

Columbia County APCO P25 700MHz Radio System Project RFP - 2017 - O
Vendor Questions and Answers

No.	RFP Reference	Question	County Response
1	Section 4	Please confirm that the RFP is requesting nine (9) new console positions for Dispatch and nine (9) additional laptop/tablet consoles for mobile dispatch capability and one (1) mobile dispatch laptop/tablet for maintenance.	Yes the County is requesting (9) new console positions for Dispatch and (9) additional laptop/tablet consoles for mobile dispatch per Section 4 of the RFP. The (1) additional mobile dispatch laptop/tablet for maintenance has not been requested and is not required.
2	Section 14.7	System Monitoring is requested during the warranty maintenance period in Section 14.7; however there is line for System Monitoring pricing in years 2-15. What is the intended period requested for System Monitoring?	System monitoring is required during the 1st year warranty period. For years 2-15 the County would like to consider this as an optional service so pricing has been requested as such.
3	N/A	Please confirm that "Read and Understood" is allowed as an acceptable Compliance Matrix response for Section 1. INTRODUCTION, Section 2 RULES GOVERNING PROPOSAL SUBMISSION and Section 3 CURRENT SYSTEM DESCRIPTION sections of the RFP. Please confirm that the technical Point By Point Response is appropriate for the TECHNICAL SPECIFICATIONS AND REQUIRED SCOPE OF WORK Sections 1-14.	This is correct.
4	Section 12	How many "train-the-trainer" personnel does the County wish to include in each of the following training courses: dispatch supervisor, dispatch operator, system management, system maintenance, and radio user?	Dispatch Supervisor = 4, Dispatch Operator = 4, System Management = 5, System Maintenance = 5, Radio User = 2 classes of 15 each.
5	Cost Proposal 1.28	Specific to Price Page Table 1.28 Local Government Mobile Radios: Please confirm how many of the 108 mobile radios require a dash-mount installation and how many require a remote-mount installation?	All 108 will be dash mount.

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6	Section 10.11	Section 10.11 Logging Recorder System Install, the RFP states "The Contractor shall furnish and install any necessary devices, interfaces, firmware, and software to connect the trunking equipment to the existing upgraded or replacement logging recorder system equipment." Please confirm that the Logging Recorder System is just for the radio system only and is separate from the existing telephony logging system.	The logging recorder will be for the P25 radio system only no phone lines will be recorded on the Contractor supplied recorder.
7	Section 8.2 (B) and (C)	Please confirm if paragraph (C) was included in error, or are both paragraphs applicable and simply describing two different levels of adaptive modulation? This is describing two different levels of adaptive modulation. The FCC requires that a path maintain 99.95% availability for a given modulation to be licensed.	The goal is to engineer all microwave paths with the exception of the dedicated CCSO to Cumorah Hill path to the 99.999% 2 way path availability with a minimum throughput of 45mbps (75mbps for the CCSO to Cumorah Hill path) while also achieving the required 99.95% path availability at the higher throughput of 155mbps which will allow that modulation to be licensed for use by the County.
8	Section 2.32	The RFP references MPLS only in the definitions section, but a specific requirement for MPLS is not included anywhere in the specification. Please confirm that MPLS is not a requirement in this RFP.	A MPLS network or MPLS equipment is not a requirement of this RFP.
9	Section 3.2 and 9.3.2	The coordinates given in section 3.2 for Deep Creek tower site appear to be incorrect (30:20:10.9 N 82:39:21.7 W), whereas those given in section 9.3.2 to be the correct coordinates (30:21:29.9 N 82:37:7.7 W).	The coordinates in Section 9.3.2 are correct.
10	Section 7	Does the County intend that each microwave installation will have its own DC power system (rectifiers and batteries), independent from the P25 hardware's DC power system, to allow each system to have its own duration of battery backup?	The County's intention is to have a single new DC power plant that will provide the specified run time for the MW and P25 systems combined. With the exception of the Franklin St. Site where only MW will be installed as part of this project.

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11	Section 8	Specific to the microwave path from CCSO to Comorah Hill: Please confirm that this is to be a separate MHSB path for CCSO and not part of the main microwave transport ring.	Correct this path should be considered a Spur and be proposed as MHSB.
12	Section 8	Paragraph 8 (F) states: "The proposed microwave system shall consist of all outdoor mounted radio equipment unless stated otherwise." Please confirm if the County is envisioning a split-mount microwave solution with Outdoor Units (a.k.a "ODU" or radio head) at the tower top and an Indoor Unit (a.k.a. "IDU" or base-band/modem unit) in the shelter, or an all-outdoor microwave solution (with all electronics, including circuit interfaces, self-contained at the tower-top) for the primary offering microwave transport.	Split mount or all outdoor radios will be acceptable.
13	Section 7.7	Should the responding vendor provide fiber cable from the EOC to the new site?	No the County will provide the fiber.
14	N/A	We request that a copy of the sign in sheet from the Pre-Bid Conference be provided to the vendors.	Attached
15	Section 2.24	Specific to the Evaluation Criteria as it relates to the cost proposal; Pricing is weighted at 30 points but the RFP does not provide the method or "math" for how the 30 points will be calculated. Please confirm the method for the price evaluation. Should vendors understand that the formula for calculating cost points be (lowest cost / cost of proposal being evaluated X maximum allowable points = awarded points).	Yes, the lowest cost / cost of proposal being evaluated X maximum allowable points = awarded points.
16	Cost Proposal 1.26 and 1.28	The Price Pages reflect a quantity of 1 for the required auxiliary external speakers in both the Public Safety and Local Government Radio sections.	This is correct.

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17	Section 3.5.5 Cost Proposal 1.2 and 1.3	A. The system shall be equipped, licensed and configured to support a minimum of 25,000 individual user ID"s and have the capacity to support, at a minimum, 100,000 individual user ID"s without additional hardware. In the Price Pages the quantity provided contradicts the RFP language and reflects 64,000.00 individual user ID's. Please confirm that the requirement is for a "minimum of 25,000 individual user ID's and have the capacity to support, at a minimum, 100,000 individual user ID"s without additional hardware."	Yes, the price pages in Cost Proposal Section 1.2 and 1.3 should reflect 25,000 User ID's not 64,000.
18	N/A	Clarify if the proposing vendors should include the cost and scope to remove the legacy system equipment and antennas currently installed at the Jail 400' tower site and the Columbia City 120' tower site. We ask this question as these sites are not common to the new system design and are not included in the RFP designated sites.	This work is not part of this RFP.
19	Section 5.2 O	Is it the County's desire to utilize Link Layer Authenticate?	Yes.
20	Section 5.5	Can the county please clarify the mobile feature sets? It appears that some features may be for portable radios?	Remove the Intrinsically safe option from the table. The other should still be applicable to mobile radios.
21	Section 5.7	Typically, manufacturer specifications are 5-5-90. Is the County's intention to do 10-10-80?	Yes the County would like to use the 10-10-80 duty cycle as it is a more accurate level of usage we have seen with public safety agencies.
22	Section 5.7 J	Are other certifications acceptable, i.e., UL vs. FM?	Yes UL is an acceptable certification of intrinsically safe.
23	Section 5.9 C	The county has requested replacement radios for all local government agencies. Can you please clarify if the intention is for all local government agencies to be a part of the new system, rather than staying on the current system?	Delete this requirement from the RFP as it is not relevant. All radios will be part of the new system.

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24	N/A	Are there any additional points awarded for products made in the USA?	No
25	N/A	Does the County have an expected schedule for this project? Can the County provide a desired completion date?	The County has requested that each Vendor provide their proposed schedule for the project. It is the County's desire to be operational on the new system as soon as possible.
26	N/A	Is it the County's intent to achieve County-wide, 95% coverage guarantee with an additional 6dB attenuation (in addition to the use of clutter and terrain) using the County owned RF sites documented in the released RFP?	Yes it is the County's intent to achieve the maximum amount of coverage possible County-wide from the designated 5 RF sites considering and additional 6dB of building attenuation in addition to the use of clutter and terrain. The amount of coverage achieved/guarenteed will be up to each vendor to determine based on this set of parameters and other set forth in the RFP.
27	N/A	How many P25 CSSI talk paths to the P25 RFSS should the Zetron console system be provisioned?	The County's proposed 5 channel Phase 2 system will be capable of 8 simultaneous talk paths.
28	Section 1.5	Per Statement of Work, vendors are not responsible for site construction or other activities ordinarily requiring tribal, environmental, NEPA, and SHPO approvals. Please consider deletion of the stated requirements.	Remove this requirement from the RFP.
29	Section 1.6 and 1.8	Per statement of Work, vendors are not responsible for site construction or other activities ordinarily requiring site plans, permits and certificates of occupancy. Please consider deletion of the stated requirements.	Remove this requirement from the RFP.
30	Section 4.1.1	How many Mutual Aid base stations will be connected to the console system?	The vendor shall provide 8 conventional interfaces in the EOC communications room for connection to the console system.
31		What type of backup control stations are they, i.e., P25 or others?	P25.
32		How many backup control stations will be connected to the console system?	9 one for each console position.
33		Where will these control stations be located?	In a rack in the the EOC communications room.

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34		Is console required to support radio caller or emergency PTT ID display, channel/talkgroup selection, etc.?	Yes.
35	Section 4.7.2	What is a total number of conventional interface resources at the EOC and the four remaining RF tower sites, 16 or more?	As stated there should be 12 conventional interfaces at the EOC tower site and 4 at each of the 4 remaining RF tower sites (Deep Creek, CCSO, Lulu and Chmorah Hill)
36	Section 5.2 L	This requirement mandates a specific implementation method for noise cancellation (dual microphones). There are other methods available that have been independently verified to provide better noise cancellation performance than dual microphones. We request that Columbia County remove the implementation method and mandate noise cancellation technologies to facilitate a true open procurement. We understand the County reserves the right to test all proposed radios' ability to eliminate noise in real public safety situations prior to approving them for purchase.	Strike the words that require dual microphone capability.
37	Section 5.5	Please clarify what is meant by "Minimum Number of Modes." Does minimum number modes refer to the minimum number of channels?	Yes.
38	Section 5.6	Is 512 indicated for both mid-tier and high-tier the correct number for each?	Yes.
39	Section 6.3	Vendors are not responsible for site/tower construction or other activities ordinarily requiring FCC Antenna Structure Registration. Please consider deletion of the stated requirements.	Remove this requirement from the RFP.
40	Section 7.8 D	Please clarify responsibility for provision of six-pair single mode fiber cable between the EOC Communications Room and the EOC tower site. Vendors were told at pre-bid meeting the County would provide this fiber.	County will provide the fiber.

Columbia County, FL & Omnicom Consulting Group, Inc.
APCO P25 700MHz Radio System Project RFP – 2017- O
PRE-BID SIGN-IN SHEET

Meeting: Pre-Bid	Date: June 8, 2017
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Contact Name and Title: David Finney Service Manager
Department Name: Mobile Communications
Phone: 850 575 1983 Email: davidfinney@callmc.com

Contact Name and Title: GAVIN LASATER
Department Name: WCI
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Department Name: Williams Communications
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Contact Name and Title: Michelle Poole
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Contact Name and Title: PACO MIRALLES
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Contact Name and Title: DAVID CANN
Department Name: EFJ
Phone: Email: DCANN@EFJI.COM

Contact Name and Title: Lawrence Wilson
Department Name: Central Communication
Phone: Email:

Contact Name and Title: MICHAEL MINTON
Department Name: COLUMBIA COUNTY FIRE DEPT.
Phone: Email:

Contact Name and Title: _____
Department Name: _____
Phone: _____ Email: _____

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Vendor Questions and Answers

Franklin St. Tower Additional Information

EQUIPMENT LIST

ITEM#	QUAN.	MANUFAC.PART#	DESCRIPTION
1	1	Q0130M200	LOAD CENTER, 200A 120/240VAC 1PH 30 POSITION SQ.D
2	1	DU321	DISCONNECT SWITCH, 30A 240V SIEMENS
3	1	LAP-B1	NORTHERN TECHNOLOGIES SURGE ARRESTOR
4	1		4'x4' TELCO BOARD
5	2	CTL2-516	1 HOLE CRIMP FITTING FOR #2 WIRE, T&B
6	1	U010010	GFI EXTERIOR RECEPTACLE, 20A 120V - HUBBELL
7	2	WA361-A05XP5XXJ	36,000 BTU 35A 240V HVAC UNIT W/5KW HEAT, BARD
8	1		4" (12) PDRT WAVEGUIDE ENTRY PLATE
9	4	C-240	40W (2) BULB 48" FLUORESCENT LIGHT LITHONIA
10	50 FT		#2 GREEN STRANDED WIRE FOR GROUND HALD
11	2	0406	20A 120V SMOKE DETECTOR, FIREX
12	35 FT		24" CABLE RACK CENTRAL STEEL
13	6		1-5/8" x 1-5/8" x 30" LONG UNISTRUT
14	8		PLASTIC END CAPS FOR CABLE RACK
15	1		4"x12" WIRE DUCT FOR RECTIFIER DROPS
16	1	35H7FW15-J-626	BEST MORTISE LOCKSET
17	4	54740	COMPRESSION FITTING FOR #2 X #2 WIRE BLACKBURN
18	25	#10	GROUNDING HALD SUPPORT CLIC STRAP
19	1		4" PVC WITH 4" CAP ON EXT.
20	7	5352	20A 120V DUPLEX RECEPTACLES HUBBELL
21	1		4" X 12" X 1/4" COPPER GROUND PLATE
22	1	1207ES	TRINCO DOOR STOP AND HOOK
23	12	TC5435A	TYRAP MOUNTING CLAMP WITH TYRAP #TY23M
24	1	TEC20	DUAL HVAC CONTROLLER BARD
25	1		100W INCAND. EXT. LIGHT W/SWITCHED PHOTOCELL, PERFECTLINE
26	2	CSB120	20A 120V LIGHT SWITCH HUBBELL
27	1		STANDAR DOOR DRIP CAP
28	1	CECO	3'x7' INSULATED STEEL DOOR
29	1		200A AUTOMATIC TRANSFER SWITCH (CUSTOMER SUPPLIED)

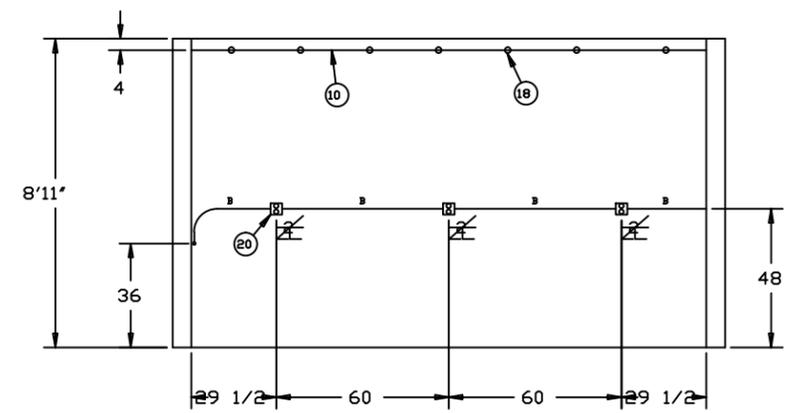
- NOTES:
- LOAD CENTER GROUND WIRE MUST BE ATTACHED TO GROUNDING SYSTEM BEFORE APPLYING POWER.
 - ALL WIRE AMPACITIES BASED ON TABLE 310-16 NEC, 310-15(b)(2)(c). ALL WIRE IS RATED AT 90°C W/75°C RATED LUGS. ALL WIRING IS PER 1996 NEC. CONDUIT FILL BASED ON APPENDIX C NEC(TABLE C1).
 - ALL EXTERIOR FIXTURES ARE WEATHERPROOF.
 - 3/4" WHITE FRP BOARD PANELING ON WALLS AND CEILING.

