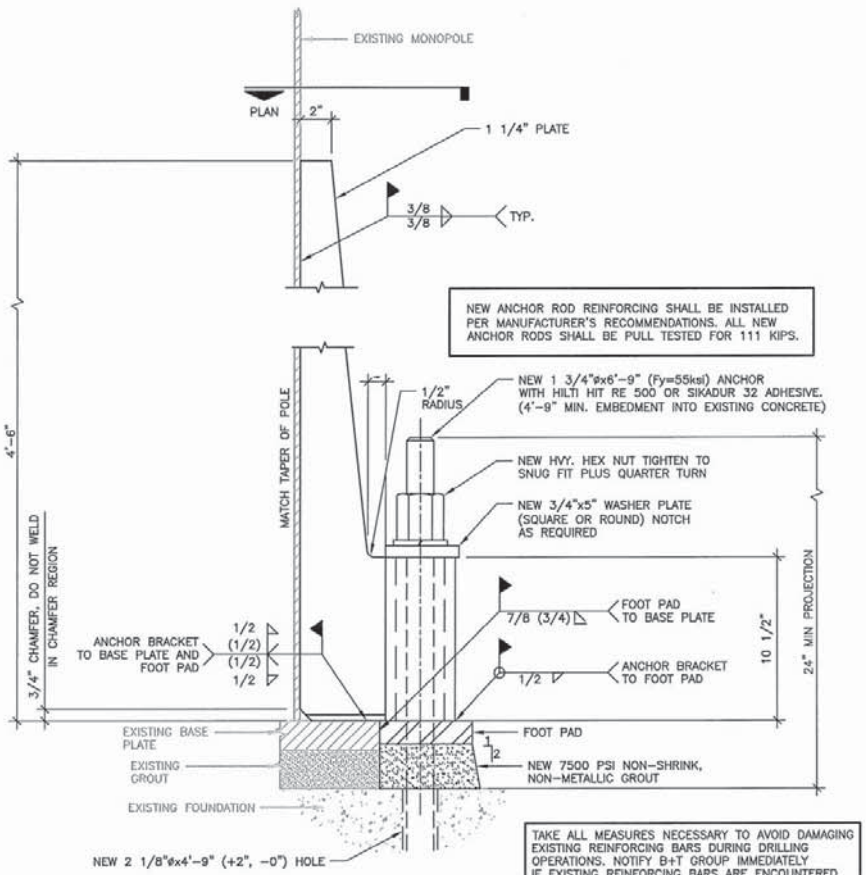
SHEET NUMBER:	REVISION:
S4	0



1 TOWER SECTION (0'-19.5')
SCALE: N.T.S.



PLAN



2 ANCHOR ROD BRACKET DETAIL
SCALE: N.T.S.

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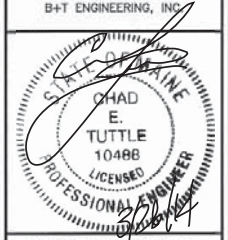
CROWN CASTLE

ISSUED FOR:

REV	DATE	DESCRIPTION
0	03/26/14	ISSUED FOR CONSTRUCTION

PROJECT NO:	86959.004.01
PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
CHECKED BY:	SSC

B+T ENGINEERING, INC.



