



WesTower
 7525 SE 24th St, Suite 500
 Mercer Island, WA 98040
 (206) 412-0479



Glaus, Pyle, Schomer, Burns & DeHaven, Inc., dba Glaus, Pyle, Schomer, Burns & DeHaven. PC

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N

GPD# 2013781.59

August 9, 2013

RIGOROUS STRUCTURAL ANALYSIS REPORT

AT&T DESIGNATION: Site USID: 11002
 Site FA: 10097180
 Client #: PT17
 Site Name: I-5 AND SHAVER
 AT&T Project: MOD UMTS 7-31-13

ANALYSIS CRITERIA: Codes: TIA-222-G, 2009 IBC & 2010 OCCS
 95-mph (3-second gust) with 0" ice
 40-mph (3-second gust) with 1.25" ice

SITE DATA: 4009 North Missouri Ave, Portland, OR 97227, Multnomah County
 Latitude 45° 33' 8.838" N, Longitude 122° 40' 41.556" W
 Market: SEATTLE/OREGON/NO.ID
 52' Valmont Monopole

Mr. Chris Listfeld,

GPD is pleased to submit this Rigorous Structural Analysis Report to determine the structural integrity of the aforementioned tower. The purpose of the analysis is to determine the suitability of the tower with the existing and proposed loading configuration detailed in the analysis report.

Analysis Results

Tower Stress Level with Proposed Equipment:	74.6%	Pass
Foundation Ratio with Proposed Equipment:	86.4%	Pass

We at GPD appreciate the opportunity of providing our continuing professional services to you and WesTower. If you have any questions or need further assistance on this or any other projects please do not hesitate to call.

Respectfully submitted,



John N. Kabak, P.E.
 Oregon #: 85692PE

EXPIRES: 6/30/2015

02-2013-18-51

SUMMARY & RESULTS

The purpose of this analysis was to verify whether the existing structure is capable of carrying the proposed loading configuration as specified by AT&T Mobility to WesTower. This report was commissioned by Mr. Chris Listfeld of WesTower.

Seismic loads were considered using a substantiated analysis utilizing the TIA standard. Based on section 2.7.3 of the this standard the seismic effects may be ignored due to the earthquake spectral response acceleration (S_s) for this site being less than or equal to 1.00. The wind effects control the tower loading.

TOWER SUMMARY AND RESULTS

Member	Capacity	Results
Monopole	74.6%	Pass
Flange Plates	15.4%	Pass
Flange Bolts	9.8%	Pass
Foundation	86.4%	Pass

ANALYSIS METHOD

tnxTower (Version 6.1.0.9), a commercially available software program, was used to create a three-dimensional model of the tower and calculate primary member stresses for various dead, live, wind, and ice load cases. Selected output from the analysis is included in Appendix B. The following table details the information provided to complete this structural analysis. This analysis is solely based on this information and is being completed without the benefit of a detailed site visit.

DOCUMENTS PROVIDED

Document	Remarks	Source
Equipment Modification Form	AT&T Internal Modification Document, uploaded 8/1/13	Siterra
RF Data Sheet	AT&T Site I5 AND SHAVER Rev 1.0, dated 7/23/13	WesTower
Tower Design	Valmont Order #: 11137-95, dated 8/21/95	Siterra
Top Tower Section Design	Valmont Order #:13326-96, dated 6/19/96	Siterra
Foundation Design	Valmont Order #: 11137-95, dated 10/25/95	Siterra
Geotechnical Report	Redmond & Associates Project #: 110.034.G, dated 8/21/95	Siterra
Previous Structural Analysis	GPD Project #: 2012710.70, dated 6/11/12	Siterra

ASSUMPTIONS

This rigorous structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the tower. This analysis is from information supplied, and therefore, its results are based on and are as accurate as that supplied data. GPD has made no independent determination, nor is it required to, of its accuracy. The following assumptions were made for this structural analysis.

1. The tower member sizes and shapes are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and as stated in the materials section.
2. The antenna configuration is as supplied and/or as modeled in the analysis. It is assumed to be complete and accurate. All antennas, mounts, coax and waveguides are assumed to be properly installed and supported as per manufacturer requirements.
3. Some assumptions are made regarding antennas and mount sizes and their projected areas based on best interpretation of data supplied and of best knowledge of antenna type and industry practice.
4. All mounts, if applicable, are considered adequate to support the loading. No actual analysis of the mount(s) is performed. This analysis is limited to analyzing the tower only.
5. The soil parameters are as per data supplied or as assumed and stated in the calculations.
6. Foundations are properly designed and constructed to resist the original design loads indicated in the documents provided.
7. The tower and structures have been properly maintained in accordance with TIA Standards and/or with manufacturer's specifications.
8. All welds and connections are assumed to develop at least the member capacity unless determined otherwise and explicitly stated in this report.
9. Loading interpreted from photos is accurate to $\pm 5'$ AGL, antenna size accurate to ± 3.3 sf, and coax equal to the number of existing antennas without reserve.
10. All existing loading was obtained from the previous structural analysis, dated 6/11/12, provided Equipment Modification Form, RF Data Sheet and site photos and was assumed to be accurate.
11. The existing loading elevation found in the provided Equipment Modification Form was found to vary from the listed elevation within the provided RF Data Sheet. The existing and proposed elevations have been modeled based on the elevation reflected within the EMF.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and GPD Group should be allowed to review any new information to determine its effect on the structural integrity of the tower.

DISCLAIMER OF WARRANTIES

GPD GROUP has not performed a site visit to the tower to verify the member sizes or antenna/coax loading. If the existing conditions are not as represented on the tower elevation contained in this report, we should be contacted immediately to evaluate the significance of the discrepancy. This is not a condition assessment of the tower or foundation. This report does not replace a full tower inspection. The tower and foundations are assumed to have been properly fabricated, erected, maintained, in good condition, twist free, and plumb.