⊃ - INDICATES RECEPTACLE GROUPING

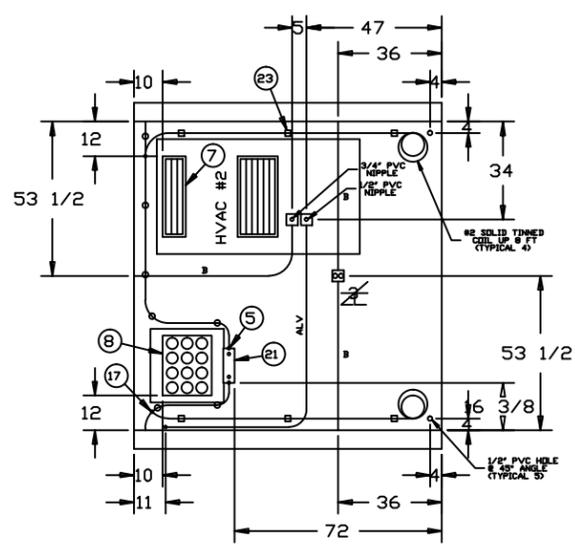
CONDUIT KEY

A = 1/2"	ALV = 1/2"
B = 3/4"	BLV = 3/4"
C = 1"	CLV = 1"
D = 1-1/4"	
E = 2"	
F = 2-1/2"	
G = 3"	
H = 4"	

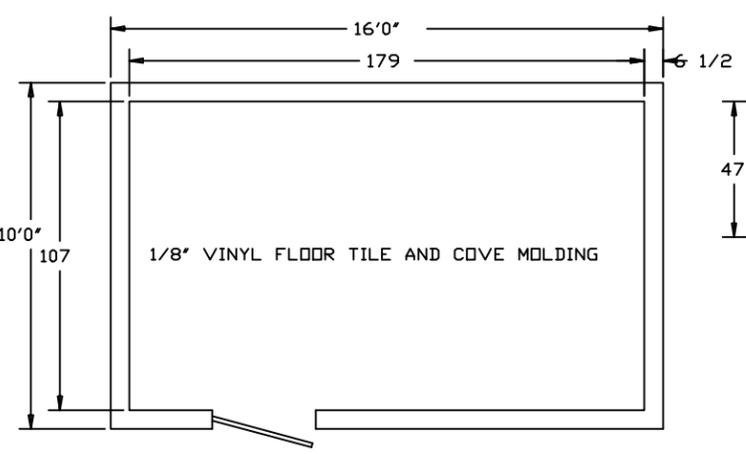
NOTE: "LV" DESIGNATES LOW VOLTAGE CONDUIT



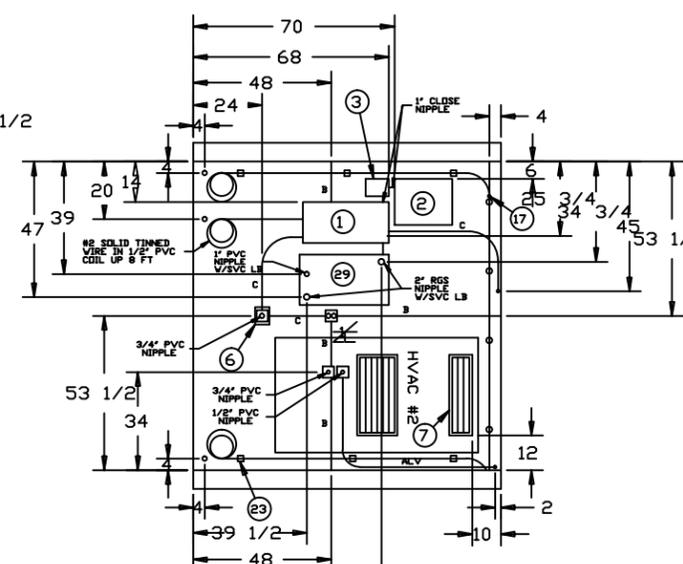
REAR SIDEWALL



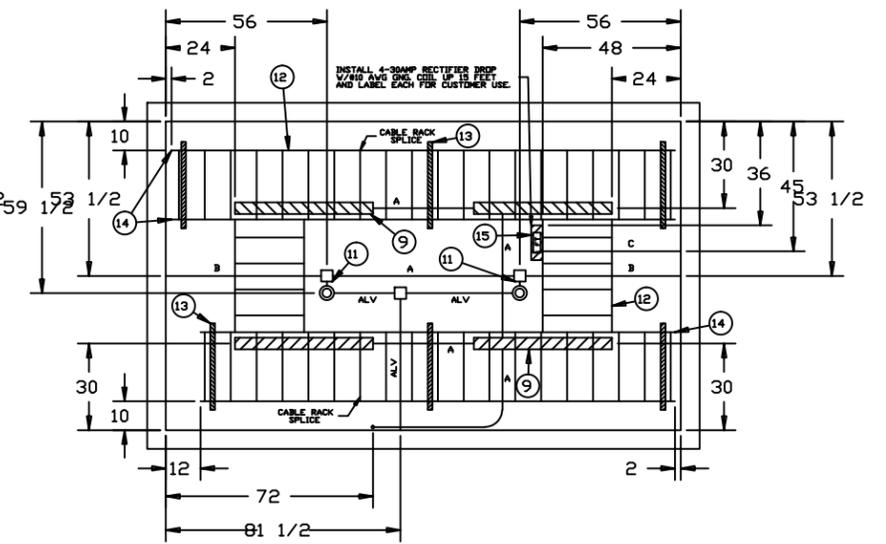
LEFT ENDWALL



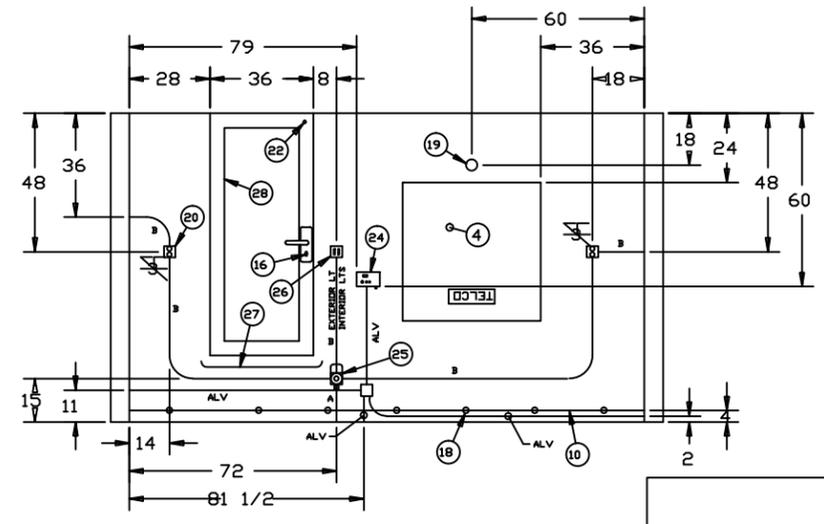
FLOOR



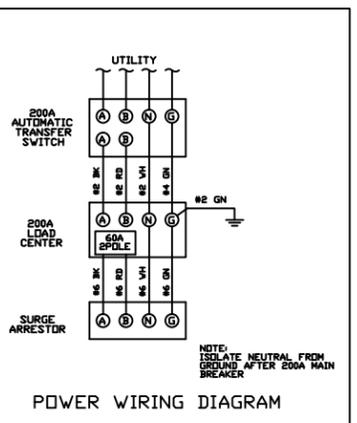
RIGHT ENDWALL



CEILING REFLECTED VIEW
MOUNT CABLE RACK 95" A.F.F. TO BOTTOM OF CABLE RACK



FRONT SIDEWALL



POWER WIRING DIAGRAM

MAIN: 200A		VOLTAGE: 120/240VAC		PHASE: 1		WIRE: 3	
LOCATION	BRKR	WIRE	NO	NO	WIRE	BRKR	LOCATION
SURGE ARRESTOR	60A	#6	1	2	#8	35A	HVAC UNIT #1
" Q0200 M.C.S. "	"	"	3	4	"	"	"
INTERIOR LIGHTS	20A	#12	5	6	#8	35A	HVAC UNIT #2
EXTERIOR LIGHT	20A	#12	7	8	"	"	"
RECEPTACLE GROUP #1	20A	#12	9	10	#10	30A	RECTIFIER #2
RECEPTACLE GROUP #2	20A	#12	11	12	"	"	"
RECEPTACLE GROUP #3	20A	#12	13	14	#10	30A	RECTIFIER #3
RECTIFIER #1	30A	#10	15	16	"	"	"
"	"	"	17	18	#10	30A	RECTIFIER #4
SMOKE DETECTORS	20A	#12	19	20	"	"	"
SPARE	20A	#12	21	22	20A		SPARE
"	"	"	23	24	"	"	"
"	"	"	25	26	"	"	"
"	"	"	27	28	"	"	"
"	"	"	29	30	"	"	"

SITE: COLUMBIA COUNTY, FL

"MAY BE BUILT MIRROR IMAGED"

REV. NO.	REVISION DESCRIPTION	DATE	BY
R1	ADDED CUST. SUPPLIED ATS	8-25-99	TL5

ROHN BUILDING DESIGN
INC. © 1991 UNR-ROHN, INC. ALL RIGHTS RESERVED

TITLE: CONCRETE - ESC10169
SOUTHEASTERN COMM. SVC.
10'X16'X9'H SHELTER EST2677

SCALE: 3/8" = 1'0"
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE GIVEN IN INCHES. TOLERANCES: DECIMALS FRACTIONS ANGLES?

DRAWN BY: TL5 DATE: 8-12-99
PROJECT MGR: JEG DATE: 8-12-99
FILE NUMBER: ES02383 DWG NUMBER: D990223 R1

Date: **December 13, 2013**

Lawrence Wilson
Central Communications
263 NW Lake City Ave.
Lake City, FL 32055
(386) 758-1125 ext.1576



Tower Engineering Professionals, Inc.
3703 Junction Boulevard
Raleigh, NC 27603
(919) 661-6351
mgardner@tepgroup.net

Subject: Structural Analysis Report – Revision 1

Central Communications Designation: Columbia County Reconfiguration

Central Communications Site Name: Franklin Street
Central Communications Site Number: Unknown
FCC Number: 1049322

Engineering Firm Designation: **TEP Project Number:** 26513_12261

Site Data: **259 NE Franklin Street, Lake City, Columbia County, FL 32055**
Latitude: 30° 11' 38.30" Longitude: -82° 38' 04.80"
255 Foot - Self Supporting Tower

Dear Mr. Wilson,

Tower Engineering Professionals, Inc. is pleased to submit this “**Structural Analysis Report**” to determine the structural integrity of the above mentioned tower.

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, under the following load case, to be:

LC1: Existing + Proposed Equipment
Note: See Table 1 for the existing and proposed loading.

Insufficient Capacity

Structure Capacity	Controlling Component
115.2%	Diagonal T10 (60'-80')

The analysis has been performed in accordance with the ANSI/TIA-222-G-2-2009 Structural Standard for Antenna Supporting Structures and Antennas – Addendum 2 and the 2010 Florida Building Code based upon an ultimate 3-second gust wind speed of 128 mph converted to a nominal 3-second gust wind speed of 99 mph per section 1609.3.1 as required for use in the TIA-222-G standard per exception #5 of Section 1609.1.1. Exposure category C and risk category III were used in this analysis.

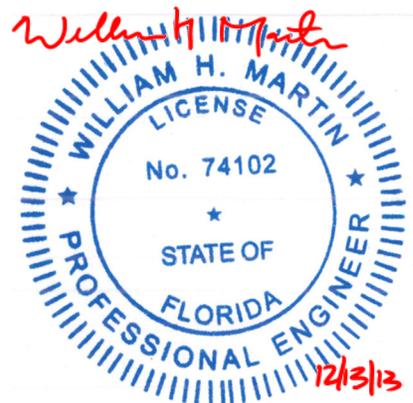
All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 and the attached drawings for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals* appreciate the opportunity of providing our continuing professional services to you and *Central Communications*. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Andrew T. Stutts, E.I.

Respectfully submitted by:

William H. Martin, P.E.



Revision #	Date Issued	Description
0	October 30, 2013	Original structural analysis (TEP#26513_10345)
1	December 13, 2013	Revised Central Communications loading

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tnxTower Output

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Coax Configuration

1) INTRODUCTION

This tower is a 255-ft model 60-T955-255 self supporting tower designed by Valmont Microflex in April of 1998. The tower was originally designed for a fastest mile wind speed of 110 mph with no ice, 95 mph with 0.5 inch radial ice, and 50 mph under service loads per ANSI/TIA/EIA-222-F-1996 standard for the appurtenances listed in Table 2. TEP visited the site in October of 2013 to gather existing appurtenance information. All other information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of ANSI/TIA-222-G-2-2009 Structural Standard for Antenna Supporting Structures and Antennas – Addendum 2 and the 2010 Florida Building Code based upon an ultimate 3-second gust wind speed of 128 mph converted to a nominal 3-second gust wind speed of 99 mph per section 1609.3.1 as required for use in the TIA-222-G standard per exception #5 of Section 1609.1.1. Risk category III was used in this analysis along with the following design criteria:

- 1) Type of Analysis: **Feasibility Structural Analysis**
- 2) Classification of Structure: **Class III**
Definition: Structures used for services that due to height, use or location represent a substantial hazard to human life and/or damage to property in the event of failure and/or used primarily for essential communications.
- 3) Exposure Category: **Exposure C**
Definition: Open terrain with scattered obstructions having heights generally less than 30-ft. This category includes flat, open country, grasslands and shorelines in hurricane prone regions.
- 4) Topographic Category: **Category 1**
Definition: No abrupt changes in general topography, e.g. flat or rolling terrain, no wind speed-up consideration shall be required.
- 5) Earthquake Category: **Not Considered**
Commentary: Earthquake effects may be ignored per this standard for site locations where Ss does not exceed 1.0. (Columbia County Ss = 0.15)

Table 1 - Existing and Proposed Antenna and Cable Information

Existing/ Proposed	Elevation (ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size (in)	Coax ¹ Location	Owner/ Tenant
Existing	258	1	4'Øx3' Antenna	Pipe	1 1	1/2 7/8	C-Leg	Columbia County
Existing	250.5	1	Decibel DB224	Sidearm	1	1 1/4	C-Leg	Columbia County
Existing	250	1	Decibel DB420	Sidearm	1	7/8	B-Leg	Columbia County
Existing	250	1	Decibel DB420	Sidearm	1	7/8	B-Leg	Columbia County
Existing	250	1	Decibel DB224 (Inverted)		1	7/8	B-Leg	Columbia County
Proposed²	250	2	Antel BCD-80010-25	(3) 6' Sidearms	2	1 1/4	B-Leg	Columbia County
		1	Celwave BMR12-0		1	7/8		
		1	TxRx 428D83101T		1	1/2		
Existing	243	1	Decibel DB224	Sidearm	1	7/8	C-Leg	Columbia County
Existing	231.5	1	Kathrein Scala K552921 (HDB-155)	Sidearm	1	7/8	C-Leg	Columbia County
Existing	224	1	Decibel DB420	(2) Sidearm	1	7/8	B-Leg	Columbia County

Table 1 - Existing and Proposed Antenna and Cable Information - Continued

Existing/ Proposed	Elevation (ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size (in)	Coax ¹ Location	Owner/ Tenant
Existing	216.6	1	Decibel DB224	Sidearm	1	7/8	C-Leg	Columbia County
Existing	207	1	Decibel DB420 (Inverted)	Sidearm	1	7/8	B-Leg	Columbia County
Existing	181	3	RFS APXV9ERR18	(3) Sector Mounts	3	1 1/16	AB-Face	Sprint
		12	Ericsson RRUS-11		6	1 5/8		
		6	6'x6"x3" Panels		1	3/8		
Existing	171.7	1	Decibel DB404 (Inverted)	Sidearm	1	7/8	C-Leg	Columbia County
Existing	153.3	1	18"Ø Dish (C-Leg)	Pipe	1	1/4	C-Leg	Columbia County
		1	Motorolla WB2900					
Proposed	124	1	Andrew PAR6-59W (C-Leg)	Pipe	1	EU63	B-Leg	Columbia County
Proposed	118	1	Andrew PAR6-59W (C-Leg)	Pipe	1	EU63	B-Leg	Columbia County

Notes:

- 1) See "Appendix B – Coax Configuration" for the coax configuration.
- 2) Carrier to ensure proposed antenna and coax does not interfere with existing equipment.

Table 2 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Model	Mount Type	Qty Coax	Coax Size (in)	Coax Location
253	263.5	9	Decibel DB224	(3) 10' Rotatable Frames		Unknown	
225	234	1	Decibel DB420	(1) 6' Standoff		Unknown	
205	205	3	Decibel DB420	(3) 6' Standoffs		Unknown	
180	180	2	Microwave Grid Dish	(2) Pipes		Unknown	

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Tower Drawings	Valmont Microflect, dated April 29, 1998 Order No. 1M417-01/MF40894	-	Central Comm.
Previous Structural Analysis	Tower Engineering Professionals, Inc., dated October 30, 2013	26513_10345	TEP
Preliminary Construction Drawings	Compass Technology Services, dated August 18, 2010 Project No. 100312	-	Central Comm.
Appurtenance Mapping	Tower Engineering Professionals, Inc.	26513_10345	TEP
Structural Analysis	Armor Tower Engineering, dated July 15, 2010 Site No. Mainstreet Broadband LAKC-082A	-	Central Comm.
Correspondence	Correspondence from Central Communications in reference to the existing and proposed loading	-	Central Comm.

3.1) Analysis Method

tnxTower (version 6.1.3.1), 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) The tower and foundation were built in accordance with the manufacturer's specifications.
- 2) The tower and foundation 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 Table 1 and "Appendix B – Coax Configuration".
- 4) All tower components are in sufficient condition to carry their full design capacity.
- 5) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance. See Table 7.
- 6) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.
- 7) The following material grade assumptions were made:
 - a) Leg grade: ASTM A53-B-46
 - b) Bracing members grade: ASTM A36
 - c) Anchor rod: ASTM A572-50
- 8) This report is not a construction document.