PORTLAND WARREN AVE
878782

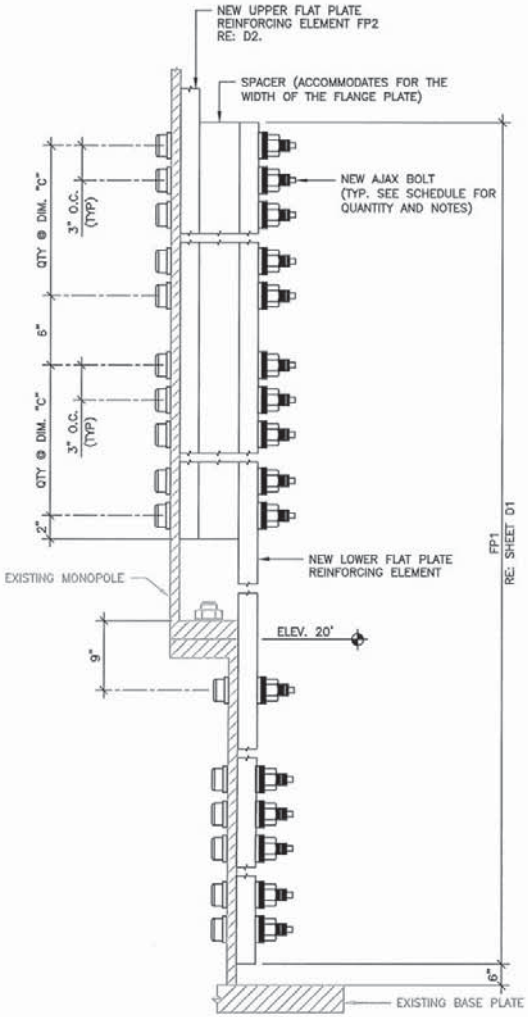
WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

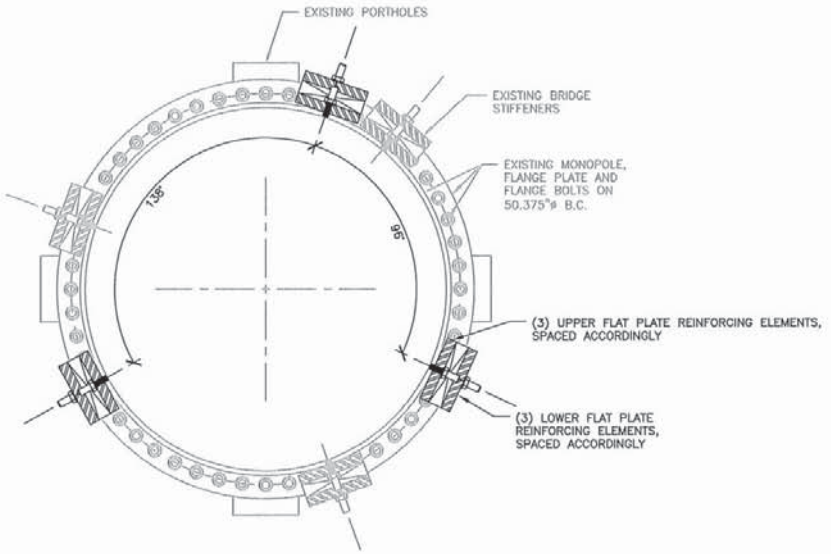
SHEET TITLE
TOWER SECTION (0'-19.5') AND ANCHOR ROD BRACKET DETAIL

SHEET NUMBER:	REVISION:
S5	0

FLAT PLATE BRIDGE STIFFENER-SCHEDULE (65KSI)			
ELEVATION	NO. OF BRIDGE STIFFENERS	FLAT PLATE SIZE	QTY @ DIM. "C"
20'	3	1 1/4"x8 1/2"	10 HOLES @ 2'-3"



1 FLAT PLATE BRIDGE STIFFENER DETAIL
SCALE: N.T.S.



2 TOWER SECTION (20')
SCALE: N.T.S.

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CROWN CASTLE

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PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
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E.
TUTTLE
10488
LICENSED
PROFESSIONAL ENGINEER
3/26/14