The engineering services rendered by GPD GROUP in connection with this Rigorous Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. All tower components have been assumed to only resist dead loads when no other loads are applied. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

GPD GROUP does not analyze the fabrication of the structure (including welding). It is not possible to have all the very detailed information needed to perform a thorough analysis of every structural sub-component and connection of an existing tower. GPD GROUP provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc. The purpose of this report is to assess the feasibility of adding appurtenances usually accompanied by transmission lines to the structure.

It is the owner's responsibility to determine the amount of ice accumulation in excess of the specified code recommended amount, if any, that should be considered in the structural analysis.

The attached sketches are a schematic representation of the analyzed tower. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions, proper fit, and clearance in the field. Any mentions of structural modifications are reasonable estimates and should not be used as a precise construction document. Precise modification drawings are obtainable from GPD GROUP, but are beyond the scope of this report.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

GPD GROUP makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD GROUP will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of GPD GROUP pursuant to this report will be limited to the total fee received for preparation of this report.

tnxTower GPD Group 520 South Main Street, Suite 2531 Akron, OH 44311 Phone: (330) 572-2100 FAX: (330) 572-3709	Job PT17 (11002) I-5 AND SHAVER	Page 1 of 4
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	Client WesTower	Designed by TBeltz

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 Multnomah County, Oregon.

Basic wind speed of 95 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 1.2500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

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 plf
5/8" Step Bolts	C	Surface Ar (CaAa)	52.00 - 8.00	1	1	0.000	0.4167	0.000	1.00
Safety Line 3/8	C	Surface Ar (CaAa)	52.00 - 8.00	1	1	0.000	0.3750	0.000	0.22

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight plf
LDF5-50A (7/8 FOAM)	A	No	Inside Pole	52.00 - 8.00	8	No Ice	0.00
						1/2" Ice	0.00
						1" Ice	0.00
						2" Ice	0.00
LDF2-50 (3/8 FOAM)	A	No	Inside Pole	52.00 - 8.00	3	No Ice	0.00
						1/2" Ice	0.00
						1" Ice	0.00
						2" Ice	0.00
LDF4-50A (1/2 FOAM)	A	No	Inside Pole	52.00 - 8.00	3	No Ice	0.00
						1/2" Ice	0.00
						1" Ice	0.00
						2" Ice	0.00
DC Power Cable	A	No	Inside Pole	52.00 - 8.00	2	No Ice	0.00
						2" Ice	0.00

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight plf
Fiber Cable	A	No	Inside Pole	52.00 - 8.00	1	1/2" Ice	0.60
						1" Ice	0.60
						2" Ice	0.60
						No Ice	0.15
						1/2" Ice	0.15
LDF4-50A (1/2 FOAM)	A	No	Inside Pole	40.00 - 8.00	1	1" Ice	0.15
						2" Ice	0.15
						No Ice	0.15
						1/2" Ice	0.15
						1" Ice	0.15
						2" Ice	0.15

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight lb
12' T-Arm (1)	A	From Leg	2.00 0.00 0.00	0.0000	52.00	No Ice	2.33	333.00
						1/2" Ice	2.96	400.00
						1" Ice	3.60	467.00
						2" Ice	4.87	533.00
12' T-Arm (1)	B	From Leg	2.00 0.00 0.00	0.0000	52.00	No Ice	2.33	333.00
						1/2" Ice	2.96	400.00
						1" Ice	3.60	467.00
						2" Ice	4.87	533.00
12' T-Arm (1)	C	From Leg	2.00 0.00 0.00	0.0000	52.00	No Ice	2.33	333.00
						1/2" Ice	2.96	400.00
						1" Ice	3.60	467.00
						2" Ice	4.87	533.00
AP1417-8801940 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	10.0000	52.00	No Ice	4.19	55.81
						1/2" Ice	4.89	98.34
						1" Ice	5.55	150.05
						2" Ice	6.97	274.20
AP1417-8801940 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	25.0000	52.00	No Ice	4.19	55.81
						1/2" Ice	4.89	98.34
						1" Ice	5.55	150.05
						2" Ice	6.97	274.20
800 10765 w/ mount pipe	A	From Leg	4.00 0.00 1.00	10.0000	52.00	No Ice	6.65	77.35
						1/2" Ice	7.85	144.75
						1" Ice	8.76	220.26
						2" Ice	10.61	399.29
800 10765 w/ mount pipe	B	From Leg	4.00 0.00 1.00	25.0000	52.00	No Ice	6.65	77.35
						1/2" Ice	7.85	144.75
						1" Ice	8.76	220.26
						2" Ice	10.61	399.29
(2) CS72993.08	A	From Leg	4.00 0.00 1.00	10.0000	52.00	No Ice	0.42	18.00
						1/2" Ice	0.54	26.15
						1" Ice	0.66	36.29
						2" Ice	0.93	63.29
(2) CS72993.08	B	From Leg	4.00 0.00 1.00	25.0000	52.00	No Ice	0.42	18.00
						1/2" Ice	0.54	26.15
						1" Ice	0.66	36.29
						2" Ice	0.93	63.29
(2) LGP21401	A	From Leg	4.00	10.0000	52.00	No Ice	0.23	14.10

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	Client	WesTower	Designed by	TBeltz