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	ØP_allow (lb)	% Capacity	Pass / Fail
T1	255 - 240	Leg	Pipe 2.5 STD	1	-12742.10	53865.90	23.7	Pass
T2	240 - 220	Leg	PIPE 3.5 STD	25	-44551.60	96872.30	46.0	Pass
T3	220 - 200	Leg	Pipe 5 STD	52	-88058.30	157444.00	55.9	Pass
T4	200 - 180	Leg	PIPE 8 STD (SCH40)	73	-120397.00	330771.00	36.4	Pass
T5	180 - 160	Leg	PIPE 8 STD (SCH40)	94	-157923.00	330771.00	47.7	Pass
T6	160 - 140	Leg	PIPE 8 STD (SCH40)	115	-196255.00	330771.00	59.3	Pass
T7	140 - 120	Leg	Pipe 10 STD (SCH40)	136	-231031.00	461312.00	50.1	Pass
T8	120 - 100	Leg	Pipe 10 STD (SCH40)	151	-271670.00	461312.00	58.9	Pass
T9	100 - 80	Leg	Pipe 10 STD (SCH40)	166	-312679.00	461312.00	67.8	Pass
T10	80 - 60	Leg	Pipe 12 STD	181	-353403.00	573746.00	61.6	Pass
T11	60 - 40	Leg	Pipe 12 STD	196	-394550.00	573746.00	68.8	Pass
T12	40 - 20	Leg	Pipe 12 STD	212	-435406.00	573746.00	75.9	Pass
T13	20 - 0	Leg	Pipe 12 SCH 80	227	-477259.00	1026190.00	46.5	Pass
T1	255 - 240	Diagonal	L1 3/4x1 3/4x3/16	11	-3222.66	10205.20	31.6	Pass
T2	240 - 220	Diagonal	L1 3/4x1 3/4x3/16	38	-4452.03	10417.70	42.7	Pass
T3	220 - 200	Diagonal	L2x2x3/16	59	-6979.21	11924.80	58.5	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	ØP_allow (lb)	% Capacity	Pass / Fail
T4	200 - 180	Diagonal	L2x2x3/16	80	-4138.10	10275.80	40.3	Pass
T5	180 - 160	Diagonal	L2x2x3/16	101	-5885.40	8336.13	70.6	Pass
T6	160 - 140	Diagonal	L2 1/2x2 1/2x3/16	123	-6392.38	11534.80	55.4 66.3 (b)	Pass
T7	140 - 120	Diagonal	L3x3x3/16	140	-8542.10	12189.90	70.1 79.9 (b)	Pass
T8	120 - 100	Diagonal	L3x3x3/16	155	-10196.90	10196.90	100.0	Pass
T9	100 - 80	Diagonal	L3x3x1/4	170	-10675.00	11209.10	95.2	Pass
T10	80 - 60	Diagonal	L3x3x1/4	185	-11214.10	9737.46	115.2	Fail
T11	60 - 40	Diagonal	L3 1/2x3 1/2x1/4	200	-11942.30	15665.80	76.2	Pass
T12	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	215	-12498.70	13872.90	90.1	Pass
T13	20 - 0	Diagonal	L3 1/2x3 1/2x5/16	230	-13465.70	15125.40	89.0	Pass
T1	255 - 240	Top Girt	L2 1/2x2 1/2x3/16	5	-226.26	14536.40	1.6 3.3 (b)	Pass
							Summary	
							Leg (T12)	75.9 Pass
							Diagonal (T10)	115.2 Fail
							Top Girt (T1)	3.3 Pass
							Bolt Checks	94.9 Pass
							RATING =	115.2 Fail

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
-	Anchor Rods	-	49.9	Pass

Table 6 - Foundation Reaction Comparison

Component	Design Reactions ³ (k)	Analysis Reactions (k)	% Capacity	Pass / Fail
Download Per Leg	714.06	487.77	68.3	Pass
Shear Per Leg	55.15	42.67	77.4	Pass
Uplift Per Leg	650.93	435.30	66.9	Pass

Notes:

3) Capacities calculated are based on comparisons to design reactions and do not represent an actual analysis of the foundation. Design reactions include a 1.35 factor as allowed by ANSI/TIA-222-G-2-2009 Section 15.5.1.

Structure Rating (max from all components) =	115.2%
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Table 7 - Dish Twist/Sway Results for 60 mph Service Wind Speed

Elevation (ft)	Dish Model	Beam Deflection		
		Deflection (in)	Tilt (deg)	Twist (deg)
153.3	18"Ø Dish (C-Leg)	2.659	0.1716	0.0194
124	Andrew PAR6-59W (C-Leg)	1.703	0.1300	0.0152
118	Andrew PAR6-59W (C-Leg)	1.536	0.1232	0.0139

4.1) Recommendations

- 1) TEP did not have sufficient information to perform a foundation analysis. Provide TEP with a foundation drawing and a geotechnical report for this site in order to determine the substructure capacity. If this information is not available, TEP recommends a foundation mapping and a geotechnical investigation be performed for this site.
- 2) Prior to acceptance of changed configuration a rigorous structural analysis shall be performed in order to determine the overall stability and the adequacy of the structural members, foundations and connections.
- 3) The tower does not have sufficient capacity to carry the existing and proposed loads. Modifications will be required to bring the tower into compliance with the ANSI/TIA-222-G standard for the existing and proposed loading. The following components require modifications:
 - a) Diagonals from 60' to 80'
 - b) Possible foundation reinforcement.Further engineering and detailing is required to design the necessary modifications. Anchor rods are sufficient.
- 4) A Professional Engineer licensed in the state of Florida shall issue design drawings for the above modifications. This analysis report is not a construction document.
- 5) If the load differs from that described in Table 1 of this report, "Appendix B – Coax Configuration" or the provisions of this analysis are found to be invalid, another structural analysis should be performed.

APPENDIX A
TNXTOWER OUTPUT

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45	T46	T47	T48	T49	T50	T51	T52	T53	T54	T55	T56	T57	T58	T59	T60	T61	T62	T63	T64	T65	T66	T67	T68	T69	T70	T71	T72	T73	T74	T75	T76	T77	T78	T79	T80	T81	T82	T83	T84	T85	T86	T87	T88	T89	T90	T91	T92	T93	T94	T95	T96	T97	T98	T99	T100	T101	T102	T103	T104	T105	T106	T107	T108	T109	T110	T111	T112	T113	T114	T115	T116	T117	T118	T119	T120	T121	T122	T123	T124	T125	T126	T127	T128	T129	T130	T131	T132	T133	T134	T135	T136	T137	T138	T139	T140	T141	T142	T143	T144	T145	T146	T147	T148	T149	T150	T151	T152	T153	T154	T155	T156	T157	T158	T159	T160	T161	T162	T163	T164	T165	T166	T167	T168	T169	T170	T171	T172	T173	T174	T175	T176	T177	T178	T179	T180	T181	T182	T183	T184	T185	T186	T187	T188	T189	T190	T191	T192	T193	T194	T195	T196	T197	T198	T199	T200	T201	T202	T203	T204	T205	T206	T207	T208	T209	T210	T211	T212	T213	T214	T215	T216	T217	T218	T219	T220	T221	T222	T223	T224	T225	T226	T227	T228	T229	T230	T231	T232	T233	T234	T235	T236	T237	T238	T239	T240	T241	T242	T243	T244	T245	T246	T247	T248	T249	T250	T251	T252	T253	T254	T255	T256	T257	T258	T259	T260	T261	T262	T263	T264	T265	T266	T267	T268	T269	T270	T271	T272	T273	T274	T275	T276	T277	T278	T279	T280	T281	T282	T283	T284	T285	T286	T287	T288	T289	T290	T291	T292	T293	T294	T295	T296	T297	T298	T299	T300	T301	T302	T303	T304	T305	T306	T307	T308	T309	T310	T311	T312	T313	T314	T315	T316	T317	T318	T319	T320	T321	T322	T323	T324	T325	T326	T327	T328	T329	T330	T331	T332	T333	T334	T335	T336	T337	T338	T339	T340	T341	T342	T343	T344	T345	T346	T347	T348	T349	T350	T351	T352	T353	T354	T355	T356	T357	T358	T359	T360	T361	T362	T363	T364	T365	T366	T367	T368	T369	T370	T371	T372	T373	T374	T375	T376	T377	T378	T379	T380	T381	T382	T383	T384	T385	T386	T387	T388	T389	T390	T391	T392	T393	T394	T395	T396	T397	T398	T399	T400	T401	T402	T403	T404	T405	T406	T407	T408	T409	T410	T411	T412	T413	T414	T415	T416	T417	T418	T419	T420	T421	T422	T423	T424	T425	T426	T427	T428	T429	T430	T431	T432	T433	T434	T435	T436	T437	T438	T439	T440	T441	T442	T443	T444	T445	T446	T447	T448	T449	T450	T451	T452	T453	T454	T455	T456	T457	T458	T459	T460	T461	T462	T463	T464	T465	T466	T467	T468	T469	T470	T471	T472	T473	T474	T475	T476	T477	T478	T479	T480	T481	T482	T483	T484	T485	T486	T487	T488	T489	T490	T491	T492	T493	T494	T495	T496	T497	T498	T499	T500	T501	T502	T503	T504	T505	T506	T507	T508	T509	T510	T511	T512	T513	T514	T515	T516	T517	T518	T519	T520	T521	T522	T523	T524	T525	T526	T527	T528	T529	T530	T531	T532	T533	T534	T535	T536	T537	T538	T539	T540	T541	T542	T543	T544	T545	T546	T547	T548	T549	T550	T551	T552	T553	T554	T555	T556	T557	T558	T559	T560	T561	T562	T563	T564	T565	T566	T567	T568	T569	T570	T571	T572	T573	T574	T575	T576	T577	T578	T579	T580	T581	T582	T583	T584	T585	T586	T587	T588	T589	T590	T591	T592	T593	T594	T595	T596	T597	T598	T599	T600	T601	T602	T603	T604	T605	T606	T607	T608	T609	T610	T611	T612	T613	T614	T615	T616	T617	T618	T619	T620	T621	T622	T623	T624	T625	T626	T627	T628	T629	T630	T631	T632	T633	T634	T635	T636	T637	T638	T639	T640	T641	T642	T643	T644	T645	T646	T647	T648	T649	T650	T651	T652	T653	T654	T655	T656	T657	T658	T659	T660	T661	T662	T663	T664	T665	T666	T667	T668	T669	T670	T671	T672	T673	T674	T675	T676	T677	T678	T679	T680	T681	T682	T683	T684	T685	T686	T687	T688	T689	T690	T691	T692	T693	T694	T695	T696	T697	T698	T699	T700	T701	T702	T703	T704	T705	T706	T707	T708	T709	T710	T711	T712	T713	T714	T715	T716	T717	T718	T719	T720	T721	T722	T723	T724	T725	T726	T727	T728	T729	T730	T731	T732	T733	T734	T735	T736	T737	T738	T739	T740	T741	T742	T743	T744	T745	T746	T747	T748	T749	T750	T751	T752	T753	T754	T755	T756	T757	T758	T759	T760	T761	T762	T763	T764	T765	T766	T767	T768	T769	T770	T771	T772	T773	T774	T775	T776	T777	T778	T779	T780	T781	T782	T783	T784	T785	T786	T787	T788	T789	T790	T791	T792	T793	T794	T795	T796	T797	T798	T799	T800	T801	T802	T803	T804	T805	T806	T807	T808	T809	T810	T811	T812	T813	T814	T815	T816	T817	T818	T819	T820	T821	T822	T823	T824	T825	T826	T827	T828	T829	T830	T831	T832	T833	T834	T835	T836	T837	T838	T839	T840	T841	T842	T843	T844	T845	T846	T847	T848	T849	T850	T851	T852	T853	T854	T855	T856	T857	T858	T859	T860	T861	T862	T863	T864	T865	T866	T867	T868	T869	T870	T871	T872	T873	T874	T875	T876	T877	T878	T879	T880	T881	T882	T883	T884	T885	T886	T887	T888	T889	T890	T891	T892	T893	T894	T895	T896	T897	T898	T899	T900	T901	T902	T903	T904	T905	T906	T907	T908	T909	T910	T911	T912	T913	T914	T915	T916	T917	T918	T919	T920	T921	T922	T923	T924	T925	T926	T927	T928	T929	T930	T931	T932	T933	T934	T935	T936	T937	T938	T939	T940	T941	T942	T943	T944	T945	T946	T947	T948	T949	T950	T951	T952	T953	T954	T955	T956	T957	T958	T959	T960	T961	T962	T963	T964	T965	T966	T967	T968	T969	T970	T971	T972	T973	T974	T975	T976	T977	T978	T979	T980	T981	T982	T983	T984	T985	T986	T987	T988	T989	T990	T991	T992	T993	T994	T995	T996	T997	T998	T999	T1000	T1001	T1002	T1003	T1004	T1005	T1006	T1007	T1008	T1009	T1010	T1011	T1012	T1013	T1014	T1015	T1016	T1017	T1018	T1019	T1020	T1021	T1022	T1023	T1024	T1025	T1026	T1027	T1028	T1029	T1030	T1031	T1032	T1033	T1034	T1035	T1036	T1037	T1038	T1039	T1040	T1041	T1042	T1043	T1044	T1045	T1046	T1047	T1048	T1049	T1050	T1051	T1052	T1053	T1054	T1055	T1056	T1057	T1058	T1059	T1060	T1061	T1062	T1063	T1064	T1065	T1066	T1067	T1068	T1069	T1070	T1071	T1072	T1073	T1074	T1075	T1076	T1077	T1078	T1079	T1080	T1081	T1082	T1083	T1084	T1085	T1086	T1087	T1088	T1089	T1090	T1091	T1092	T1093	T1094	T1095	T1096	T1097	T1098	T1099	T1100	T1101	T1102	T1103	T1104	T1105	T1106	T1107	T1108	T1109	T1110	T1111	T1112	T1113	T1114	T1115	T1116	T1117	T1118	T1119	T1120	T1121	T1122	T1123	T1124	T1125	T1126	T1127	T1128	T1129	T1130	T1131	T1132	T1133	T1134	T1135	T1136	T1137	T1138	T1139	T1140	T1141	T1142	T1143	T1144	T1145	T1146	T1147	T1148	T1149	T1150	T1151	T1152	T1153	T1154	T1155	T1156	T1157	T1158	T1159	T1160	T1161	T1162	T1163	T1164	T1165	T1166	T1167	T1168	T1169	T1170	T1171	T1172	T1173	T1174	T1175	T1176	T1177	T1178	T1179	T1180	T1181	T1182	T1183	T1184	T1185	T1186	T1187	T1188	T1189	T1190	T1191	T1192	T1193	T1194	T1195	T1196	T1197	T1198	T1199	T1200	T1201	T1202	T1203	T1204	T1205	T1206	T1207	T1208	T1209	T1210	T1211	T1212	T1213	T1214	T1215	T1216	T1217	T1218	T1219	T1220	T1221	T1222	T1223	T1224	T1225	T1226	T1227	T1228	T1229	T1230	T1231	T1232	T1233	T1234	T1235	T1236	T1237	T1238	T1239	T1240	T1241	T1242	T1243	T1244	T1245	T1246	T1247	T1248	T1249	T1250	T1251	T1252	T1253	T1254	T1255	T1256	T1257	T1258	T1259	T1260	T1261	T1262	T1263	T1264	T1265	T1266	T1267	T1268	T1269	T1270	T1271	T1272	T1273	T1274	T1275	T1276	T1277	T1278	T1279	T1280	T1281	T1282	T1283	T1284	T1285	T1286	T1287	T1288	T1289	T1290	T1291	T1292	T1293	T1294	T1295	T1296	T1297	T1298	T1299	T1300	T1301	T1302	T1303	T1304	T1305	T1306	T1307	T1308	T1309	T1310	T1311	T1312	T1313	T1314	T1315	T1316	T1317	T1318	T1319	T1320	T1321	T1322	T1323	T1324	T1325	T1326	T1327	T1328	T1329	T1330	T1331	T1332	T1333	T1334	T1335	T1336	T1337	T1338	T1339	T1340	T1341	T1342	T1343	T1344	T1345
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tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	Franklin Street	Page	1 of 29
	Project	TEP# 26513_12261, Revision 1	Date	13:49:19 12/13/13
	Client	Central Communications	Designed by	Rebecca H. Lalor, E.I.

tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	Franklin Street	Page	2 of 29
	Project	TEP# 26513_12261, Revision 1	Date	13:49:19 12/13/13
	Client	Central Communications	Designed by	Rebecca H. Lalor, E.I.

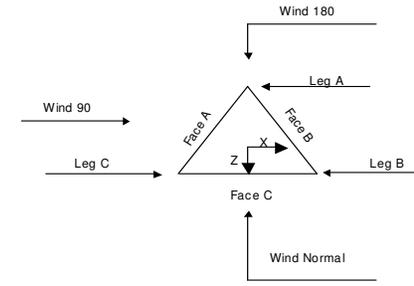
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 255.00 ft above the ground line. The base of the tower is set at an elevation of 0.00 ft above the ground line. The face width of the tower is 5.00 ft at the top and 21.67 ft at the base. This tower is designed using the TIA-222-G standard. The following design criteria apply:

- Tower is located in Columbia County, Florida.
- ASCE 7-10 Wind Data is used.
- Basic wind speed of 128 mph.
- Risk Category III and IV.
- Exposure Category C.
- Topographic Category 1.
- Crest Height 0.00 ft.
- 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 tower member design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification Use Code Stress Ratios Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination | <ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned Assume Rigid Index Plate Use Clear Spans For Wind Area Use Clear Spans For KLr Retension Guys To Initial Tension Bypass Mast Stability Checks Use Azimuth Dish Coefficients Project Wind Area of Appurt. Autocale Torque Arm Areas SR Members Have Cut Ends Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Use TIA-222-G Tension Splice Capacity Exemption | <ul style="list-style-type: none"> Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation Consider Feedline Torque Include Angle Block Shear Check <li style="text-align: center;">Poles Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets |
|--|--|--|



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	255.00-240.00			5.00	1	15.00
T2	240.00-220.00			5.00	1	20.00
T3	220.00-200.00			5.00	1	20.00
T4	200.00-180.00			5.00	1	20.00
T5	180.00-160.00			6.67	1	20.00
T6	160.00-140.00			8.33	1	20.00
T7	140.00-120.00			10.00	1	20.00
T8	120.00-100.00			11.67	1	20.00
T9	100.00-80.00			13.34	1	20.00
T10	80.00-60.00			15.00	1	20.00
T11	60.00-40.00			16.67	1	20.00
T12	40.00-20.00			18.34	1	20.00
T13	20.00-0.00			20.00	1	20.00

Tower Section Geometry (cont'd)

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	<i>ft</i>	<i>ft</i>				<i>in</i>	<i>in</i>
T1	255.00-240.00	5.00	X Brace	No	No	0.0000	0.0000
T2	240.00-220.00	5.00	X Brace	No	No	0.0000	0.0000

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Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors							
				X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace	
											X Y
140.00-120.00				1	1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1	1
T9	Yes	Yes	1	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1	1
T10	Yes	Yes	1	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1	1
T11	Yes	Yes	1	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1	1
T12	Yes	Yes	1	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1	1
T13	Yes	Yes	1	1	1	1	1	1	1	1	1
20.00-0.00				1	1	1	1	1	1	1	1

Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry (cont'd)