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878782

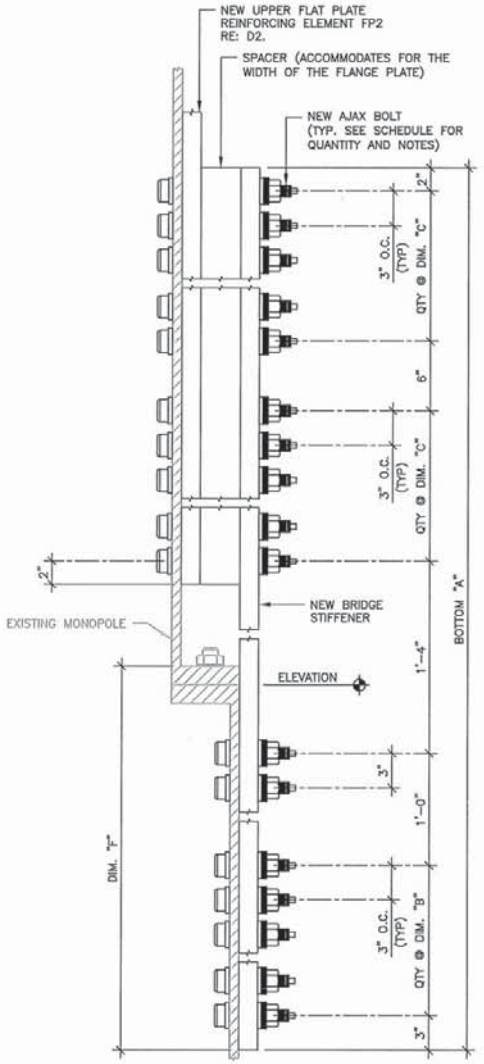
WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

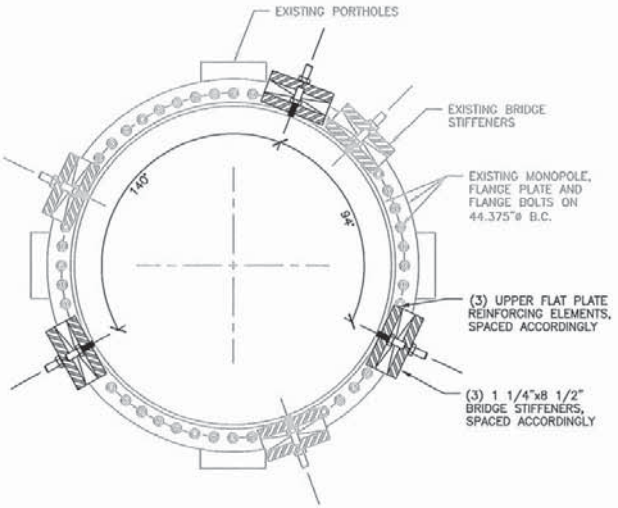
SHEET TITLE
FLAT PLATE BRIDGE STIFFENER DETAIL, SCHEDULE AND TOWER SECTION (20')

SHEET NUMBER:	REVISION:
S6	0

FLAT PLATE BRIDGE STIFFENER-SCHEDULE (65KSI)								
ELEVATION	NO. OF BRIDGE STIFFENERS	FLAT PLATE SIZE	BOTTOM "A"	QTY @ DIM. "B"	QTY @ DIM. "C"	DIM. "F"	AJAX BOLT QTY PER STIFFENER	TOTAL AJAX BOLT QTY
60'	3	1 1/4"x8 1/2"	11'-3"	15 HOLES @ 3'-6"	10 HOLES @ 2'-3"	5'-6"	37	111