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A _A Front	C _A A _A Side	Weight	
			Horz Lateral	Vert						°
				0.00						
				1.00			1/2" Ice	1.45	0.31	21.26
							1" Ice	1.61	0.40	30.32
							2" Ice	1.97	0.61	54.89
(2) LGP21401	B	From Leg	4.00	25.0000	52.00	No Ice	1.29	0.23	14.10	
			0.00			1/2" Ice	1.45	0.31	21.26	
			1.00			1" Ice	1.61	0.40	30.32	
						2" Ice	1.97	0.61	54.89	
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00	25.0000	52.00	No Ice	8.55	6.65	89.03	
			0.00			1/2" Ice	9.18	7.68	157.32	
			1.00			1" Ice	9.79	8.56	234.42	
						2" Ice	11.06	10.38	413.07	
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.00	15.0000	52.00	No Ice	8.55	6.65	89.03	
			0.00			1/2" Ice	9.18	7.68	157.32	
			1.00			1" Ice	9.79	8.56	234.42	
						2" Ice	11.06	10.38	413.07	
800 10766 w/ mount pipe	B	From Leg	4.00	25.0000	52.00	No Ice	11.31	8.70	87.60	
			0.00			1/2" Ice	11.93	10.11	170.09	
			1.00			1" Ice	12.55	11.38	262.23	
						2" Ice	13.88	13.58	479.47	
DBXCP-4545A-R2M w/Mount Pipe	C	From Leg	4.00	40.0000	52.00	No Ice	7.68	3.93	53.16	
			0.00			1/2" Ice	8.11	4.51	105.86	
			1.00			1" Ice	8.56	5.10	165.29	
						2" Ice	9.48	6.38	303.64	
9442 RRH 700	A	From Leg	4.00	0.0000	52.00	No Ice	3.53	1.60	44.00	
			0.00			1/2" Ice	3.80	1.82	64.97	
			1.00			1" Ice	4.08	2.06	89.18	
						2" Ice	4.67	2.56	148.13	
9442 RRH 700	B	From Leg	4.00	0.0000	52.00	No Ice	3.53	1.60	44.00	
			0.00			1/2" Ice	3.80	1.82	64.97	
			1.00			1" Ice	4.08	2.06	89.18	
						2" Ice	4.67	2.56	148.13	
9442 RRH 700	C	From Leg	4.00	0.0000	52.00	No Ice	3.53	1.60	44.00	
			0.00			1/2" Ice	3.80	1.82	64.97	
			1.00			1" Ice	4.08	2.06	89.18	
						2" Ice	4.67	2.56	148.13	
9442 RRH AWS	A	From Leg	4.00	0.0000	52.00	No Ice	2.51	1.59	43.00	
			0.00			1/2" Ice	2.75	1.80	60.37	
			1.00			1" Ice	2.99	2.01	80.63	
						2" Ice	3.49	2.46	130.62	
9442 RRH AWS	B	From Leg	4.00	0.0000	52.00	No Ice	2.51	1.59	43.00	
			0.00			1/2" Ice	2.75	1.80	60.37	
			1.00			1" Ice	2.99	2.01	80.63	
						2" Ice	3.49	2.46	130.62	
9442 RRH AWS	C	From Leg	4.00	0.0000	52.00	No Ice	2.51	1.59	43.00	
			0.00			1/2" Ice	2.75	1.80	60.37	
			1.00			1" Ice	2.99	2.01	80.63	
						2" Ice	3.49	2.46	130.62	
DC6-48-60-18-8F Surge Suppression Unit	C	From Leg	4.00	0.0000	52.00	No Ice	1.47	1.47	18.90	
			0.00			1/2" Ice	1.67	1.67	36.62	
			1.00			1" Ice	1.88	1.88	56.82	
						2" Ice	2.33	2.33	105.34	
TT19-08BP111-001	C	From Leg	4.00	0.0000	52.00	No Ice	0.64	0.52	16.00	
			0.00			1/2" Ice	0.76	0.62	21.80	
			1.00			1" Ice	0.88	0.74	29.22	
						2" Ice	1.14	0.99	49.70	
2' Sidearm	C	From Leg	1.00	0.0000	40.00	No Ice	0.16	0.93	25.00	
			0.00			1/2" Ice	0.21	1.12	32.81	

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	Client	WesTower	Designed by	TBeltz

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A _{Front}	C _A A _{Side}	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft ²	ft ²	lb
			0.00						
						1" Ice	0.28	1.31	42.89
						2" Ice	0.43	1.73	70.63
GPS	C	From Leg	2.00	0.0000	40.00	No Ice	0.17	0.17	0.87
			0.00			1/2" Ice	0.24	0.24	3.85
			0.00			1" Ice	0.32	0.32	7.85
						2" Ice	0.51	0.51	19.56

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
52.00	12' T-Arm (1)	44	6.120	0.9552	0.0194	3331
40.00	2' Sidearm	44	3.889	0.8621	0.0115	2565

Section Capacity Table

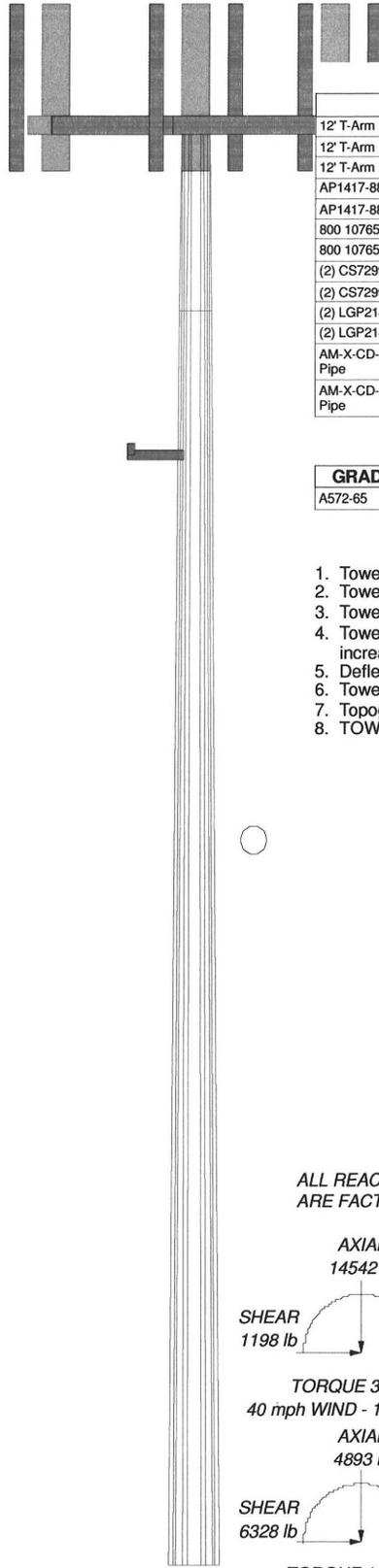
Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	φP _{allow} lb	% Capacity	Pass Fail
L1	52 - 45	Pole	TP13.8x12.68x0.1875	1	-2402.45	605789.00	18.7	Pass
L2	45 - 0	Pole	TP21x13.8x0.1875	2	-4879.63	847052.00	74.6	Pass
Summary							ELC:	Proposed
Pole (L2)							74.6	Pass
Rating =							74.6	Pass