Tower Elevation	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width	U	Net Width	U	Net Width	U	Net Width	U	Net Width	U	Net Width	U	Net Width	U
ft	Deduct in		Deduct in		Deduct in		Deduct in		Deduct in		Deduct in		Deduct in	
T1	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
255.00-240.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
240.00-220.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
220.00-200.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
200.00-180.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
180.00-160.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T11	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T12	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T13	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry (cont'd)

Tower Elevation	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size	No.	Bolt Size	No.	Bolt Size	No.	Bolt Size	No.	Bolt Size	No.	Bolt Size	No.	Bolt Size	No.
ft		in		in		in		in		in		in		in	
T1	Flange	0.7500	3	0.5000	2	0.5000	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0
255.00-240.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T2	Flange	0.8750	4	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
240.00-220.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T3	Flange	0.8750	4	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
220.00-200.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T4	Flange	1.0000	6	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
200.00-180.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T5	Flange	1.5000	4	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
180.00-160.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T6	Flange	1.5000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
160.00-140.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T7	Flange	1.5000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
140.00-120.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T8	Flange	1.5000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	0	0.6250	0
120.00-100.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T9	Flange	1.5000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	0	0.6250	0
100.00-80.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T10	Flange	1.5000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	0	0.6250	0
80.00-60.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T11	Flange	1.5000	6	0.6250	2	0.6250	0	0.6250	0	0.6250	0	0.7500	0	0.6250	0
60.00-40.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T12	Flange	1.5000	6	0.6250	2	0.6250	0	0.6250	0	0.6250	0	0.7500	0	0.6250	0
40.00-20.00		A325N >		A325X		A325N		A325N		A325N		A325N		A325N	
T13	Flange	0.0000	0	0.6250	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
20.00-0.00		A325N >		A325X		A325N		A325N		A325N		A325X		A325N	

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Shield Leg	Allow	Component Type	Placement	Face Offset in	Lateral Offset (Frac FW)	# Per Row	#	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Rail L2x2x1/8	B	No	Af (CaAa)	182.00 - 1.33	0.0000	-0.4	2	2	34.0000	2.0000		1.65
Rung L2 x2 x1/8 (34.25" width w/ 48" step)	B	No	Af (CaAa)	182.00 - 1.33	0.0000	-0.4	1	1	1.4270	1.4270		1.18
Rung PL 6"x1/8" (12" wide 60" step)	B	No	Af (CaAa)	255.00 - 0.00	-7.0000	0.45	1	1	1.2000	1.2000		0.26
Rung PL 6"x1/8" (12" wide 60" step)	C	No	Af (CaAa)	255.00 - 0.00	-7.0000	0.45	1	1	1.2000	1.2000		0.26

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	# Rows	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
6"x1/8" (12" wide 60" step) Step Pegs (5/8" SR) 7-in. w/30" step	A	No	Ar (CaAa)	255.00 - 0.00	0.0000	0.5	1	1	0.2920	0.1460		0.24
5/8" SR) 7-in. w/30" step	B	No	Ar (CaAa)	255.00 - 0.00	0.0000	0.5	1	1	0.2920	0.1460		0.24
5/8" SR) 7-in. w/30" step	C	No	Ar (CaAa)	255.00 - 0.00	0.0000	0.5	1	1	0.2920	0.1460		0.24

3/8" Coax	B	No	Ar (CaAa)	255.00 - 5.00	0.0000	0.48	1	1	0.3750	0.3750		0.07
7/8" Coax	C	No	Ar (CaAa)	255.00 - 5.00	-8.0000	0.43	1	1	0.8750	0.8750		0.26
LDF4P-50A (1/2 FOAM)	C	No	Ar (CaAa)	255.00 - 5.00	-3.0000	0.47	1	1	0.5000	0.6300		0.15
LDF6-50A (1-1/4 FOAM)	C	No	Ar (CaAa)	250.50 - 5.00	-9.0000	0.44	1	1	0.5000	1.5500		0.66
LDF5-50A (7/8 FOAM)	B	No	Ar (CaAa)	248.00 - 6.00	-8.0000	0.43	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	B	No	Ar (CaAa)	253.00 - 6.00	-6.0000	0.47	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	B	No	Ar (CaAa)	249.00 - 6.00	-7.5000	0.45	1	1	0.5000	1.0900		0.33
LDF6-50A (1-1/4 FOAM)	B	No	Ar (CaAa)	250.00 - 5.00	-7.0000	0.44	2	2	0.5000	1.5500		0.66
LDF5-50A (7/8 FOAM)	B	No	Ar (CaAa)	250.00 - 5.00	-6.0000	0.48	1	1	0.5000	1.0900		0.33
LDF4-50A (1/2 FOAM)	B	No	Ar (CaAa)	245.00 - 5.00	-9.0000	0.43	1	1	0.5000	0.6300		0.15
LDF5-50A (7/8 FOAM)	C	No	Ar (CaAa)	240.50 - 5.00	-7.5000	0.45	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	C	No	Ar (CaAa)	231.50 - 5.00	-7.0000	0.44	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	B	No	Ar (CaAa)	227.00 - 6.00	-9.0000	0.48	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	C	No	Ar (CaAa)	214.92 - 5.00	-8.0000	0.44	1	1	0.5000	1.0900		0.33
LDF5-50A (7/8 FOAM)	B	No	Ar (CaAa)	207.50 - 6.00	-6.0000	0.48	1	1	0.5000	1.0900		0.33

1-1/16" coax	B	No	Ar (CaAa)	182.00 - 1.00	0.0000	-0.43	3	2	0.5000	1.0625		0.20
LDF7-50A (1-5/8 FOAM)	B	No	Ar (CaAa)	182.00 - 3.00	0.0000	-0.36	6	6	0.5000	1.9800		0.82
3/8" Coax	B	No	Ar (CaAa)	182.00 - 3.00	0.0000	-0.32	1	1	0.3750	0.3750		0.07
LDF5-50A (7/8 FOAM)	C	No	Ar (CaAa)	172.00 - 5.00	-9.0000	0.41	1	1	0.5000	1.0900		0.33
1/4 Coax	C	No	Ar (CaAa)	153.33 - 5.00	-1.0000	0.48	1	1	0.2500	0.2500		0.10
5/8" Cable (Lights)	C	No	Ar (CaAa)	131.00 - 9.00	-5.0000	0.48	1	1	0.6250	0.6250		0.30
5/8" Cable (Lights)	C	No	Ar (CaAa)	131.00 - 9.00	0.0000	0.46	1	1	0.6250	0.6250		0.30
EU63	B	No	Ar (CaAa)	124.00 - 5.00	-5.0000	0.45	1	1	0.5000	2.0300		0.56
EU63	B	No	Ar (CaAa)	118.00 - 5.00	-4.0000	0.43	1	1	0.5000	2.0300		0.56

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

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
T1	255.00-240.00	A	0.000	0.000	0.219	0.000	3.66
		B	0.000	0.000	11.557	0.000	35.76
		C	0.000	0.000	7.159	0.000	20.80
T2	240.00-220.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	21.985	0.000	69.59
		C	0.000	0.000	13.836	0.000	41.87
T3	220.00-200.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	24.220	0.000	76.36
		C	0.000	0.000	16.388	0.000	49.60
T4	200.00-180.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	30.480	0.000	100.62
		C	0.000	0.000	16.942	0.000	51.28
T5	180.00-160.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	74.557	0.000	281.90
		C	0.000	0.000	18.250	0.000	55.24
T6	160.00-140.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	74.557	0.000	281.90
		C	0.000	0.000	19.455	0.000	59.21
T7	140.00-120.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	75.369	0.000	284.14
		C	0.000	0.000	20.997	0.000	66.48
T8	120.00-100.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	82.271	0.000	303.18
		C	0.000	0.000	22.122	0.000	71.88
T9	100.00-80.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	82.677	0.000	304.30
		C	0.000	0.000	22.122	0.000	71.88
T10	80.00-60.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	82.677	0.000	304.30
		C	0.000	0.000	22.122	0.000	71.88
T11	60.00-40.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	82.677	0.000	304.30
		C	0.000	0.000	22.122	0.000	71.88
T12	40.00-20.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	82.677	0.000	304.30
		C	0.000	0.000	22.122	0.000	71.88
T13	20.00-0.00	A	0.000	0.000	0.292	0.000	4.88
		B	0.000	0.000	69.578	0.000	257.87
		C	0.000	0.000	17.165	0.000	54.00

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
T1	255.00-240.00	0.4607	1.8873	0.3911	2.2739
T2	240.00-220.00	0.4646	2.1210	0.4104	2.4226

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Section	Elevation	CP _x	CP _z	CP _x	CP _z
		Ice	Ice	Ice	Ice
	ft	in	in	in	in
T3	220.00-200.00	0.3330	2.0349	0.2870	2.2909
T4	200.00-180.00	0.5061	1.4835	0.4871	1.5964
T5	180.00-160.00	0.9001	-2.0242	0.9942	-2.7728
T6	160.00-140.00	1.0063	-2.2935	1.1193	-3.1638
T7	140.00-120.00	1.0585	-2.3458	1.1840	-3.2915
T8	120.00-100.00	1.7386	-2.0778	1.8768	-3.1031
T9	100.00-80.00	2.0183	-2.2888	2.1745	-3.4330
T10	80.00-60.00	2.1601	-2.4088	2.3264	-3.6160
T11	60.00-40.00	2.3368	-2.5710	2.5159	-3.8620
T12	40.00-20.00	2.5500	-2.7748	2.7450	-4.1704
T13	20.00-0.00	2.4073	-3.6243	2.6235	-5.1297

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T2	7	w/30" step	240.00		
		Step Pegs (5/8" SR) 7-in.	220.00 -	0.6000	0.6000
T2	9	w/30" step	240.00		
		3/8" Coax	220.00 -	0.6000	0.6000
			240.00		
T2	10	7/8" Coax	220.00 -	0.6000	0.6000
			240.00		
T2	11	LDF4P-50A (1/2 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	12	LDF6-50A (1-1/4 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	13	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	14	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	15	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	16	LDF6-50A (1-1/4 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	17	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	18	LDF4-50A (1/2 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	19	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			240.00		
T2	20	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			231.50		
T2	21	LDF5-50A (7/8 FOAM)	220.00 -	0.6000	0.6000
			227.00		
T3	3	Rung PL 6"x1/8" (12" wide	200.00 -	0.6000	0.6000
		60" step)	220.00		
T3	4	Rung PL 6"x1/8" (12" wide	200.00 -	0.6000	0.6000
		60" step)	220.00		
T3	5	Step Pegs (5/8" SR) 7-in.	200.00 -	0.6000	0.6000
		w/30" step	220.00		
T3	6	Step Pegs (5/8" SR) 7-in.	200.00 -	0.6000	0.6000
		w/30" step	220.00		
T3	7	Step Pegs (5/8" SR) 7-in.	200.00 -	0.6000	0.6000
		w/30" step	220.00		
T3	9	3/8" Coax	200.00 -	0.6000	0.6000
			220.00		
T3	10	7/8" Coax	200.00 -	0.6000	0.6000
			220.00		
T3	11	LDF4P-50A (1/2 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	12	LDF6-50A (1-1/4 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	13	LDF5-50A (7/8 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	14	LDF5-50A (7/8 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	15	LDF5-50A (7/8 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	16	LDF6-50A (1-1/4 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	17	LDF5-50A (7/8 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	18	LDF4-50A (1/2 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	19	LDF5-50A (7/8 FOAM)	200.00 -	0.6000	0.6000
			220.00		
T3	20	LDF5-50A (7/8 FOAM)	200.00 -	0.6000	0.6000