1 FLAT PLATE BRIDGE STIFFENER DETAIL
SCALE: N.T.S.



2 TOWER SECTION (60')
SCALE: N.T.S.

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CROWN CASTLE

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PROJECT NO:	86959.004.01
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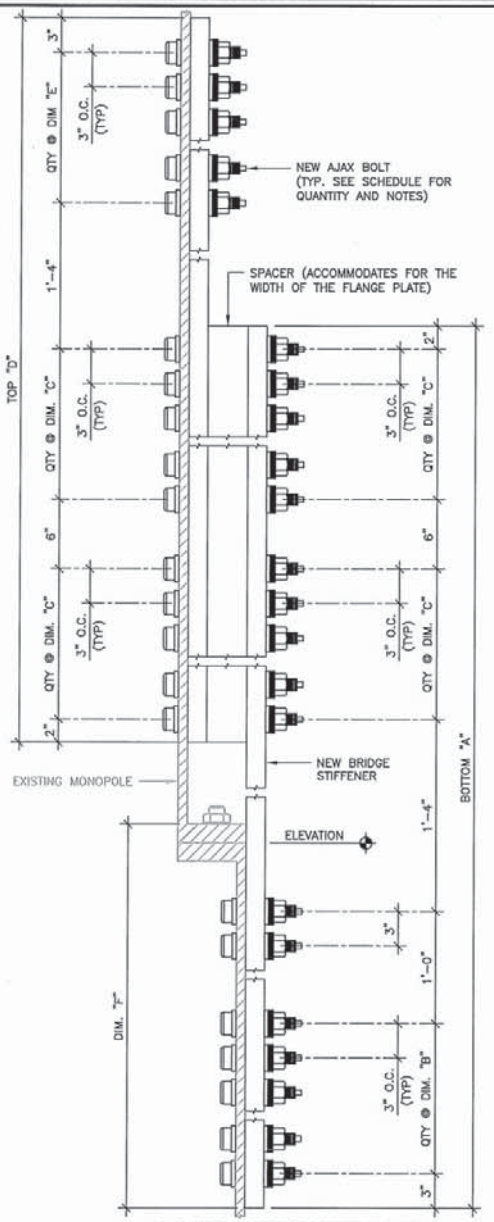
PORTLAND, ME

EXISTING 180' MONOPOLE

SHEET TITLE
FLAT PLATE BRIDGE STIFFENER DETAIL, SCHEDULE AND TOWER SECTION (60')

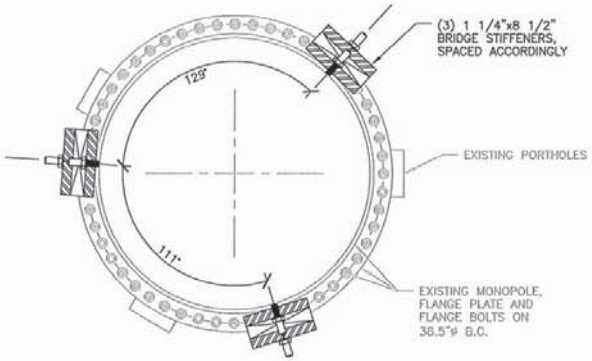
SHEET NUMBER: S7
REVISION: 0



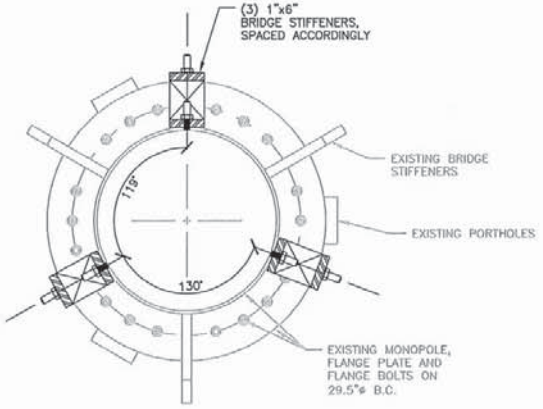
1 FLAT PLATE BRIDGE STIFFENER DETAIL
SCALE: N.T.S.

FLAT PLATE BRIDGE STIFFENER-SCHEDULE (65KSI)

ELEVATION	NO. OF BRIDGE STIFFENERS	FLAT PLATE SIZE	BOTTOM "A"	QTY @ DIM. "B"	QTY @ DIM. "C"	TOP "D"	QTY @ DIM. "E"	DIM. "F"	AJAX BOLT QTY PER STIFFENER	TOTAL AJAX BOLT QTY
100'	3	1 1/4"x8 1/2"	11'-3"	15 HOLES @ 3'-6"	10 HOLES @ 2'-3"	10'-4"	15 HOLES @ 3'-6"	5'-6"	52	156
140'	3	1"x6"	7'-6"	8 HOLES @ 1'-9"	6 HOLES @ 1'-3"	6'-6"	8 HOLES @ 1'-9"	3'-9"	30	90



2 TOWER SECTION (100')
SCALE: N.T.S.



3 TOWER SECTION (140')
SCALE: N.T.S.

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CROWN CASTLE

ISSUED FOR:

REV	DATE	DESCRIPTION
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PROJECT NO:	88959.004.01
PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
CHECKED BY:	SSC

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LICENSED PROFESSIONAL ENGINEER
3/26/14

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878782

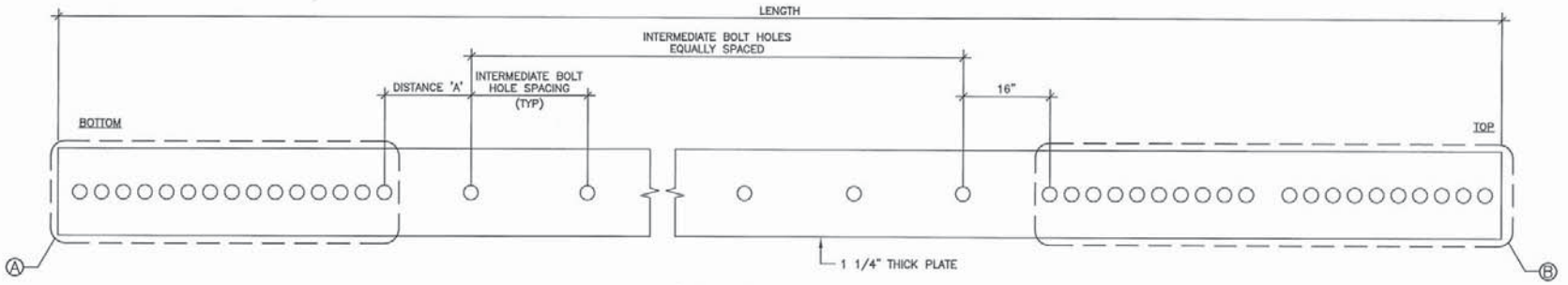
WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

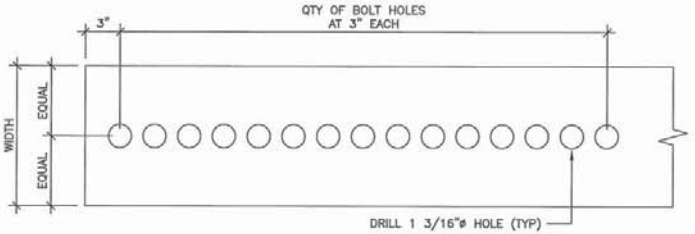
SHEET TITLE
FLAT PLATE BRIDGE STIFFENER DETAIL, SCHEDULE AND TOWER SECTIONS (100' AND 140')

SHEET NUMBER: S8

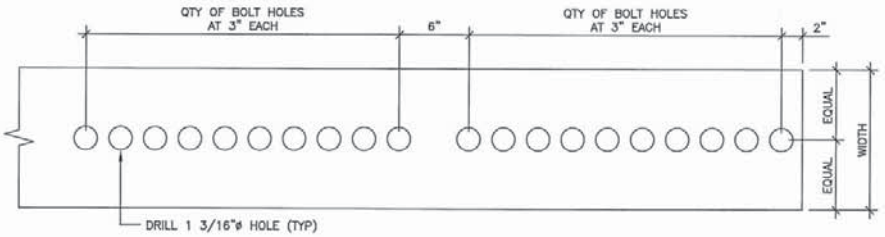
REVISION: 0



1 PART: FP1
SCALE: N.T.S.



2 DETAIL A (BOTTOM)
SCALE: N.T.S.



3 DETAIL B (TOP)
SCALE: N.T.S.

PART NUMBER	BLACK WEIGHT (LBS)	WIDTH	THICKNESS	LENGTH	DISTANCE 'A'	TOTAL QTY OF 1 3/16"ø BOLT HOLES	QTY OF BOLT HOLES (BOTTOM END)	QTY OF BOLT HOLES (TOP END)	INTERMEDIATE BOLT HOLE SPACING
FP1	920	8 1/2"	1 1/4"	25'-5 1/2"	12 1/2"	46	15	10	1'-5"