Section	1	2
Length (ft)	7.00	45.00
Number of Sides	12	12
Thickness (in)	0.1875	0.1875
Top Dia (in)	12.6800	13.8000
Bot Dia (in)	13.8000	21.0000
Grade	A572-65	
Weight (lb)	187.7	1591.3

52.0 ft

45.0 ft

0.0 ft



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
12' T-Arm (1)	52	800 10766 w/ mount pipe	52
12' T-Arm (1)	52	DBXCP-4545A-R2M w/Mount Pipe	52
12' T-Arm (1)	52	9442 RRH 700	52
AP1417-8801940 w/ Mount Pipe	52	9442 RRH 700	52
AP1417-8801940 w/ Mount Pipe	52	9442 RRH 700	52
800 10765 w/ mount pipe	52	9442 RRH AWS	52
800 10765 w/ mount pipe	52	9442 RRH AWS	52
(2) CS72993.08	52	9442 RRH AWS	52
(2) CS72993.08	52	DC6-48-60-18-8F Surge Suppression Unit	52
(2) LGP21401	52		
(2) LGP21401	52	TT19-08BP111-001	52
AM-X-CD-16-65-00T-RET w/ Mount Pipe	52	2' Sidearm	40
AM-X-CD-16-65-00T-RET w/ Mount Pipe	52	GPS	40

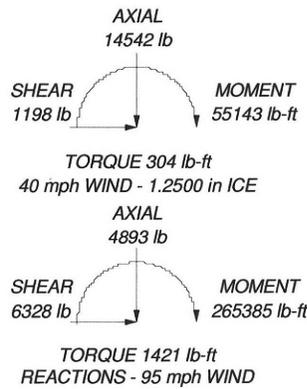
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Multnomah County, Oregon.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 95 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 1.25 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 0.00 ft
8. TOWER RATING: 74.6%