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T1	3	Rung PL 6"x1/8" (12" wide	240.00 -	0.6000	0.6000
		60" step)	255.00		
T1	4	Rung PL 6"x1/8" (12" wide	240.00 -	0.6000	0.6000
		60" step)	255.00		
T1	5	Step Pegs (5/8" SR) 7-in.	240.00 -	0.6000	0.6000
		w/30" step	255.00		
T1	6	Step Pegs (5/8" SR) 7-in.	240.00 -	0.6000	0.6000
		w/30" step	255.00		
T1	7	Step Pegs (5/8" SR) 7-in.	240.00 -	0.6000	0.6000
		w/30" step	255.00		
T1	9	3/8" Coax	240.00 -	0.6000	0.6000
			255.00		
T1	10	7/8" Coax	240.00 -	0.6000	0.6000
			255.00		
T1	11	LDF4P-50A (1/2 FOAM)	240.00 -	0.6000	0.6000
			255.00		
T1	12	LDF6-50A (1-1/4 FOAM)	240.00 -	0.6000	0.6000
			250.50		
T1	13	LDF5-50A (7/8 FOAM)	240.00 -	0.6000	0.6000
			248.00		
T1	14	LDF5-50A (7/8 FOAM)	240.00 -	0.6000	0.6000
			253.00		
T1	15	LDF5-50A (7/8 FOAM)	240.00 -	0.6000	0.6000
			249.00		
T1	16	LDF6-50A (1-1/4 FOAM)	240.00 -	0.6000	0.6000
			250.00		
T1	17	LDF5-50A (7/8 FOAM)	240.00 -	0.6000	0.6000
			250.00		
T1	18	LDF4-50A (1/2 FOAM)	240.00 -	0.6000	0.6000
			245.00		
T1	19	LDF5-50A (7/8 FOAM)	240.00 -	0.6000	0.6000
			240.50		
T2	3	Rung PL 6"x1/8" (12" wide	220.00 -	0.6000	0.6000
		60" step)	240.00		
T2	4	Rung PL 6"x1/8" (12" wide	220.00 -	0.6000	0.6000
		60" step)	240.00		
T2	5	Step Pegs (5/8" SR) 7-in.	220.00 -	0.6000	0.6000
		w/30" step	240.00		
T2	6	Step Pegs (5/8" SR) 7-in.	220.00 -	0.6000	0.6000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T3	21	LDF5-50A (7/8 FOAM)	220.00 - 200.00	0.6000	0.6000
T3	22	LDF5-50A (7/8 FOAM)	220.00 - 214.92	0.6000	0.6000
T3	23	LDF5-50A (7/8 FOAM)	200.00 - 207.50	0.6000	0.6000
T4	1	Rail L2x2x1/8	180.00 - 182.00	0.6000	0.6000
T4	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	180.00 - 182.00	0.6000	0.6000
T4	3	Rung PL 6"x1/8" (12" wide 60" step)	180.00 - 200.00	0.6000	0.6000
T4	4	Rung PL 6"x1/8" (12" wide 60" step)	180.00 - 200.00	0.6000	0.6000
T4	5	Step Pegs (5/8" SR) 7-in. w/30" step	180.00 - 200.00	0.6000	0.6000
T4	6	Step Pegs (5/8" SR) 7-in. w/30" step	180.00 - 200.00	0.6000	0.6000
T4	7	Step Pegs (5/8" SR) 7-in. w/30" step	180.00 - 200.00	0.6000	0.6000
T4	9	3/8" Coax	180.00 - 200.00	0.6000	0.6000
T4	10	7/8" Coax	180.00 - 200.00	0.6000	0.6000
T4	11	LDF4P-50A (1/2 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	12	LDF6-50A (1-1/4 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	13	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	14	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	15	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	16	LDF6-50A (1-1/4 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	17	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	18	LDF4-50A (1/2 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	19	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	20	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	21	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	22	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	23	LDF5-50A (7/8 FOAM)	180.00 - 200.00	0.6000	0.6000
T4	25	1-1/16" coax	180.00 - 182.00	0.6000	0.6000
T4	26	LDF7-50A (1-5/8 FOAM)	180.00 - 182.00	0.6000	0.6000
T4	27	3/8" Coax	180.00 - 182.00	0.6000	0.6000
T5	1	Rail L2x2x1/8	160.00 - 180.00	0.6000	0.6000
T5	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	160.00 - 180.00	0.6000	0.6000
T5	3	Rung PL 6"x1/8" (12" wide 60" step)	160.00 - 180.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T5	4	60" step) Rung PL 6"x1/8" (12" wide 60" step)	180.00 - 160.00	0.6000	0.6000
T5	5	Step Pegs (5/8" SR) 7-in. w/30" step	180.00 - 160.00	0.6000	0.6000
T5	6	Step Pegs (5/8" SR) 7-in. w/30" step	160.00 - 180.00	0.6000	0.6000
T5	7	Step Pegs (5/8" SR) 7-in. w/30" step	160.00 - 180.00	0.6000	0.6000
T5	9	3/8" Coax	160.00 - 180.00	0.6000	0.6000
T5	10	7/8" Coax	160.00 - 180.00	0.6000	0.6000
T5	11	LDF4P-50A (1/2 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	12	LDF6-50A (1-1/4 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	13	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	14	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	15	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	16	LDF6-50A (1-1/4 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	17	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	18	LDF4-50A (1/2 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	19	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	20	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	21	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	22	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	23	LDF5-50A (7/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	25	1-1/16" coax	160.00 - 180.00	0.6000	0.6000
T5	26	LDF7-50A (1-5/8 FOAM)	160.00 - 180.00	0.6000	0.6000
T5	27	3/8" Coax	160.00 - 180.00	0.6000	0.6000
T5	28	LDF5-50A (7/8 FOAM)	160.00 - 172.00	0.6000	0.6000
T6	1	Rail L2x2x1/8	140.00 - 160.00	0.6000	0.6000
T6	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	140.00 - 160.00	0.6000	0.6000
T6	3	Rung PL 6"x1/8" (12" wide 60" step)	140.00 - 160.00	0.6000	0.6000
T6	4	Rung PL 6"x1/8" (12" wide 60" step)	140.00 - 160.00	0.6000	0.6000
T6	5	Step Pegs (5/8" SR) 7-in. w/30" step	140.00 - 160.00	0.6000	0.6000
T6	6	Step Pegs (5/8" SR) 7-in. w/30" step	140.00 - 160.00	0.6000	0.6000
T6	7	Step Pegs (5/8" SR) 7-in. w/30" step	140.00 - 160.00	0.6000	0.6000
T6	9	3/8" Coax	140.00 - 160.00	0.6000	0.6000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T6	10	7/8" Coax	160.00	0.6000	0.6000
T6	11	LDF4P-50A (1/2 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	12	LDF6-50A (1-1/4 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	13	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	14	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	15	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	16	LDF6-50A (1-1/4 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	17	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	18	LDF4-50A (1/2 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	19	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	20	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	21	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	22	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	23	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	25	1-1/16" coax	140.00 - 160.00	0.6000	0.6000
T6	26	LDF7-50A (1-5/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	27	3/8" Coax	140.00 - 160.00	0.6000	0.6000
T6	28	LDF5-50A (7/8 FOAM)	140.00 - 160.00	0.6000	0.6000
T6	29	1/4 Coax	140.00 - 153.33	0.6000	0.6000
T7	1	Rail L2x2x1/8	120.00 - 140.00	0.6000	0.6000
T7	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	120.00 - 140.00	0.6000	0.6000
T7	3	Rung PL 6"x1/8" (12" wide 60" step)	120.00 - 140.00	0.6000	0.6000
T7	4	Rung PL 6"x1/8" (12" wide 60" step)	120.00 - 140.00	0.6000	0.6000
T7	5	Step Pegs (5/8" SR) 7-in. w/30" step	120.00 - 140.00	0.6000	0.6000
T7	6	Step Pegs (5/8" SR) 7-in. w/30" step	120.00 - 140.00	0.6000	0.6000
T7	7	Step Pegs (5/8" SR) 7-in. w/30" step	120.00 - 140.00	0.6000	0.6000
T7	9	3/8" Coax	120.00 - 140.00	0.6000	0.6000
T7	10	7/8" Coax	120.00 - 140.00	0.6000	0.6000
T7	11	LDF4P-50A (1/2 FOAM)	120.00 - 140.00	0.6000	0.6000
T7	12	LDF6-50A (1-1/4 FOAM)	120.00 - 140.00	0.6000	0.6000
T7	13	LDF5-50A (7/8 FOAM)	120.00 - 140.00	0.6000	0.6000
T7	13	LDF5-50A (7/8 FOAM)	120.00 - 140.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T7	14	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	15	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	16	LDF6-50A (1-1/4 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	17	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	18	LDF4-50A (1/2 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	19	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	20	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	21	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	22	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	23	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	25	1-1/16" coax	140.00 - 120.00	0.6000	0.6000
T7	26	LDF7-50A (1-5/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	27	3/8" Coax	140.00 - 120.00	0.6000	0.6000
T7	28	LDF5-50A (7/8 FOAM)	140.00 - 120.00	0.6000	0.6000
T7	29	1/4 Coax	140.00 - 120.00	0.6000	0.6000
T7	30	5/8" Cable (Lights)	140.00 - 131.00	0.6000	0.6000
T7	31	5/8" Cable (Lights)	131.00 - 120.00	0.6000	0.6000
T7	32	EU63	124.00 - 120.00	0.6000	0.6000
T8	1	Rail L2x2x1/8	100.00 - 120.00	0.6000	0.6000
T8	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	100.00 - 120.00	0.6000	0.6000
T8	3	Rung PL 6"x1/8" (12" wide 60" step)	100.00 - 120.00	0.6000	0.6000
T8	4	Rung PL 6"x1/8" (12" wide 60" step)	100.00 - 120.00	0.6000	0.6000
T8	5	Step Pegs (5/8" SR) 7-in. w/30" step	100.00 - 120.00	0.6000	0.6000
T8	6	Step Pegs (5/8" SR) 7-in. w/30" step	100.00 - 120.00	0.6000	0.6000
T8	7	Step Pegs (5/8" SR) 7-in. w/30" step	100.00 - 120.00	0.6000	0.6000
T8	9	3/8" Coax	100.00 - 120.00	0.6000	0.6000
T8	10	7/8" Coax	100.00 - 120.00	0.6000	0.6000
T8	11	LDF4P-50A (1/2 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	12	LDF6-50A (1-1/4 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	13	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	14	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
			120.00		
T8	15	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	16	LDF6-50A (1-1/4 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	17	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	18	LDF4-50A (1/2 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	19	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	20	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	21	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	22	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	23	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	25	1-1/16" coax	100.00 - 120.00	0.6000	0.6000
T8	26	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	27	3/8" Coax	100.00 - 120.00	0.6000	0.6000
T8	28	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.6000
T8	29	1/4 Coax	100.00 - 120.00	0.6000	0.6000
T8	30	5/8" Cable (Lights)	100.00 - 120.00	0.6000	0.6000
T8	31	5/8" Cable (Lights)	100.00 - 120.00	0.6000	0.6000
T8	32	EU63	100.00 - 120.00	0.6000	0.6000
T8	33	EU63	100.00 - 118.00	0.6000	0.6000
T9	1	Rail L2x2x1/8	80.00 - 100.00	0.6000	0.6000
T9	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	80.00 - 100.00	0.6000	0.6000
T9	3	Rung PL 6"x1/8" (12" wide 60" step)	80.00 - 100.00	0.6000	0.6000
T9	4	Rung PL 6"x1/8" (12" wide 60" step)	80.00 - 100.00	0.6000	0.6000
T9	5	Step Pegs (5/8" SR) 7-in. w/30" step	80.00 - 100.00	0.6000	0.6000
T9	6	Step Pegs (5/8" SR) 7-in. w/30" step	80.00 - 100.00	0.6000	0.6000
T9	7	Step Pegs (5/8" SR) 7-in. w/30" step	80.00 - 100.00	0.6000	0.6000
T9	9	3/8" Coax	80.00 - 100.00	0.6000	0.6000
T9	10	7/8" Coax	80.00 - 100.00	0.6000	0.6000
T9	11	LDF4P-50A (1/2 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	12	LDF6-50A (1-1/4 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	13	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	14	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	15	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	16	LDF6-50A (1-1/4 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	17	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	18	LDF4-50A (1/2 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	19	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	20	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T9	21	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	22	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	23	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	25	1-1/16" coax	80.00 - 100.00	0.6000	0.6000
T9	26	LDF7-50A (1-5/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	27	3/8" Coax	80.00 - 100.00	0.6000	0.6000
T9	28	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T9	29	1/4 Coax	80.00 - 100.00	0.6000	0.6000
T9	30	5/8" Cable (Lights)	80.00 - 100.00	0.6000	0.6000
T9	31	5/8" Cable (Lights)	80.00 - 100.00	0.6000	0.6000
T9	32	EU63	80.00 - 100.00	0.6000	0.6000
T9	33	EU63	80.00 - 100.00	0.6000	0.6000
T10	1	Rail L2x2x1/8	60.00 - 80.00	0.6000	0.6000
T10	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	60.00 - 80.00	0.6000	0.6000
T10	3	Rung PL 6"x1/8" (12" wide 60" step)	60.00 - 80.00	0.6000	0.6000
T10	4	Rung PL 6"x1/8" (12" wide 60" step)	60.00 - 80.00	0.6000	0.6000
T10	5	Step Pegs (5/8" SR) 7-in. w/30" step	60.00 - 80.00	0.6000	0.6000
T10	6	Step Pegs (5/8" SR) 7-in. w/30" step	60.00 - 80.00	0.6000	0.6000
T10	7	Step Pegs (5/8" SR) 7-in. w/30" step	60.00 - 80.00	0.6000	0.6000
T10	9	3/8" Coax	60.00 - 80.00	0.6000	0.6000
T10	10	7/8" Coax	60.00 - 80.00	0.6000	0.6000
T10	11	LDF4P-50A (1/2 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	12	LDF6-50A (1-1/4 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	13	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	14	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	15	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	16	LDF6-50A (1-1/4 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	17	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	18	LDF4-50A (1/2 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	19	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	20	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	21	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	22	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	23	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	25	1-1/16" coax	60.00 - 80.00	0.6000	0.6000
T10	26	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	27	3/8" Coax	60.00 - 80.00	0.6000	0.6000
T10	28	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T10	29	1/4 Coax	60.00 - 80.00	0.6000	0.6000
T10	30	5/8" Cable (Lights)	60.00 - 80.00	0.6000	0.6000
T10	31	5/8" Cable (Lights)	60.00 - 80.00	0.6000	0.6000
T10	32	EU63	60.00 - 80.00	0.6000	0.6000
T10	33	EU63	60.00 - 80.00	0.6000	0.6000
T11	1	Rail L2x2x1/8	40.00 - 60.00	0.6000	0.6000
T11	2	Rung L2 x2 x1/8 (34.25" width w/ 48" step)	40.00 - 60.00	0.6000	0.6000
T11	3	Rung PL 6"x1/8" (12" wide 60" step)	40.00 - 60.00	0.6000	0.6000
T11	4	Rung PL 6"x1/8" (12" wide 60" step)	40.00 - 60.00	0.6000	0.6000
T11	5	Step Pegs (5/8" SR) 7-in. w/30" step	40.00 - 60.00	0.6000	0.6000
T11	6	Step Pegs (5/8" SR) 7-in. w/30" step	40.00 - 60.00	0.6000	0.6000
T11	7	Step Pegs (5/8" SR) 7-in. w/30" step	40.00 - 60.00	0.6000	0.6000

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	Client	Central Communications	Designed by	Rebecca H. Lalor, E.I.

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	Client	Central Communications	Designed by	Rebecca H. Lalor, E.I.

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T11	9	3/8" Coax	40.00 - 60.00	0.6000	0.6000
T11	10	7/8" Coax	40.00 - 60.00	0.6000	0.6000
T11	11	LDF4P-50A (1/2 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	12	LDF6-50A (1-1/4 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	13	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	14	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	15	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	16	LDF6-50A (1-1/4 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	17	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	18	LDF4-50A (1/2 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	19	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	20	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	21	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	22	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	23	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	25	1-1/16" coax	40.00 - 60.00	0.6000	0.6000
T11	26	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	27	3/8" Coax	40.00 - 60.00	0.6000	0.6000
T11	28	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T11	29	1/4 Coax	40.00 - 60.00	0.6000	0.6000
T11	30	5/8" Cable (Lights)	40.00 - 60.00	0.6000	0.6000
T11	31	5/8" Cable (Lights)	40.00 - 60.00	0.6000	0.6000
T11	32	EU63	40.00 - 60.00	0.6000	0.6000
T11	33	EU63	40.00 - 60.00	0.6000	0.6000
T12	1	Rail L2x2x1/8	20.00 - 40.00	0.6000	0.6000
T12	2	Rung L2 x2 xl/8 (34.25" width w/ 48" step)	20.00 - 40.00	0.6000	0.6000
T12	3	Rung PL 6"x1/8" (12" wide 60" step)	20.00 - 40.00	0.6000	0.6000
T12	4	Rung PL 6"x1/8" (12" wide 60" step)	20.00 - 40.00	0.6000	0.6000
T12	5	Step Pegs (5/8" SR) 7-in. w/30" step	20.00 - 40.00	0.6000	0.6000
T12	6	Step Pegs (5/8" SR) 7-in. w/30" step	20.00 - 40.00	0.6000	0.6000
T12	7	Step Pegs (5/8" SR) 7-in. w/30" step	20.00 - 40.00	0.6000	0.6000
T12	9	3/8" Coax	20.00 - 40.00	0.6000	0.6000
T12	10	7/8" Coax	20.00 - 40.00	0.6000	0.6000
T12	11	LDF4P-50A (1/2 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	12	LDF6-50A (1-1/4 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	13	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	14	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	15	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	16	LDF6-50A (1-1/4 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	17	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	18	LDF4-50A (1/2 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	19	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	20	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	21	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	22	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	23	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	25	1-1/16" coax	20.00 - 40.00	0.6000	0.6000
T12	26	LDF7-50A (1-5/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	27	3/8" Coax	20.00 - 40.00	0.6000	0.6000
T12	28	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T12	29	1/4 Coax	20.00 - 40.00	0.6000	0.6000
T12	30	5/8" Cable (Lights)	20.00 - 40.00	0.6000	0.6000
T12	31	5/8" Cable (Lights)	20.00 - 40.00	0.6000	0.6000
T12	32	EU63	20.00 - 40.00	0.6000	0.6000
T12	33	EU63	20.00 - 40.00	0.6000	0.6000
T13	1	Rail L2x2x1/8	1.33 - 20.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T13	2	Rung L2 x2 xl/8 (34.25" width w/ 48" step)	1.33 - 20.00	0.6000	0.6000
T13	3	Rung PL 6"x1/8" (12" wide 60" step)	0.00 - 20.00	0.6000	0.6000
T13	4	Rung PL 6"x1/8" (12" wide 60" step)	0.00 - 20.00	0.6000	0.6000
T13	5	Step Pegs (5/8" SR) 7-in. w/30" step	0.00 - 20.00	0.6000	0.6000
T13	6	Step Pegs (5/8" SR) 7-in. w/30" step	0.00 - 20.00	0.6000	0.6000
T13	7	Step Pegs (5/8" SR) 7-in. w/30" step	0.00 - 20.00	0.6000	0.6000
T13	9	3/8" Coax	5.00 - 20.00	0.6000	0.6000
T13	10	7/8" Coax	5.00 - 20.00	0.6000	0.6000
T13	11	LDF4P-50A (1/2 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	12	LDF6-50A (1-1/4 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	13	LDF5-50A (7/8 FOAM)	6.00 - 20.00	0.6000	0.6000
T13	14	LDF5-50A (7/8 FOAM)	6.00 - 20.00	0.6000	0.6000
T13	15	LDF5-50A (7/8 FOAM)	6.00 - 20.00	0.6000	0.6000
T13	16	LDF6-50A (1-1/4 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	17	LDF5-50A (7/8 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	18	LDF4-50A (1/2 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	19	LDF5-50A (7/8 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	20	LDF5-50A (7/8 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	21	LDF5-50A (7/8 FOAM)	6.00 - 20.00	0.6000	0.6000
T13	22	LDF5-50A (7/8 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	23	LDF5-50A (7/8 FOAM)	6.00 - 20.00	0.6000	0.6000
T13	25	1-1/16" coax	1.00 - 20.00	0.6000	0.6000
T13	26	LDF7-50A (1-5/8 FOAM)	3.00 - 20.00	0.6000	0.6000
T13	27	3/8" Coax	3.00 - 20.00	0.6000	0.6000
T13	28	LDF5-50A (7/8 FOAM)	5.00 - 20.00	0.6000	0.6000
T13	29	1/4 Coax	5.00 - 20.00	0.6000	0.6000
T13	30	5/8" Cable (Lights)	9.00 - 20.00	0.6000	0.6000
T13	31	5/8" Cable (Lights)	9.00 - 20.00	0.6000	0.6000
T13	32	EU63	5.00 - 20.00	0.6000	0.6000
T13	33	EU63	5.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offset: Horiz Lateral Vert	Azimuth Adjustment	Placement	C _s A _s Front	C _s A _s Side	Weight	
			ft ft ft	°	ft	ft ²	ft ²	lb	
4' dia. x 3' antenna	C	From Leg	0.00 0.00 3.00	0.0000	255.00	No Ice	13.10	9.60	785.00
5/8"x6-ft L Rod	B	From Leg	0.00 0.00 3.00	0.0000	255.00	No Ice	0.38	0.38	6.26
12" x 24" Beacon	C	From Leg	0.00 0.00 1.00	0.0000	255.00	No Ice	1.60	1.60	30.00

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	Client		Central Communications						Designed by		Rebecca H. Lalor, E.I.

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _v A _A Front ft ²	C _v A _A Side ft ²	Weight lb	

Side Arm Mount [SO 308-1]	C	From Leg	3.00 0.00 0.00	-45.0000	250.50	No Ice	0.98	3.03	53.00
DB224	C	From Leg	6.00 0.00 0.00	-45.0000	250.50	No Ice	3.15	3.15	32.00
6' 9" Standoff Mount	A	From Leg	10.00 3.38 0.00	0.0000	250.00	No Ice	1.33	7.93	123.40
DB420	A	From Leg	0.00 6.75 0.00	0.0000	248.00	No Ice	3.33	3.33	34.00
6' 9" Standoff Mount	B	From Leg	10.00 3.38 0.00	-20.0000	250.00	No Ice	1.33	7.93	123.40
DB420	B	From Leg	0.00 6.75 0.00	-20.0000	253.00	No Ice	3.33	3.33	34.00
DB224	B	From Leg	10.00 6.75 0.00	-20.0000	249.00	No Ice	3.15	3.15	32.00

Side Arm Mount [SO 308-1]	A	From Leg	3.00 0.00 0.00	-10.0000	250.00	No Ice	0.98	3.03	53.00
Side Arm Mount [SO 308-1]	A	From Leg	3.00 0.00 0.00	-10.0000	250.00	No Ice	0.98	3.03	53.00
Side Arm Mount [SO 308-1]	C	From Leg	3.00 0.00 0.00	90.0000	250.00	No Ice	0.98	3.03	53.00
BCD-80010EDIN25 w/ Mount Pipe	A	From Leg	6.00 0.00 0.00	0.0000	250.00	No Ice	4.37	4.37	48.90
BCD-80010EDIN25 w/ Mount Pipe	A	From Leg	6.00 0.00 0.00	0.0000	250.00	No Ice	4.37	4.37	48.90
BMR12 w/ Mount Pipe	C	From Leg	6.00 0.00 0.00	0.0000	250.00	No Ice	18.19	18.19	168.65
428D	C	From Leg	6.00 0.00 -5.00	0.0000	250.00	No Ice	0.54	0.46	8.90

Side Arm Mount [SO 308-1]	C	From Leg	3.00 0.00 0.00	10.0000	243.00	No Ice	0.98	3.03	53.00
DB224	C	From Leg	6.00 0.00 10.00	10.0000	240.50	No Ice	3.15	3.15	32.00

(2) C2x1x1/8x40" (Horizontal)	A	From Leg	1.67 0.00 0.00	-45.0000	231.50	No Ice	0.39	0.02	5.32
K552921 (HDB-155) 4 dipole	A	From Leg	3.33 0.00	-45.0000	231.50	No Ice	2.39	4.80	39.60

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	Client		Central Communications						Designed by		Rebecca H. Lalor, E.I.