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CROWN CASTLE

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REV	DATE	DESCRIPTION
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PROJECT NO:	86959.004.01
PROJECT ENG:	BRADEN TABB
DRAWN BY:	UUJ / GLS
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WARREN AVE,
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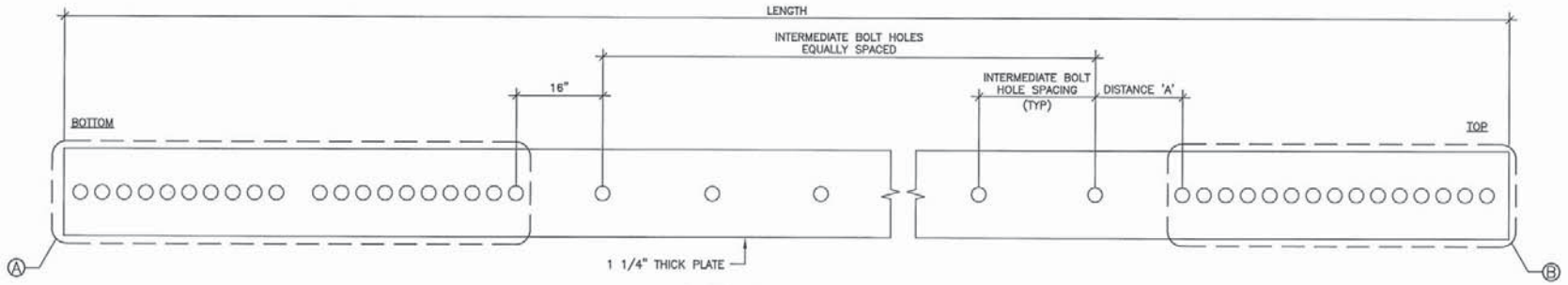
EXISTING 180' MONOPOLE

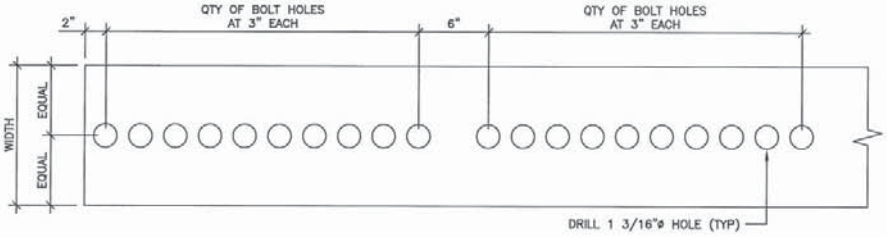
SHEET TITLE
PART DETAILS

SHEET NUMBER: D1

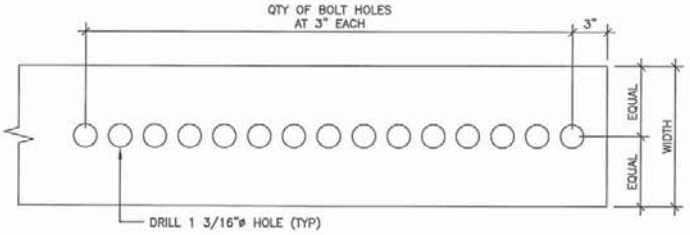
REVISION: 0



1 PART: FP1
SCALE: N.T.S.



2 DETAIL A (BOTTOM)
SCALE: N.T.S.



3 DETAIL B (TOP)
SCALE: N.T.S.

PART NUMBER	BLACK WEIGHT (LBS)	WIDTH	THICKNESS	LENGTH	DISTANCE 'A'	TOTAL QTY OF 1 3/16"ø BOLT HOLES	QTY OF BOLT HOLES (BOTTOM END)	QTY OF BOLT HOLES (TOP END)	INTERMEDIATE BOLT HOLE SPACING
FP2	937	8 1/2"	1 1/4"	25'-0"	7"	46	10	15	1'-5"

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WARREN AVE,
PORTLAND, ME

EXISTING 180' MONOPOLE

SHEET TITLE
PART DETAILS

SHEET NUMBER: D2
REVISION: 0