ALL REACTIONS ARE FACTORED

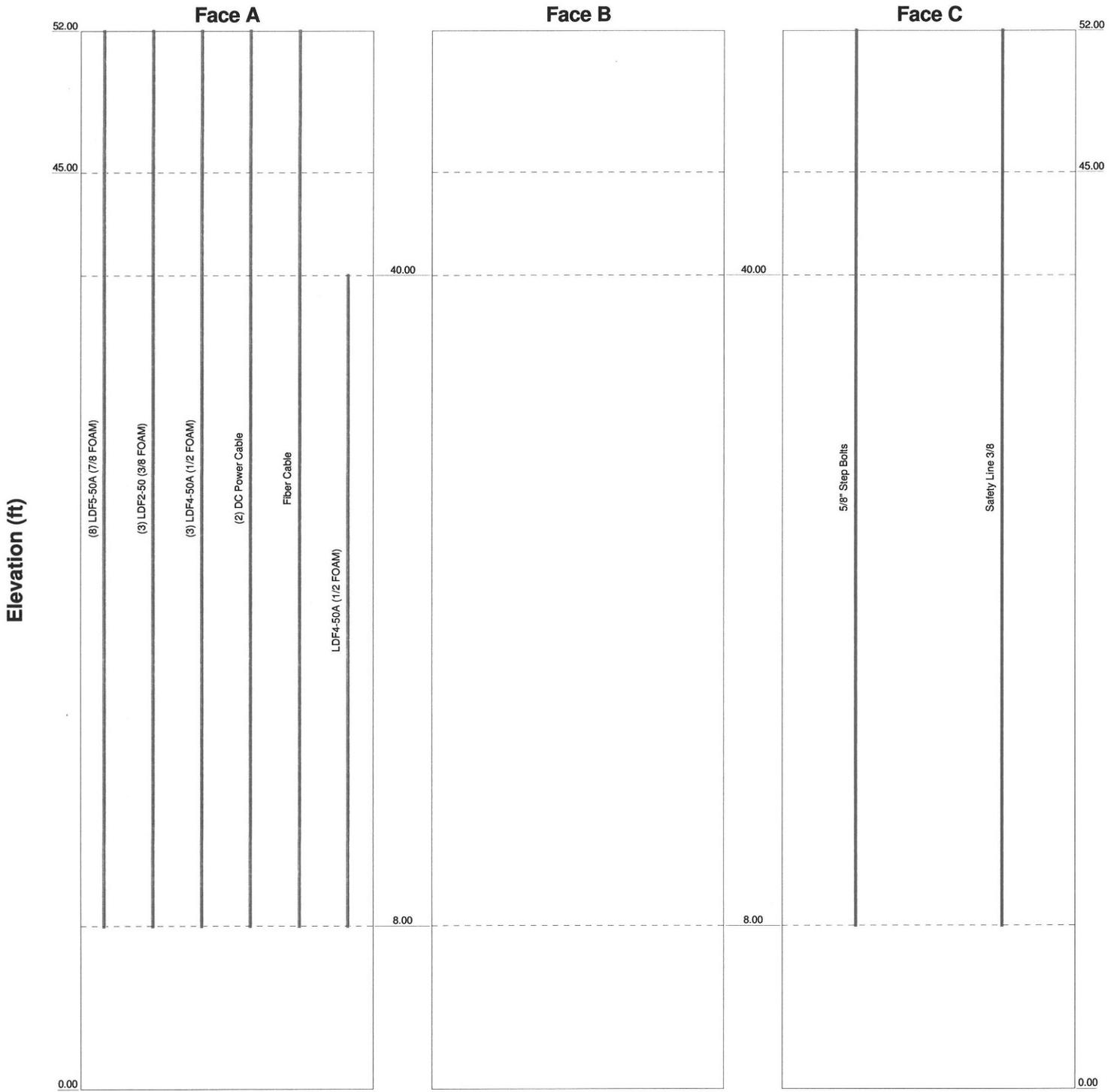


 GPD Group Consulting Engineers	520 South Main Street, Suite 2531 Akron, OH 44311 Phone: (330) 572-2100 FAX: (330) 572-3709		Job: PT17 (11002) I-5 AND SHAVER Project: 2013781.59
	Client: WesTower Code: TIA-222-G Path: \\AKRN03.gpdco.com\DATA\2011\TandF\11002\03 2013\781 59 WesTower SA\tr\11002.er	Drawn by: TBeltz Date: 08/09/13	App'd: Scale: NTS Dwg No: E-1

Feedline Distribution Chart

0' - 52'

Round Flat App In Face App Out Face Truss Leg



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	Client: WesTower	Drawn by: TBeltz	App'd:
Code: TIA-222-G	Date: 08/09/13	Scale: NTS	
Path: <small>\\AKR003.gpdco.com\DATA\2011\ATandT\11002\2013781.59\WesTower_SAI\hxl11002.dwg</small>		Dwg No. E-7	

Feedline Plan
45'

Round

Flat

App In Face

App Out Face

Section @ 45'



Consulting Engineers

GPD Group

520 South Main Street, Suite 2531
Akron, OH 44311
Phone: (330) 572-2100
FAX: (330) 572-3709

Job: **PT17 (11002) I-5 AND SHAVER**

Project: **2013781.59**

Client: **WesTower**

Drawn by: **TBeltz**

App'd:

Code: **TIA-222-G**

Date: **08/09/13**

Scale: **NTS**

Path:

\\AKRN03.gpdco.com\DATA\2011\ATandT\11002\03 2013781 59 WesTower_SAI\tr\11002.dwg

Dwg No. **E-7**



Existing Flange Connection @
PT17 (11002) I-5 AND SHAVER
 2013781.59

45'

O.T. Moment =	30.46 k*ft
Axial =	2.4 kips
Shear =	4.04 kips

Acceptable Stress Ratio	= 105.0%
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Flange Bolts	
# Bolts =	8
Bolt Type =	A325
Threads Included? =	Yes
Bolt Diameter =	1.5 in
Bolt Circle =	17.7 in
ϕ_t =	0.75
ϕ_v =	0.75
<i>Tension & Shear (TIA-222-G-1, Section 4.9.6)</i>	
F_{ub} =	105 ksi
A_b =	1.767146 in ²
A_n =	1.41 in ²
ϕR_{nv} =	62.62 kips
ϕR_{nt} =	111.04 kips
V_{ub} =	0.50 kips
T_{ub} =	9.99 kips
<i>Prying Action Check</i>	
Tavail =	102.33 kips
t_{min} (upper plate) =	0.26 in
Max Comp. on Bolt =	10.59 kips
Shear Capacity =	0.8%
Tensile Capacity =	9.8%
Interaction Capacity =	1.0%
Bolt Capacity =	9.8% OK

Pole Information	
Shaft Diam. (Upper) =	13.8 in
Thickness (Upper) =	0.1875 in
# of Sides (Upper) =	12
F_y (Upper) =	65 ksi
Shaft Diam. (Lower) =	13.8 in
Thickness (Lower) =	0.1875 in
# of Sides (Lower) =	12
F_y (Lower) =	65 ksi

Upper Flange Plate	
Location =	External
Plate Strength (F_y) =	65 ksi
Plate Tensile (F_u) =	80 ksi
Plate Thickness =	1 in
Outer Diameter =	21.45 in
ϕ_t =	0.9
wcalc =	11.08 in
wmax =	16.77 in
w =	11.08 in
Z =	2.77 in ³
M_u =	25.03 k-in
ϕM_n =	162.1002 k-in
UP Capacity =	15.4% OK

Upper Stiffeners	
Configuration =	None

Lower Flange Plate	
Location =	External
Plate Strength (F_y) =	65 ksi
Plate Thickness =	1 in
Outer Diameter =	21.45 in
wcalc =	11.08 in
wmax =	16.77 in
w =	11.08 in
Z =	2.77 in ³
M_u =	25.03 k-in
ϕM_n =	162.1002 k-in
LP Capacity =	15.4% OK

Lower Stiffeners	
Configuration =	None



STEEL PILE ANALYSIS WORKSHEET

Client: WesTower
 Site ID: PT17 (11002)
 Site Name: I-5 AND SHAVER
 Location: Multnomah County, Oregon
 Loading Type: Wind

Job No.: 2013781.59
 Sheet No: 1 Of 1
 Made By: TTB Date: 8/9/2013
 Chk'd By: EW Date: 8/9/2013
 Code: G