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _v A _A Front ft ²	C _v A _A Side ft ²	Weight lb	

6' 9" Standoff Mount	B	From Leg	3.38 0.00 0.00	-30.0000	224.00	No Ice	1.33	7.93	123.40
DB420	B	From Leg	6.75 0.00 10.00	-30.0000	227.00	No Ice	3.33	3.33	34.00

Side Arm Mount [SO 308-1]	C	From Leg	3.00 0.00 0.00	35.0000	216.58	No Ice	0.98	3.03	53.00
DB224	C	From Leg	6.00 0.00 10.00	35.0000	214.92	No Ice	3.15	3.15	32.00

Side Arm Mount [SO 306-1]	B	From Leg	2.00 0.00 0.00	0.0000	207.00	No Ice	0.98	2.18	42.00
DB420	B	From Leg	4.00 0.00 -10.00	0.0000	207.50	No Ice	3.33	3.33	34.00

Sector Mount [SM 602-3]	C	None		0.0000	181.00	No Ice	33.11	33.11	1540.50
APXV9ERR18-C-A20 w/ Mount Pipe	A	From Leg	3.00 0.00 1.00	0.0000	181.00	No Ice	8.50	7.47	87.55
APXV9ERR18-C-A20 w/ Mount Pipe	B	From Leg	3.00 0.00 1.00	0.0000	181.00	No Ice	8.50	7.47	87.55
APXV9ERR18-C-A20 w/ Mount Pipe	C	From Leg	3.00 0.00 1.00	0.0000	181.00	No Ice	8.50	7.47	87.55
(4) RRUS 11	A	From Leg	2.00 0.00 1.00	0.0000	181.00	No Ice	3.25	1.37	47.62
(4) RRUS 11	B	From Leg	2.00 0.00 1.00	0.0000	181.00	No Ice	3.25	1.37	47.62
(4) RRUS 11	C	From Leg	2.00 0.00 1.00	0.0000	181.00	No Ice	3.25	1.37	47.62
(2) 6' x 6" x 3" Panel w/ Mount Pipe	A	From Leg	3.00 0.00 1.00	0.0000	181.00	No Ice	4.94	4.61	70.55
(2) 6' x 6" x 3" Panel w/ Mount Pipe	B	From Leg	3.00 0.00 1.00	0.0000	181.00	No Ice	4.94	4.61	70.55
(2) 6' x 6" x 3" Panel w/ Mount Pipe	C	From Leg	3.00 0.00 1.00	0.0000	181.00	No Ice	4.94	4.61	70.55
3.5" Dia. x 5' Mount Pipe	A	From Leg	0.50 0.00 0.00	0.0000	181.00	No Ice	1.50	1.50	45.48
3.5" Dia. x 5' Mount Pipe	B	From Leg	0.50 0.00 0.00	0.0000	181.00	No Ice	1.50	1.50	45.48

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _v A _A Front ft ²	C _v A _A Side ft ²	Weight lb	
3.5" Dia. x 5' Mount Pipe	C	From Leg	0.50 0.00 0.00	0.0000	181.00	No Ice	1.50	1.50	45.48

Side Arm Mount [SO 306-1]	C	From Leg	2.00 0.00 0.00	0.0000	171.67	No Ice	0.98	2.18	42.00
DB404	C	From Leg	4.00 0.00 -5.00	0.0000	172.00	No Ice	1.14	1.14	14.00

WB2900	C	From Leg	1.33 0.00 -1.00	0.0000	153.33	No Ice	0.25	0.21	1.50
2.4" x 2-ft pipe	C	From Leg	1.33 0.00 0.00	0.0000	153.33	No Ice	0.35	0.35	7.32

3" x 6" SideLight	A	From Leg	3.00 0.00 0.00	0.0000	131.00	No Ice	0.10	0.10	0.98
1.25" Pipe x 8-ft Horizontal Pipe	A	From Face	0.00 0.00 0.00	0.0000	131.00	No Ice	0.67	0.67	18.16
3" x 6" SideLight	C	From Leg	3.00 0.00 0.00	0.0000	131.00	No Ice	0.10	0.10	0.98
1.25" Pipe x 8-ft Horizontal Pipe	C	From Face	0.00 0.00 0.00	0.0000	131.00	No Ice	0.67	0.67	18.16
3" x 6" SideLight	B	From Leg	3.00 0.00 0.00	0.0000	131.00	No Ice	0.10	0.10	0.98

4.5" x 5' Dish Mount	C	From Leg	1.00 0.00 0.00	0.0000	124.00	No Ice	1.76	1.76	54.00

4.5" x 5' Dish Mount	C	From Leg	1.00 0.00 0.00	0.0000	118.00	No Ice	1.76	1.76	54.00

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight lb	
2.0' Dish	C	Paraboloid w/o	From	2.00	75.0000		153.33	2.00	No Ice	3.14	30.00

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Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight lb	
		Radome	Leg	0.00 0.00 0.00							

PAR6-59W	C	Paraboloid w/Radome	From Leg	2.00 0.00 0.00	63.0000		124.00	6.36	No Ice	31.75	143.00

PAR6-59W	C	Paraboloid w/Radome	From Leg	2.00 0.00 0.00	10.0000		118.00	6.36	No Ice	31.75	143.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	Dead+Wind 0 deg - Service
27	Dead+Wind 30 deg - Service
28	Dead+Wind 60 deg - Service
29	Dead+Wind 90 deg - Service
30	Dead+Wind 120 deg - Service
31	Dead+Wind 150 deg - Service
32	Dead+Wind 180 deg - Service
33	Dead+Wind 210 deg - Service
34	Dead+Wind 240 deg - Service
35	Dead+Wind 270 deg - Service
36	Dead+Wind 300 deg - Service
37	Dead+Wind 330 deg - Service

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Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	255 - 240	8.410	34	0.3475	0.0807
T2	240 - 220	7.323	34	0.3365	0.0726
T3	220 - 200	5.957	34	0.2999	0.0551
T4	200 - 180	4.768	34	0.2487	0.0387
T5	180 - 160	3.781	34	0.2160	0.0271
T6	160 - 140	2.916	34	0.1835	0.0208
T7	140 - 120	2.193	34	0.1496	0.0172
T8	120 - 100	1.591	34	0.1255	0.0144
T9	100 - 80	1.086	34	0.1009	0.0090
T10	80 - 60	0.691	30	0.0755	0.0059
T11	60 - 40	0.390	30	0.0545	0.0036
T12	40 - 20	0.178	30	0.0333	0.0020
T13	20 - 0	0.053	30	0.0118	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
255.00	4' dia. x 3' antenna	34	8.410	0.3475	0.0807	157931
253.00	DB420	34	8.264	0.3464	0.0798	157931
250.50	Side Arm Mount [SO 308-1]	34	8.081	0.3450	0.0786	157931
250.00	6' 9" Standoff Mount	34	8.045	0.3447	0.0783	157931
249.00	DB224	34	7.972	0.3441	0.0778	131609
248.00	DB420	34	7.899	0.3434	0.0773	112808
243.00	Side Arm Mount [SO 308-1]	34	7.538	0.3395	0.0745	65876
240.50	DB224	34	7.358	0.3371	0.0729	55021
231.50	(2) C2x1x1/8x40" (Horizontal)	34	6.726	0.3243	0.0657	36853
227.00	DB420	34	6.419	0.3157	0.0616	31803
224.00	6' 9" Standoff Mount	34	6.219	0.3093	0.0588	29143
216.58	Side Arm Mount [SO 308-1]	34	5.740	0.2912	0.0520	25010
214.92	DB224	34	5.636	0.2867	0.0505	24452
207.50	DB420	34	5.189	0.2669	0.0443	22268
207.00	Side Arm Mount [SO 306-1]	34	5.160	0.2656	0.0439	22135
181.00	Sector Mount [SM 602-3]	34	3.827	0.2174	0.0275	49253
172.00	DB404	34	3.420	0.2037	0.0241	41531
171.67	Side Arm Mount [SO 306-1]	34	3.406	0.2032	0.0240	41080
153.33	WB2900	34	2.659	0.1716	0.0194	32549
153.33	2.0' Dish	34	2.659	0.1716	0.0194	32550
131.00	3" x 6" SideLight	34	1.909	0.1379	0.0161	45900
124.00	PAR6-59W	34	1.703	0.1300	0.0152	51811
118.00	PAR6-59W	34	1.536	0.1232	0.0139	53384

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	255 - 240	37.957	18	1.5405	0.3685

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
255.00	4' dia. x 3' antenna	18	37.957	1.5405	0.3685	43973
253.00	DB420	18	37.308	1.5374	0.3643	43973
250.50	Side Arm Mount [SO 308-1]	18	36.498	1.5332	0.3589	43973
250.00	6' 9" Standoff Mount	18	36.336	1.5322	0.3577	43973
249.00	DB224	18	36.012	1.5303	0.3555	36644
248.00	DB420	18	35.689	1.5282	0.3532	31409
243.00	Side Arm Mount [SO 308-1]	18	34.079	1.5147	0.3404	18315
240.50	DB224	18	33.280	1.5054	0.3330	15112
231.50	(2) C2x1x1/8x40" (Horizontal)	18	30.451	1.4536	0.3002	9092
227.00	DB420	18	29.074	1.4175	0.2814	7570
224.00	6' 9" Standoff Mount	18	28.173	1.3900	0.2686	6811
216.58	Side Arm Mount [SO 308-1]	18	26.018	1.3112	0.2375	5713
214.92	DB224	18	25.549	1.2919	0.2308	5577
207.50	DB420	18	23.537	1.2045	0.2025	5050
207.00	Side Arm Mount [SO 306-1]	18	23.406	1.1988	0.2007	5018
181.00	Sector Mount [SM 602-3]	18	17.374	0.9845	0.1258	10992
172.00	DB404	18	15.532	0.9229	0.1100	9225
171.67	Side Arm Mount [SO 306-1]	18	15.465	0.9205	0.1095	9124
153.33	WB2900	18	12.079	0.7784	0.0885	7206
153.33	2.0' Dish	18	12.079	0.7784	0.0885	7206
131.00	3" x 6" SideLight	18	8.676	0.6258	0.0736	10142
124.00	PAR6-59W	18	7.741	0.5899	0.0692	11465
118.00	PAR6-59W	10	6.983	0.5592	0.0637	11818

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load Allowable	Allowable Ratio	Criteria
T1	255	Leg	A325N	0.7500	3	3259.99	29820.60	0.109	1	Bolt Tension Member Block Shear Member Bearing
		Diagonal	A325X	0.5000	2	1607.37	5301.56	0.303	1	
		Top Girt	A325X	0.5000	1	205.46	6198.75	0.033	1	

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Section No.	Elevation	Component Type	Bolt Grade	Bolt Size	Number Of Bolts	Maximum Load per Bolt	Allowable Load	Ratio Load Allowable	Allowable Ratio	Criteria
	ft			in		lb	lb			
T2	240	Leg	A325N	0.8750	4	9856.13	40589.10	0.243	1	Bolt Tension
		Diagonal	A325X	0.5000	2	2215.89	5301.56	0.418		Member Block Shear
T3	220	Leg	A325N	0.8750	4	20058.40	40589.10	0.494	1	Bolt Tension
		Diagonal	A325X	0.5000	2	3270.06	5811.33	0.563	1	Member Block Shear
T4	200	Leg	A325N	1.0000	6	17998.50	53014.40	0.340	1	Bolt Tension
		Diagonal	A325X	0.5000	2	1935.03	5811.33	0.333	1	Member Block Shear
T5	180	Leg	A325N > 1	1.5000	4	35603.10	119282.00	0.298	1	Bolt Tension
		Diagonal	A325X	0.5000	2	2867.46	5811.33	0.493	1	Member Block Shear
T6	160	Leg	A325N > 1	1.5000	6	29612.50	119282.00	0.248	1	Bolt Tension
		Diagonal	A325X	0.7500	1	6236.04	9404.30	0.663	1	Member Block Shear
T7	140	Leg	A325N > 1	1.5000	6	34822.70	119282.00	0.292	1	Bolt Tension
		Diagonal	A325X	0.7500	1	8332.45	10423.80	0.799	1	Member Block Shear
T8	120	Leg	A325N > 1	1.5000	6	40978.30	119282.00	0.344	1	Bolt Tension
		Diagonal	A325X	0.7500	1	9887.67	10423.80	0.949	1	Member Block Shear
T9	100	Leg	A325N > 1	1.5000	6	47242.70	119282.00	0.396	1	Bolt Tension
		Diagonal	A325X	0.7500	1	10360.00	13898.40	0.745	1	Member Block Shear
T10	80	Leg	A325N > 1	1.5000	6	53343.20	119282.00	0.447	1	Bolt Tension
		Diagonal	A325X	0.7500	1	10893.30	13898.40	0.784	1	Member Block Shear
T11	60	Leg	A325N > 1	1.5000	6	59433.60	119282.00	0.498	1	Bolt Tension
		Diagonal	A325X	0.6250	2	5806.53	12192.20	0.476	1	Member Block Shear
T12	40	Leg	A325N > 1	1.5000	6	65384.10	119282.00	0.548	1	Bolt Tension
		Diagonal	A325X	0.6250	2	6030.97	12192.20	0.495	1	Member Block Shear
T13	20	Diagonal	A325X	0.6250	2	6732.84	15186.40	0.443	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation	Size	L	L _w	KI/r	A	P _n	ΦP _n	Ratio P _n / ΦP _n
	ft		ft	ft		in ²	lb	lb	
T1	255 - 240	Pipe 2.5 STD	15.00	5.00	63.3	1.7040	-12742.10	53865.90	0.237 ¹
									K=1.00

Section No.	Elevation	Size	L	L _w	KI/r	A	P _n	ΦP _n	Ratio P _n / ΦP _n
	ft		ft	ft		in ²	lb	lb	
T2	240 - 220	PIPE 3.5 STD	20.00	5.00	44.9	2.6795	-44551.60	96872.30	0.460 ¹
									K=1.00
T3	220 - 200	Pipe 5 STD	20.00	6.67	42.6	4.2974	-88058.30	157444.00	0.559 ¹
									K=1.00
T4	200 - 180	PIPE 8 STD (SCH40)	20.02	6.67	27.3	8.3993	-120397.00	330771.00	0.364 ¹
									K=1.00
T5	180 - 160	PIPE 8 STD (SCH40)	20.02	6.67	27.3	8.3993	-157923.00	330771.00	0.477 ¹
									K=1.00
T6	160 - 140	PIPE 8 STD (SCH40)	20.02	6.67	27.3	8.3993	-196255.00	330771.00	0.593 ¹
									K=1.00
T7	140 - 120	Pipe 10 STD (SCH40)	20.02	10.01	32.5	11.9656	-231031.00	461312.00	0.501 ¹
									K=1.00
T8	120 - 100	Pipe 10 STD (SCH40)	20.02	10.01	32.5	11.9656	-271670.00	461312.00	0.589 ¹
									K=1.00
T9	100 - 80	Pipe 10 STD (SCH40)	20.02	10.01	32.5	11.9656	-312679.00	461312.00	0.678 ¹
									K=1.00
T10	80 - 60	Pipe 12 STD	20.02	10.01	27.4	14.5790	-353403.00	573746.00	0.616 ¹
									K=1.00
T11	60 - 40	Pipe 12 STD	20.02	10.01	27.4	14.5790	-394550.00	573746.00	0.688 ¹
									K=1.00
T12	40 - 20	Pipe 12 STD	20.02	10.01	27.4	14.5790	-435406.00	573746.00	0.759 ¹
									K=1.00
T13	20 - 0	Pipe 12 SCH 80	20.02	10.01	28.1	26.1424	-477259.00	1026190.00	0.465 ¹
									K=1.00

¹ P_n / ΦP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation	Size	L	L _w	KI/r	A	P _n	ΦP _n	Ratio P _n / ΦP _n
	ft		ft	ft		in ²	lb	lb	
T1	255 - 240	L1 3/4x1 3/4x3/16	7.07	3.19	113.6	0.6211	-3222.66	10205.20	0.316 ¹
									K=1.02
T2	240 - 220	L1 3/4x1 3/4x3/16	7.07	3.12	111.8	0.6211	-4452.03	10417.70	0.427 ¹
									K=1.02
T3	220 - 200	L2x2x3/16	8.33	3.60	112.3	0.7150	-6979.21	11924.80	0.585 ¹
									K=1.02
T4	200 - 180	L2x2x3/16	9.24	4.12	124.3	0.7150	-4138.10	10275.80	0.403 ¹
									K=0.99
T5	180 - 160	L2x2x3/16	10.46	4.77	139.2	0.7150	-5885.40	8336.13	0.706 ¹
									K=0.96
T6	160 - 140	L2 1/2x2 1/2x3/16	11.79	5.48	132.9	0.9020	-6392.38	11534.80	0.554 ¹
									K=1.00
T7	140 - 120	L3x3x3/16	15.06	7.06	142.1	1.0900	-8542.10	12189.90	0.701 ¹
									K=1.00
T8	120 - 100	L3x3x3/16	16.34	7.72	155.4	1.0900	-10196.90	10196.90	1.000 ¹
									K=1.00
T9	100 - 80	L3x3x1/4	17.69	8.40	154.4	1.4400	-10675.00	11209.10	0.952 ¹
									K=1.00
T10	80 - 60	L3x3x1/4	19.08	9.02	182.8	1.4400	-11214.10	9737.46	1.152 ¹
									K=1.00
T11	60 - 40	4.9-3 (1.15 CR) - 185 L3 1/2x3 1/2x1/4	20.52	9.68	156.1	1.6900	-11942.30	15665.80	0.762 ¹
									K=0.93
T12	40 - 20	L3 1/2x3 1/2x1/4	21.99	10.42	165.9	1.6900	-12498.70	13872.90	0.901 ¹

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Section No.	Elevation	Size	L	L _n	KI/r	A	P _n	φP _n	Ratio P _n / φP _n	
	ft		ft	ft		in ²	lb	lb		
T13	20 - 0	L3 1/2x3 1/2x5/16	23.49	11.17		K=0.92 176.7 K=0.91	2.0900	-13465.70	15125.40	0.890 ¹

¹ P_n / φP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation	Size	L	L _n	KI/r	A	P _n	φP _n	Ratio P _n / φP _n	
	ft		ft	ft		in ²	lb	lb		
T1	255 - 240	L2 1/2x2 1/2x3/16	5.00	4.55		115.2 K=1.04	0.9020	-226.26	14536.40	0.016 ¹

¹ P_n / φP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation	Size	L	L _n	KI/r	A	P _n	φP _n	Ratio P _n / φP _n
	ft		ft	ft		in ²	lb	lb	
T1	255 - 240	Pipe 2.5 STD	15.00	5.00	63.3	1.7040	9779.96	70547.70	0.139 ¹
T2	240 - 220	PIPE 3.5 STD	20.00	5.00	44.9	2.6795	39424.50	110933.00	0.355 ¹
T3	220 - 200	Pipe 5 STD	20.00	6.67	42.6	4.2974	80233.40	177914.00	0.451 ¹
T4	200 - 180	PIPE 8 STD (SCH40)	20.02	6.67	27.3	8.3993	107991.00	347729.00	0.311 ¹
T5	180 - 160	PIPE 8 STD (SCH40)	20.02	6.67	27.3	8.3993	142412.00	347729.00	0.410 ¹
T6	160 - 140	PIPE 8 STD (SCH40)	20.02	6.67	27.3	8.3993	177675.00	347729.00	0.511 ¹
T7	140 - 120	Pipe 10 STD (SCH40)	20.02	10.01	32.5	11.9656	208936.00	495377.00	0.422 ¹
T8	120 - 100	Pipe 10 STD (SCH40)	20.02	10.01	32.5	11.9656	245870.00	495377.00	0.496 ¹
T9	100 - 80	Pipe 10 STD (SCH40)	20.02	10.01	32.5	11.9656	283456.00	495377.00	0.572 ¹
T10	80 - 60	Pipe 12 STD	20.02	10.01	27.4	14.5790	320059.00	603569.00	0.530 ¹
T11	60 - 40	Pipe 12 STD	20.02	10.01	27.4	14.5790	356601.00	603569.00	0.591 ¹
T12	40 - 20	Pipe 12 STD	20.02	10.01	27.4	14.5790	392304.00	603569.00	0.650 ¹
T13	20 - 0	Pipe 12 SCH 80	20.02	10.01	28.1	26.1424	426814.00	1082300.00	0.394 ¹

¹ P_n / φP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation	Size	L	L _n	KI/r	A	P _n	φP _n	Ratio P _n / φP _n
	ft		ft	ft		in ²	lb	lb	

tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	Franklin Street	Page	28 of 29
	Project	TEP# 26513_12261, Revision 1	Date	13:49:19 12/13/13
	Client	Central Communications	Designed by	Rebecca H. Lalor, E.I.

Section No.	Elevation	Size	L	L _n	KI/r	A	P _n	φP _n	Ratio P _n / φP _n	
	ft		ft	ft		in ²	lb	lb		
T1	255 - 240	L1 3/4x1 3/4x3/16	7.07	3.19		75.2	0.3779	3214.73	16439.90	0.196 ¹
T2	240 - 220	L1 3/4x1 3/4x3/16	7.07	3.12		73.7	0.3779	4431.79	16439.90	0.270 ¹
T3	220 - 200	L2x2x3/16	8.33	3.60		73.5	0.4484	6540.12	19503.60	0.335 ¹
T4	200 - 180	L2x2x3/16	9.24	4.12		83.6	0.4484	3870.06	19503.60	0.198 ¹
T5	180 - 160	L2x2x3/16	10.04	4.56		92.1	0.4484	5734.92	19503.60	0.294 ¹
T6	160 - 140	L2 1/2x2 1/2x3/16	11.34	5.26		83.4	0.5535	6236.04	24075.20	0.259 ¹
T7	140 - 120	L3x3x3/16	15.06	7.06		92.1	0.6945	8332.45	30208.70	0.276 ¹
T8	120 - 100	L3x3x3/16	16.34	7.72		100.5	0.6945	9887.67	30208.70	0.327 ¹
T9	100 - 80	L3x3x1/4	17.69	8.40		110.3	0.9159	10360.00	39843.30	0.260 ¹
T10	80 - 60	L3x3x1/4	19.08	9.02		118.2	0.9159	10893.30	39843.30	0.273 ¹
		4.9-3 (1.11 CR) - 184								
T11	60 - 40	L3 1/2x3 1/2x1/4	20.52	9.68		108.9	1.1269	11613.10	49019.10	0.237 ¹
T12	40 - 20	L3 1/2x3 1/2x1/4	21.99	10.42		117.1	1.1269	12061.90	49019.10	0.246 ¹
T13	20 - 0	L3 1/2x3 1/2x5/16	23.49	11.17		126.5	1.3917	13152.40	60539.80	0.217 ¹

¹ P_n / φP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation	Size	L	L _n	KI/r	A	P _n	φP _n	Ratio P _n / φP _n	
	ft		ft	ft		in ²	lb	lb		
T1	255 - 240	L2 1/2x2 1/2x3/16	5.00	4.55		73.4	0.5886	205.46	25604.50	0.008 ¹

¹ P_n / φP_n controls

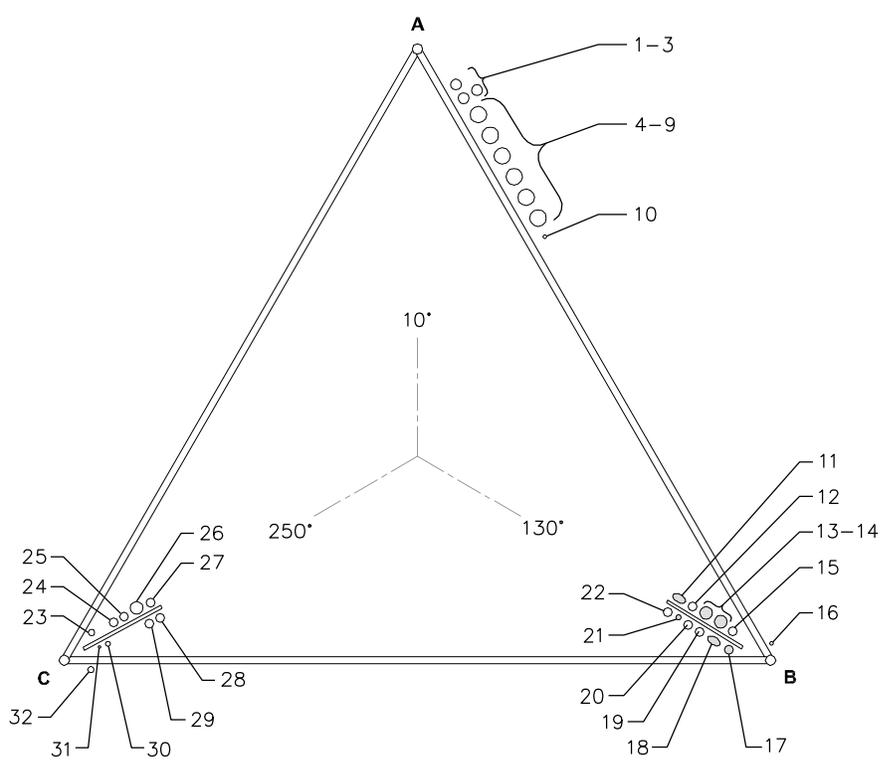
Section Capacity Table

Section No.	Elevation	Component Type	Size	Critical Element	P lb	φP _{allow} lb	% Capacity	Pass Fail
T1	255 - 240	Leg	Pipe 2.5 STD	1	-12742.10	53865.90	23.7	Pass
T2	240 - 220	Leg	PIPE 3.5 STD	25	-44551.60	96872.30	46.0	Pass
T3	220 - 200	Leg	Pipe 5 STD	52	-88058.30	157444.00	55.9	Pass
T4	200 - 180	Leg	PIPE 8 STD (SCH40)	73	-120397.00	330771.00	36.4	Pass
T5	180 - 160	Leg	PIPE 8 STD (SCH40)	94	-157923.00	330771.00	47.7	Pass
T6	160 - 140	Leg	PIPE 8 STD (SCH40)	115	-196255.00	330771.00	59.3	Pass
T7	140 - 120	Leg	Pipe 10 STD (SCH40)	136	-231031.00	461312.00	50.1	Pass
T8	120 - 100	Leg	Pipe 10 STD (SCH40)	151	-271670.00	461312.00	58.9	Pass
T9	100 - 80	Leg	Pipe 10 STD (SCH40)	166	-312679.00	461312.00	67.8	Pass
T10	80 - 60	Leg	Pipe 12 STD	181	-353403.00	573746.00	61.6	Pass
T11	60 - 40	Leg	Pipe 12 STD	196	-394550.00	573746.00	68.8	Pass
T12	40 - 20	Leg	Pipe 12 STD	212	-435406.00	573746.00	75.9	Pass
T13	20 - 0	Leg	Pipe 12 SCH 80	227	-477259.00	1026190.00	46.5	Pass
T1	255 - 240	Diagonal	L1 3/4x1 3/4x3/16	11	-3222.66	10205.20	31.6	Pass
T2	240 - 220	Diagonal	L1 3/4x1 3/4x3/16	38	-4452.03	10417.70	42.7	Pass
T3	220 - 200	Diagonal	L2x2x3/16	59	-6979.21	11924.80	58.5	Pass
T4	200 - 180	Diagonal	L2x2x3/16	80	-4138.10	10275.80	40.3	Pass
T5	180 - 160	Diagonal	L2x2x3/16	101	-5885.40	8336.13	70.6	Pass
T6	160 - 140	Diagonal	L2 1/2x2 1/2x3/16	123	-6392.38	11534.80	55.4	Pass
						66.3 (b)		
T7	140 - 120	Diagonal	L3x3x3/16	140	-8542.10	12189.90	70.1	Pass

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	Client	Central Communications	Designed by	Rebecca H. Lalor, E.I.

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail	
79.9 (b)									
T8	120 - 100	Diagonal	L3x3x3/16	155	-10196.90	10196.90	100.0	Pass	
T9	100 - 80	Diagonal	L3x3x1/4	170	-10675.00	11209.10	95.2	Pass	
T10	80 - 60	Diagonal	L3x3x1/4	185	-11214.10	9737.46	115.2	Fail	
T11	60 - 40	Diagonal	L3 1/2x3 1/2x1/4	200	-11942.30	15665.80	76.2	Pass	
T12	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	215	-12498.70	13872.90	90.1	Pass	
T13	20 - 0	Diagonal	L3 1/2x3 1/2x5/16	230	-13465.70	15125.40	89.0	Pass	
T1	255 - 240	Top Girt	L2 1/2x2 1/2x3/16	5	-226.26	14536.40	1.6	Pass	
3.3 (b)									
Summary									
							Leg (T12)	75.9	Pass
							Diagonal (T10)	115.2	Fail
							Top Girt (T1)	3.3	Pass
							Bolt Checks	94.9	Pass
							RATING =	115.2	Fail

APPENDIX B
COAX CONFIGURATION



Coax #	Type	Size	Height	Carrier	Notes
1-3	SM	1 1/16" Ø	1'-182'	SPRINT	
4-9	FH	1 5/8	3'-182'	SPRINT	
10	SM	3/8" Ø	3'-182'	SPRINT	
11	EW	EUG3	5'-118'	COLUMBIA COUNTY	PROPOSED
12	FH	7/8	6'-231.5'	COLUMBIA COUNTY	
13-14	FH	1 1/4	5'-250'	COLUMBIA COUNTY	PROPOSED
15	FH	7/8	6'-207.5'	COLUMBIA COUNTY	
16	SM	3/8" Ø	5'-255'	-	BEACON
17	FH	7/8	5'-250'	COLUMBIA COUNTY	PROPOSED
18	EW	EUG3	5'-124'	COLUMBIA COUNTY	PROPOSED
19	FH	7/8	6'-253'	COLUMBIA COUNTY	
20	FH	7/8	6'-249'	COLUMBIA COUNTY	
21	FH	1/2	5'-245'	COLUMBIA COUNTY	PROPOSED
22	FH	7/8	6'-248'	COLUMBIA COUNTY	
23	SM	5/8" Ø	9'-131'	-	SIDE LIGHTS
24	FH	7/8	5'-260.5'	COLUMBIA COUNTY	

COAX CONFIGURATION

SCALE: N.T.S.

PREPARED BY:  TOWER ENGINEERING PROFESSIONALS 3703 JUNCTION BOULEVARD RALEIGH, NC 27603-5263 (919) 661-6351 www.tepgroup.net	PREPARED FOR: CENTRAL COMMUNICATIONS 263 NW LAKE CITY AVENUE LAKE CITY, FL 32055	PROJECT INFORMATION: FRANKLIN STREET 259 NE FRANKLIN STREET LAKE CITY, FL 32055 (COLUMBIA COUNTY)	REVISION: 1 TEP JOB #: 26513_12261 SHEET NUMBER: <h1 style="text-align: center;">S-1</h1>
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Columbia County APCO P25 700MHz Radio System Project RFP - 2017 - O

Vendor Questions and Answers

Lulu Tower Additional Information



Tower Engineering Professionals
 326 Tryon Road
 Raleigh, NC 27603
 (919) 661-6351
mgardner@tepgroup.net

Date: **April 25, 2016**

Lawrence Wilson
 Central Communications
 263 NW Lake City Ave.
 Lake City, FL 32055
 (386) 758-1125

Subject: Structural Analysis Report

Carrier Designation: *Columbia County Reconfiguration*
Carrier Site Name: Lulu
Carrier Site Number: Unknown

Engineering Firm Designation: **TEP Project Number:** 67865_45994

Site Data: **Lulu Comm Center, Lulu, Columbia County, FL 32054**
Latitude 30° 6' 35.11", Longitude -82° 29' 43.50"
149 Foot - Monopole Tower

Dear Mr. Wilson,

Tower Engineering Professionals is pleased to submit this “**Structural Analysis Report**” to determine the structural integrity of the above mentioned tower.

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, under the following load case, to be:

LC1: Existing + Proposed Equipment **Sufficient Capacity**
 Note: See Table 1 for the existing and proposed loading

Structure Capacity	Controlling Component
54.1%	Pole (L3) : 47.0033 to 0 ft.

This analysis has been performed in accordance with the ANSI/TIA-222-G-2-2009 Structural Standard for Antenna Supporting Structures and Antennas – Addendum 2 and the 2014 Florida Building Code, 5th Edition, based upon an ultimate 3-second gust wind speed of 120 mph converted to a nominal 3-second gust wind speed of 93 mph per Section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C, with a maximum Topographic Factor Kzt, of 1.0 and Risk Category II were used in this analysis.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 and the attached drawings for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals* appreciate the opportunity of providing our continuing professional services to you and *Central Communications*. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Sean M. Rock, E.I.

Respectfully submitted by:

Graham M. Andres, P.E.



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Coax Configuration

1) INTRODUCTION

This tower is a 149-ft monopole tower located in Columbia County, Florida. The original design criteria were unavailable for review. TEP visited the site in April of 2016 to collect steel and appurtenance information. All other information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the ANSI/TIA-222-G-2-2009 Structural Standard for Antenna Supporting Structures and Antennas – Addendum 2 and the 2014 Florida Building Code, 5th Edition based upon an ultimate 3-second gust wind speed of 120 mph converted to a nominal 3-second gust wind speed of 93 per section 1609.3.1 as required for the use in the TIA-222-G Standard per Exception #5 of section 1609.1.1, and 60 mph under service loads. Risk Category II was used in this analysis with the following design criteria:

- 1) Type of Analysis: **Feasibility Structural Analysis**
- 2) Classification of Structure: **Class II**
Definition: Structures used for services that due to height, use or location represent a significant hazard to human life and/or damage to property in the event of failure and/or used for services that may be provided by other means.
- 3) Exposure Category: **Exposure C**
Definition: Open terrain with scattered obstructions having heights generally less than 30-ft. This category includes flat, open country, grasslands and shorelines in hurricane prone regions.
- 4) Topographic Category: **Category 1**
Definition: No abrupt changes in general topography, e.g. flat or rolling terrain, no wind speed-up consideration shall be required.
- 5) Earthquake Category: **Not Considered**
Commentary: Earthquake effects may be ignored per this standard for site locations where Ss does not exceed 1.0. (Site Location Ss = 0.098).

Table 1 - Existing and Proposed Antenna and Cable Information

Existing/ Proposed	Elevation (ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size	Coax ¹ Location	Owner/ Tenant
Existing	151.8	2	Radiowave 101876-2	(3) Standoff Mounts	2	3/8"∅ 7/8	Inside	Columbia County
		2	PTP 50650					
	149.8	1	Andrew DB224-A					
Proposed	145.0	1	Sinclair SE4192-SWBPALDF	(2) Side Arm Mounts	2²	1-5/8²	Inside	Columbia County
		1	Sinclair SC412-HF2LDF					
Proposed	130.0	1	RFS SC3-W60AC	Pipe Mount	1²	1-5/8²	Inside	Columbia County
Proposed	117.0	1	RFS SC3-W60AC	Pipe Mount	1²	1-5/8²	Inside	Columbia County

Notes:

- 1) See "Appendix B – Coax Configuration" for assumed coax configuration.
- 2) Coax size and quantity was assumed by TEP.