STEEL PILE DATA

Diameter = 1.798 ft
 Length = 12 ft
 Wall Thickness = 0.1875 in

RISA Reactions

Moment = 265.4 ft-k
 Axial = 4.89 kips
 Shear = 6.33 kips

LPILE TYPE 2 ANALYSIS FOR STEEL PILE CAPACITY

Mn = 6701.77 in-k
 Mn = 558.48 ft-k

Load Factor = 1
 ϕ (flexure) = 0.9

ϕ Mn/LF = 502.63 ft-k

MOMENT FROM CAISSON PROGRAM USING ADJUSTED S.F. AND ACTUAL PILE LENGTH

Moment = 289.0 ft-k (max. moment along caisson)

STEEL PILE CAPACITY

$$\text{Capacity} = \frac{\text{Moment from Caisson Program}}{\phi \text{Mn/LF}} = \frac{289.00 \text{ ft-k}}{502.63 \text{ ft-k}} = 57.5\% \text{ O.K.}$$

SOIL CAPACITY FROM CAISSON PROGRAM USING ADDITIONAL SAFETY FACTORS

ADDITIONAL SAFETY FACTOR FROM CAISSON = 1.54

$$\text{Capacity} = \frac{\text{Safety Factor of 1.33}}{\text{Additional Safety Factor}} = \frac{1.33}{1.54} = 86.4\% \text{ O.K.}$$

 *
 * PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995, POWER LINE SYSTEMS, INC.*
 *

*** ANALYSIS IDENTIFICATION : PT17 (11002) I-5 AND SHAVER
 NOTES : 2013781.59

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 2.50 STEEL STRENGTH (ksi) = 65.00
 DIAMETER (ft) = 4.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.00

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	C	3.00	0.00	110.0	0.0		
2	S	10.00	3.00	110.0		2.727	27.61

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 265.4 VERTICAL (k) = 4.9 SHEAR (k) = 6.3
 ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 1.54

*** CALCULATED PIER LENGTH (ft) = 12.000

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
C	0.00	3.00	110.0	0.0		0.00	1.50
S	3.00	5.91	110.0		2.727	126.58	6.44
S	8.91	3.09	110.0		2.727	-116.42	10.53

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR		WITHOUT ADDITIONAL SAFETY FACTOR	
	SHEAR (k)	MOMENT (ft-k)	SHEAR (k)	MOMENT (ft-k)
0.00	10.2	410.5	6.6	266.6
1.20	10.2	422.7	6.6	274.5
2.40	10.2	434.9	6.6	282.4
3.60	3.0	445.0	2.0	289.0
4.80	-15.1	438.3	-9.8	284.6
6.00	-38.4	406.6	-25.0	264.1
7.20	-67.0	343.9	-43.5	223.3
8.40	-100.7	243.9	-65.4	158.4
9.60	-93.3	116.1	-60.6	75.4
10.80	-49.2	30.1	-32.0	19.5
12.00	0.0	-0.0	0.0	-0.0

*** TOTAL REINFORCEMENT PCT = 0.30 REINFORCEMENT AREA (in^2) = 5.43
 *** USABLE AXIAL CAP. (k) = 4.9 USABLE MOMENT CAP. (ft-k) = 502.2

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

28	BARS #4	(AREA = 0.20 in ²	DIA = 0.500 in)	AT SPACING (in) =	4.26
18	BARS #5	(AREA = 0.31 in ²	DIA = 0.625 in)	AT SPACING (in) =	6.63
13	BARS #6	(AREA = 0.44 in ²	DIA = 0.750 in)	AT SPACING (in) =	9.18
10	BARS #7	(AREA = 0.60 in ²	DIA = 0.875 in)	AT SPACING (in) =	11.94
7	BARS #8	(AREA = 0.79 in ²	DIA = 1.000 in)	AT SPACING (in) =	17.05
6	BARS #9	(AREA = 1.00 in ²	DIA = 1.128 in)	AT SPACING (in) =	19.90
5	BARS #10	(AREA = 1.27 in ²	DIA = 1.270 in)	AT SPACING (in) =	23.88
4	BARS #11	(AREA = 1.56 in ²	DIA = 1.410 in)	AT SPACING (in) =	29.85
3	BARS #14	(AREA = 2.25 in ²	DIA = 1.693 in)	AT SPACING (in) =	39.79

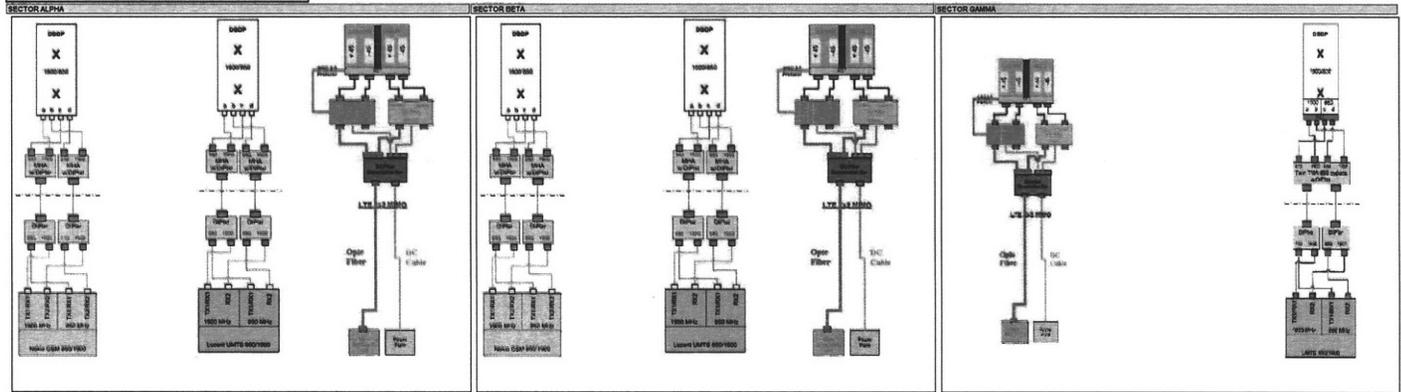
*** PRESSURE UNDER CAISSON DUE TO DESIGN AXIAL LOAD (psf) = 389.1

RF Data Sheet		Release Information	
Site ID	PT17	Date Issued	07/27/13
Site Name	IS AND BRAVER	Revision Level	1.0
Project	Antenna Changeout	Contact Details	
OSM Equipment	Sitefile	RF Design Engineer	Robert Potemeyer phone (603) 913-4036
UMTS Equipment		RF Performance Engineer	Robert Potemeyer phone (603) 913-4036
Notes	NodeBB 1-4 proposed Pencil/Trip/LD/DA/RS RAK-mtd/RAK-mtd	Done	18A
		OSM BSC	PTLDBSC13
Location Information			
Latitude (decimal) (degrees)	45.5245	Structure	Monopole
Longitude (decimal) (degrees)	-122.6761	Tower Owner	
		Collocation Pattern	
		Tier of collocation	
Street Address	4008 N MISSOURI	Business on site	
City	PORTLAND	Height Point to air	
St. Code	97217	Height Point to ground	

ITEM	EXISTING	PLANNED	DELTA
Number of Antennas	8	8	0
Antenna Weight (lbs)	549.8	571.8	22
Number of Feeders	14	14	0
Feeder Length	885.91	885.91	0
Number of TMA	0	0	0
Number of RET	7	7	0

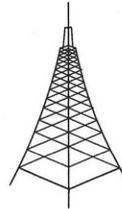
Configuration	Alpha										Beta										Gamma									
	OSM 800	OSM 850	UMTS 1900	UMTS 1900.1	UMTS 800	UMTS 850.1	LTE 700	OSM 800	OSM 850	UMTS 1900	UMTS 1900.1	UMTS 800	UMTS 850.1	LTE 700	UMTS 1900	UMTS 1900.1	UMTS 800	UMTS 850.1	LTE 700	UMTS 1900	UMTS 1900.1	UMTS 800	UMTS 850.1	LTE 700						
Number of Antennas	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1						
Antenna Part Number	1s-1d	1s-1b	3s-3b		3s-3d		8c-8d	1	8s-8b	7s-7b	1	7s-7d	1	10s-10d	1	16s-16b	1	16s-16d	1	18s-18b	1	18s-18d	1	13s-13f						
Antenna Vendor	Kathrein	Kathrein	Kathrein		Kathrein		Kathrein	Kathrein	Kathrein	Kathrein		Kathrein		Kathrein	Andrew	Andrew	Andrew		Andrew	Andrew	Andrew		Andrew	KMW						
Antenna Model	AP1417-8001840-85		80010786		80010786		AM-X-CD-18-45-40T-RET-725MHz	AP1417-8001840-85	80010786	80010786		80010786		80010786	80010786	80010786	80010786		80010786	80010786	80010786		80010786	AM-X-CD-18-45-40T-RET-725MHz						
Antenna (Feed / Port)	OSCP	OSCP	OSCP		OSCP		OSCP	OSCP	OSCP	OSCP		OSCP		OSCP	OSCP	OSCP	OSCP		OSCP	OSCP	OSCP		OSCP	OSCP						
Antenna HW	85	85	85		85		85	85	85	85		85		85	85	85	85		85	85	85		85	85						
Altitude	0	0	0		0		0	0	0	0		0		0	0	0	0		0	0	0		0	0						
Electrical TB	0	0	0		0		0	0	0	0		0		0	0	0	0		0	0	0		0	0						
Mechanical TB	0	0	0		0		0	0	0	0		0		0	0	0	0		0	0	0		0	0						
NET	No	No	Yes		Yes		No	Yes	No	Yes		Yes		Yes	Yes	Included with antenna	Yes		Yes	Included with antenna	Yes		Yes	Yes						
Antenna Dimensions (Inches) (HxWxD)	51x10.3x5.5	51x10.3x5.5	54.5x10.3x5.9		54.5x10.3x5.9		72x11.8x5.9	51x10.3x5.5	51x10.3x5.5	54.5x10.3x5.9		54.5x10.3x5.9		54.5x10.3x5.9	66x11.8x6	51.6x15.3x5.6	51.6x15.3x5.6		51.6x15.3x5.6	51.6x15.3x5.6	51.6x15.3x5.6		72x11.8x5.9	72x11.8x5.9						
Antenna Weight (lbs)	36.4	36.4	48.3		48.3		48.3	36.4	36.4	48.3		48.3		48.3	48.3	51	51		51	51	51		51	51						
Feed Center (ft)	48	48	53		53		48	48	48	53		53		53	51	51	51		51	51	51		51	51						
Number of Feeders	2	2	2		2		2	2	2	2		2		2	2	2	2		2	2	2		2	2						
Feeder Type	Comm 75, 850	LDPS 75, 1900			LDPS 75, 1900			Comm 75, 850	LDPS 75, 1900					LDPS 75, 1900	Fiber	Fiber	Fiber		LDPS 75, 1900	Fiber	Fiber		LDPS 75, 1900	Fiber						
Feeder Length	100	100	89.97		89.97		89.97	100	100	100		100		100	89.97	89.97	89.97		89.97	89.97	89.97		89.97	89.97						
Number of TMA	0	0	No Data		No Data		0	0	0	No Data		0		0	No Data	0	0		0	No Data	0		0	0						
TMA Type	None	None	None		None		None	None	None	None		None		None	None	None	None		None	None	None		None	None						
TMA DIM (Weight/Length/Height)	-	None	None		None		-	-	-	-		-		-	-	-	-		-	-	-		-	-						
OSM (Sharing / Type)	No	No	No		No		No	No	No	No		No		No	No	No	No		No	No	No		No	No						
ISCA	No	No	No		No		No	No	No	No		No		No	No	No	No		No	No	No		No	No						
BSC Name	PTLDBSC17	PTLDBSC17	OSPR0040		OSPR0040		OSPR0040	PTLDBSC17	PTLDBSC17	OSPR0040		OSPR0040		OSPR0040	OSPR0040	OSPR0040	OSPR0040		OSPR0040	OSPR0040	OSPR0040		OSPR0040	OSPR0040						
Base Name	PTLDBSC17X	PTLDBSC17A	OSPR0040A		OSPR0040A		OSPR0040A	OSPR0040A	OSPR0040A	OSPR0040A		OSPR0040A		OSPR0040A	OSPR0040A	OSPR0040A	OSPR0040A		OSPR0040A	OSPR0040A	OSPR0040A		OSPR0040A	OSPR0040A						
BSC RING	PTLDBSC13	PTLDBSC13	PTLDBSC2RARI4		PTLDBSC2RARI4		PTLDBSC2RARI4	PTLDBSC13	PTLDBSC13	PTLDBSC2RARI4		PTLDBSC2RARI4		PTLDBSC2RARI4	PTLDBSC2RARI4	PTLDBSC2RARI4	PTLDBSC2RARI4		PTLDBSC2RARI4	PTLDBSC2RARI4	PTLDBSC2RARI4		PTLDBSC2RARI4	PTLDBSC2RARI4						
CellID	404	401	407		3044		401	402	402	3045		402		402	402	4040	18		0	0	0		4040	17						
LAC	4108	4108	3392		3392		4108	4108	4108	3392		4108		4108	3392	3392	3392		4108	4108	4108		4108	4108						
TRX Count	2	2	1		1		1	1	1	1		1		1	1	1	1		1	1	1		1	1						
ERP (dBm / Watts)	58.45 (dBm) (443.0W)	58.14 (dBm) (451.7W)	58.68 (dBm) (737.0W)		58.68 (dBm) (737.0W)		58.77 (dBm) (377.0W)	60.65 (dBm) (1161.0W)	58.45 (dBm) (443.0W)	58.14 (dBm) (451.7W)		58.68 (dBm) (737.0W)		58.77 (dBm) (377.0W)	61.05 (dBm) (1273.0W)	60.19 (dBm) (1044.0W)	60.19 (dBm) (1044.0W)		60.19 (dBm) (1044.0W)	60.19 (dBm) (1044.0W)	60.19 (dBm) (1044.0W)		60.65 (dBm) (1161.0W)	60.65 (dBm) (1161.0W)						

RF Plumbing Diagram (Planned Project)





Letter of Explanation (LOE)
MUST be attached to any Structural Analysis



11008
 COLUMBIA AND I-5
 John N. Kabak, P.E. OR#: 85692PE

EXPIRES: 6/30/2015
 8/6/2013

ALL STRUCTURES	Statement in COL A is Correct	REFERENCE from Col A	N/A	Alternate Value / Concept Used	Explanation	Yes	No	N/A	Comments / Reference
Structure Analyzed to F Code		X		G Code	State Requirement				
<i>Note: ALL G analyses MUST be justified. A simple notation of jurisdiction requirement will suffice. F BUILT TOWERS in G Code jurisdictions MUST Have the new "5% Grace" Test Applied. G to be applied ONLY where this is exceeded. This 5% test applies to "like for like" only</i>									
Guy Tensions Adjusted Within Code to Find Optimum tension / Minimum Reinforcement (Applies to Guyed Tower Failures Only). Note : AT&T requires a pulse chart for altered Tensions			X						
Antenna Azimuths Inputted Per AT&T Information Note Default Azimuths in PL	X				Where provided.				
All Yield Stresses > = 50 ksi (legs)			X						
All Yield Stresses > = 36 ksi (Diagonals and Horizontals)			X						
Structures Designated Class II (G Only)	X								
Exposure B Rating Used (Topography)		X		Exposure C					
K value for Slenderness ratio < 1.0			X						
Shielding of All Appurtenances Used when Appropriate PER 2.6.9.4 (G Code Only)	X								
0.75 Reduction "Shape" Factor (Figure 2.6) for platform mounts, 0.8 for T-Boom Mounts Used (G Only)	X								

Pipes and round Members have 1.0 Drag Factors. Note if Pipe is attached to flat antenna, these must be considered separately if differing Drag factors are Used	X									
Are Tower Diagonals Designed as "Tension Only"			X							
MODIFICATION SECTION	Statement in COL A is Correct	Deviation from Col A	N/A	Alternate Value / Concept Used	Explanation	Yes	No	N/A	Comments / Reference	
Guyed										
Guyed Only: Reinforcement Recommendation accompanies Optimum Guy Tensioning Scenario.			X							
Compression Failing Legs / Diagonals / Horizontals: Effective Length Reduced by U-Bolted Member			X							
<i>NOTE: Welded Solution Must be Explained and will only be considered in cases where other reinforcing methods will not work.</i>										
Self Supporting										
Compression Failing Legs / Diagonals / Horizontals: Effective Length Reduced by U-Bolted Member			X							
<i>NOTE: Welded Solution Must be Explained and will only be considered in cases where other reinforcing methods will not work.</i>										
Monopole										
Compression Collars			X							
<i>NOTE: Welded Solution Must be Explained and will only be considered in cases where other reinforcing methods will not work.</i>										
Foundation										
Guyed Anchor Failure: Berm Solution			X							
SS Foundation Pad and Pier Failure Berm			X							
SS Foundation Caisson / Concrete Cap			X							
Monopole: Cap			X							