Table 2 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Qty Coax	Coax Size (in)	Coax Location
UNKNOWN							

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Tower and Appurtenance Mapping	Tower Engineering Professionals, Inc. dated April 18, 2016	67865_45994	TEP
Correspondence	Correspondence from Central Communications, with regards to the existing and proposed loading	-	Central Communicaions

3.1) Analysis Method

tnxTower (version 7.0.5.1), 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) The tower and foundation were built in accordance with the manufacturer's specifications.
- 2) The tower and foundation 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 Table 1 and "Appendix B – Coax Configuration".
- 4) All tower components are in sufficient condition to carry their full design capacity.
- 5) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance. See Table 6.
- 6) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.
- 7) The following material grades were assumed:
 - a) Connection bolts: ASTM A572-65
 - b) Anchor bolts: ASTM A615-J Gr. 75
 - c) Leg grade: ASTM A572-50

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	ϕP_{allow} (lb)	% Capacity	Pass / Fail
L1	148.833 - 96.0433	Pole	TP30.48x14x0.25	1	-5234.18	1544690.00	42.1	Pass
L2	96.0433 - 47.0033	Pole	TP45.41x28.8093x0.3125	2	-12924.60	2622100.00	45.5	Pass
L3	47.0033 - 0	Pole	TP59.71x43.024x0.3438	3	-26631.90	3363020.00	54.1	Pass
							Summary	
						Pole (L3)	54.1	Pass
						RATING =	54.1	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
-	Anchor Rods	-	51.0	Pass
-	Base Plate	-	37.1	Pass

Structure Rating (max from all components) =	54.1%
---	--------------

Table 6 - Dish Twist/Sway Results for 60 mph Service Wind Speed

Elevation (ft)	Dish Model	Beam Deflection		
		Deflection (in)	Tilt (deg)	Twist (deg)
150.80	Radiowaves 101876-2	14.628	1.0350	0.0798
130.00	RFS SC3-W60AC	10.958	0.8683	0.0501
117.00	RFS SC3-W60AC	8.592	0.7554	0.0321

4.1) Recommendations

- 1) If the load differs from that described in Table 1 of this report, "Appendix B – Coax Configuration" or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
- 2) The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.
- 3) TEP did not have sufficient information to perform a foundation analysis. Provide TEP with foundation drawings and a geotechnical report for this site in order to determine the substructure capacity. If this information is not available, TEP recommends a foundation mapping and geotechnical investigation.
- 4) Prior to acceptance of changed configuration a rigorous structural analysis shall be performed in order to determine the overall stability and the adequacy of the structural members, foundations and connections.

APPENDIX A
TNXTOWER OUTPUT

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
5'3" Standoff Mount - 3	148.8	PTP 650	148.8
2.4" Dia. x 5-ft Pipe	148.8	PTP 650	148.8
2.4" Dia. x 5-ft Pipe	148.8	2.0' Dish	148.8
2.4" Dia. x 5-ft Pipe	148.8	2.0' Dish	148.8
2.4" Dia. x 5-ft Pipe	148.8	Side Arm Mount [SO 602-1]	145
2.4" Dia. x 5-ft Pipe	148.8	SC412-HF2LDF	145
2.4" Dia. x 5-ft Pipe	148.8	Side Arm Mount [SO 602-1]	145
2.4" Dia. x 5-ft Pipe	148.8	SE4192-SWBALDF(DXX)	145
2.4" Dia. x 5-ft Pipe	148.8	Pipe Mount [PM 602-1]	130
2.4" Dia. x 5-ft Pipe	148.8	RFS SC3-W60AC	130
2.4" Dia. x 5-ft Pipe	148.8	Pipe Mount [PM 602-1]	117
DB224-A	148.8	RFS SC3-W60AC	117

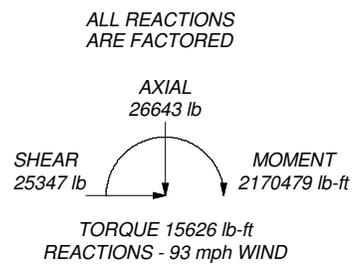
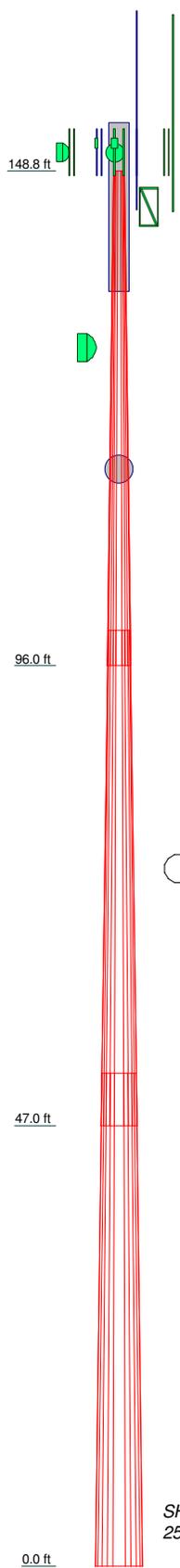
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Columbia County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 93 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 54.1%

Section	1	2	3
Length (ft)	52.79	52.79	52.60
Number of Sides	12	12	12
Thickness (in)	0.2500	0.3125	0.3438
Socket Length (ft)	3.75	5.60	43.0240
Top Dia (in)	14.0000	28.8083	59.7100
Bot Dia (in)	30.4800	45.4100	10109.2
Grade	A572-65	A572-65	
Weight (lb)	3179.9	6651.3	19940.3



 <p>Tower Engineering Professionals 326 Tryon Rd. Raleigh, NC 27603 Phone: 919-661-6351 FAX: 919-661-6350</p>	Job: Lulu
	Project: TEP#67865_45994
	Client: Central Communications Drawn by: Sean Rock App'd:
	Code: TIA-222-G Date: 04/25/16 Scale: NTS
	Path: T:\67865\45994_Lulu\79613_SAI\Rev 0\Tmx\TEP#67865_45994_Lulu.eri Dwg No. E-1

tnxTower Tower Engineering Professionals 326 Tryon Rd. Raleigh, NC 27603 Phone: 919-661-6351 FAX: 919-661-6350	Job	Lulu	Page	1 of 8
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	Client	Central Communications	Designed by	Sean Rock

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	Project	TEP#67865_45994	Date	09:52:00 04/25/16
	Client	Central Communications	Designed by	Sean Rock

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 Columbia County, Florida.

Basic wind speed of 93 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

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.

Options

- Consider Moments - Legs
- Consider Moments - Horizontals
- Consider Moments - Diagonals
- Use Moment Magnification
- √ Use Code Stress Ratios
- √ Use Code Safety Factors - Guys
- Escalate Ice
- Always Use Max Kz
- Use Special Wind Profile
- Include Bolts In Member Capacity
- Leg Bolts Are At Top Of Section
- Secondary Horizontal Braces Leg
- Use Diamond Inner Bracing (4 Sided)
- SR Members Have Cut Ends
- SR Members Are Concentric

- Distribute Leg Loads As Uniform
- Assume Legs Pinned
- √ Assume Rigid Index Plate
- √ Use Clear Spans For Wind Area
- Use Clear Spans For KL/r
- Retension Guys To Initial Tension
- √ Bypass Mast Stability Checks
- √ Use Azimuth Dish Coefficients
- √ Project Wind Area of Appurt.
- Autocalc Torque Arm Areas
- Add IBC .6D+W Combination
- Sort Capacity Reports By Component
- Triangulate Diamond Inner Bracing
- Treat Feed Line Bundles As Cylinder

- Use ASCE 10 X-Brace Ly Rules
- Calculate Redundant Bracing Forces
- Ignore Redundant Members in FEA
- SR Leg Bolts Resist Compression
- All Leg Panels Have Same Allowable
- Offset Girt At Foundation
- √ Consider Feed Line Torque
- Include Angle Block Shear Check
- Use TIA-222-G Bracing Resist. Exemption
- Use TIA-222-G Tension Splice Exemption Poles
- √ Include Shear-Torsion Interaction
- Always Use Sub-Critical Flow
- Use Top Mounted Sockets

Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	148.83-96.04	52.79	3.75	12	14.0000	30.4800	0.2500	1.0000	A572-65 (65 ksi)
L2	96.04-47.00	52.79	5.60	12	28.8093	45.4100	0.3125	1.2500	A572-65 (65 ksi)
L3	47.00-0.00	52.60		12	43.0240	59.7100	0.3438	1.3750	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia.	Area	I	r	C	I/C	J	I/Q	w	w/t
	in	in ²	in ⁴	in	in	in ³	in ⁴	in ²	in	
L1	14.4939	11.0688	267.1099	4.9225	7.2520	36.8326	541.2370	5.4477	3.0820	12.328
	31.5552	24.3352	2838.5482	10.8223	15.7886	179.7842	5751.6682	11.9770	7.4986	29.995
L2	31.0465	28.6749	2972.2218	10.2019	14.9232	199.1675	6022.5271	14.1129	6.8834	22.027
	47.0119	45.3794	11780.1073	16.1449	23.5224	500.8042	23869.6911	22.3343	11.3324	36.264
L3	46.3807	47.2417	10984.1144	15.2795	22.2864	492.8612	22256.7937	23.2509	10.6092	30.863
	61.8163	65.7110	29559.9285	21.2531	30.9298	955.7109	59896.4291	32.3410	15.0810	43.872

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _v	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1	148.83-96.04			1	1	1			
L2	96.04-47.00			1	1	1			
L3	47.00-0.00			1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C _v A _a	Weight
				ft		ft ² /ft	plf
Ladder Rung - 5/8 SR (7" Width, 31" Step)	C	No	CaAa (Out Of Face)	148.80 - 9.50	1	No Ice	0.01
3/8" Coax	C	No	Inside Pole	148.80 - 9.75	2	No Ice	0.00
LDF5-50A (7/8 FOAM)	C	No	Inside Pole	148.80 - 9.75	1	No Ice	0.00
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	145.00 - 130.00	2	No Ice	0.00
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	130.00 - 117.00	3	No Ice	0.00
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	117.00 - 9.75	4	No Ice	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation	Face	A _R	A _F	C _v A _a In Face	C _v A _a Out Face	Weight
	ft		ft ²	ft ²	ft ²	ft ²	lb
L1	148.83-96.04	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.744	163.09
L2	96.04-47.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.691	195.96
L3	47.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.529	148.92

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Feed Line Center of Pressure

Section	Elevation	CP _x	CP _z	CP _x	CP _z
		in	in	Ice in	Ice in
	ft				
L1	148.83-96.04	-0.0176	0.0101	-0.0176	0.0101
L2	96.04-47.00	-0.0176	0.0102	-0.0176	0.0102
L3	47.00-0.00	-0.0137	0.0079	-0.0137	0.0079

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _o No Ice	K _o Ice
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Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight lb	
5'3" Standoff Mount - 3 *****	C	None		0.0000	148.80	No Ice	10.43	10.43	754.87
2.4" Dia. x 5-ft Pipe	A	From Leg	5.25 -0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	B	From Leg	5.25 0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	B	From Leg	5.25 -0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	C	From Leg	5.25 0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	C	From Leg	5.25 -0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe *****	A	From Face	1.88 0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	A	From Face	1.88 -0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	B	From Face	1.88 -0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	C	From Face	1.88 0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30
2.4" Dia. x 5-ft Pipe	C	From Face	1.88 -0.50 2.00	45.0000	148.80	No Ice	1.20	1.20	18.30

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight lb	
***** DB224-A	B	From Face	1.88 -0.50 6.50	45.0000	148.80	No Ice	6.20	2.66	35.00
PTP 650	C	From Face	1.88 0.50 3.00	45.0000	148.80	No Ice	0.83	0.38	8.95
PTP 650	C	From Leg	1.88 0.50 3.00	45.0000	148.80	No Ice	0.83	0.38	8.95
***** Side Arm Mount [SO 602-1]	A	From Leg	3.00 0.00 0.00	-60.0000	145.00	No Ice	2.72	12.93	145.70
SE4192-SWBPALDF(DXX)	A	From Leg	6.00 0.00 0.00	-60.0000	145.00	No Ice	54.55	25.50	68.00
Side Arm Mount [SO 602-1]	B	From Leg	3.00 0.00 0.00	0.0000	145.00	No Ice	2.72	12.93	145.70
SC412-HF2LDF	B	From Leg	6.00 0.00 10.00	0.0000	145.00	No Ice	7.40	7.40	79.00
***** Pipe Mount [PM 602-1]	C	From Leg	1.00 0.00 0.00	-17.0000	130.00	No Ice	5.25	1.58	93.00
**** Pipe Mount [PM 602-1]	A	From Leg	1.00 0.00 0.00	-33.0000	117.00	No Ice	5.25	1.58	93.00

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight lb	
2.0' Dish	C	Paraboloid w/Shroud (HP)	From Leg	5.25 0.50 2.00	45.0000		148.80	2.00	No Ice	3.14	30.00
2.0' Dish	C	Paraboloid w/Shroud (HP)	From Face	1.88 0.50 2.00	45.0000		148.80	2.00	No Ice	3.14	30.00
***** RFS SC3-W60AC	C	Paraboloid w/Shroud (HP)	From Leg	2.00 0.00 0.00	-17.0000		130.00	3.00	No Ice	7.07	39.70
**** RFS SC3-W60AC	A	Paraboloid	From	2.00	-33.0000		117.00	3.00	No Ice	7.07	39.70

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Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				ft	°	°	ft	ft	ft ²	lb
		w/Shroud (HP)	Leg	0.00						0.00

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	Dead+Wind 0 deg - Service
27	Dead+Wind 30 deg - Service
28	Dead+Wind 60 deg - Service
29	Dead+Wind 90 deg - Service
30	Dead+Wind 120 deg - Service
31	Dead+Wind 150 deg - Service
32	Dead+Wind 180 deg - Service
33	Dead+Wind 210 deg - Service
34	Dead+Wind 240 deg - Service
35	Dead+Wind 270 deg - Service
36	Dead+Wind 300 deg - Service
37	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	148.833 - 96.0433	14.628	29	1.0350	0.0798
L2	99.7933 - 47.0033	5.879	30	0.6117	0.0144
L3	52.6033 - 0	1.517	30	0.2726	0.0036

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
150.80	2.0' Dish	29	14.628	1.0350	0.0798	50045
148.80	5'3" Standoff Mount - 3	29	14.622	1.0347	0.0798	50045
145.00	Side Arm Mount [SO 602-1]	29	13.871	1.0010	0.0736	50045
130.00	RFS SC3-W60AC	29	10.958	0.8683	0.0501	13286
117.00	RFS SC3-W60AC	29	8.592	0.7554	0.0321	7860

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	148.833 - 96.0433	62.816	8	4.4283	0.3421
L2	99.7933 - 47.0033	25.307	10	2.6329	0.0615
L3	52.6033 - 0	6.532	10	1.1736	0.0154

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
150.80	2.0' Dish	8	62.816	4.4283	0.3421	11806
148.80	5'3" Standoff Mount - 3	8	62.788	4.4271	0.3419	11806
145.00	Side Arm Mount [SO 602-1]	8	59.569	4.2841	0.3155	11806
130.00	RFS SC3-W60AC	10	47.085	3.7221	0.2145	3133
117.00	RFS SC3-W60AC	10	36.955	3.2433	0.1372	1851

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L _a	K/lr	A	P _a	φP _a	Ratio P _a /φP _a
	ft		ft	ft		in ²	lb	lb	
L1	148.833 - 96.0433 (1)	TP30.48x14x0.25	52.79	0.00	0.0	23.3928	-5234.18	1544690.00	0.003
L2	96.0433 - 0	TP45.41x28.8093x0.3125	52.79	0.00	0.0	43.6073	-12924.60	2622100.00	0.005

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Section No.	Elevation	Size	L	L _w	K/U _r	A	P _a	φP _n	Ratio P _a /φP _n
	ft		ft	ft		in ²	lb	lb	
L3	47.0033 - 0 (3)	TP59.71x43.024x0.3438	52.60	0.00	0.0	65.7110	-26631.90	3363020.00	0.008

Section No.	Elevation	Component Type	Size	Critical Element	P lb	φP _{allow} lb	% Capacity	Pass Fail	
L1	148.833 - 96.0433	Pole	TP30.48x14x0.25	1	-5234.18	1544690.00	42.1	Pass	
L2	96.0433 - 47.0033	Pole	TP45.41x28.8093x0.3125	2	-12924.60	2622100.00	45.5	Pass	
L3	47.0033 - 0	Pole	TP59.71x43.024x0.3438	3	-26631.90	3363020.00	54.1	Pass	
							Pole (L3) Summary	54.1	Pass
							RATING =	54.1	Pass

Pole Bending Design Data

Section No.	Elevation	Size	M _{ax}	φM _{ax}	Ratio M _{ax} /φM _{ax}	M _{xy}	φM _{xy}	Ratio M _{xy} /φM _{xy}
	ft		lb-ft	lb-ft		lb-ft	lb-ft	
L1	148.833 - 96.0433 (1)	TP30.48x14x0.25	380832.50	913866.67	0.417	0.00	913866.67	0.000
L2	96.0433 - 47.0033 (2)	TP45.41x28.8093x0.3125	1042591.67	2316633.33	0.450	0.00	2316633.33	0.000
L3	47.0033 - 0 (3)	TP59.71x43.024x0.3438	2170475.00	4076025.00	0.532	0.00	4076025.00	0.000

Program Version 7.0.5.1 - 2/1/2016 File:T:/67865/45994_Lulu/79613_SA/Rev 0/tnx/TEP#67865_45994 Lulu.rtf

Pole Shear Design Data

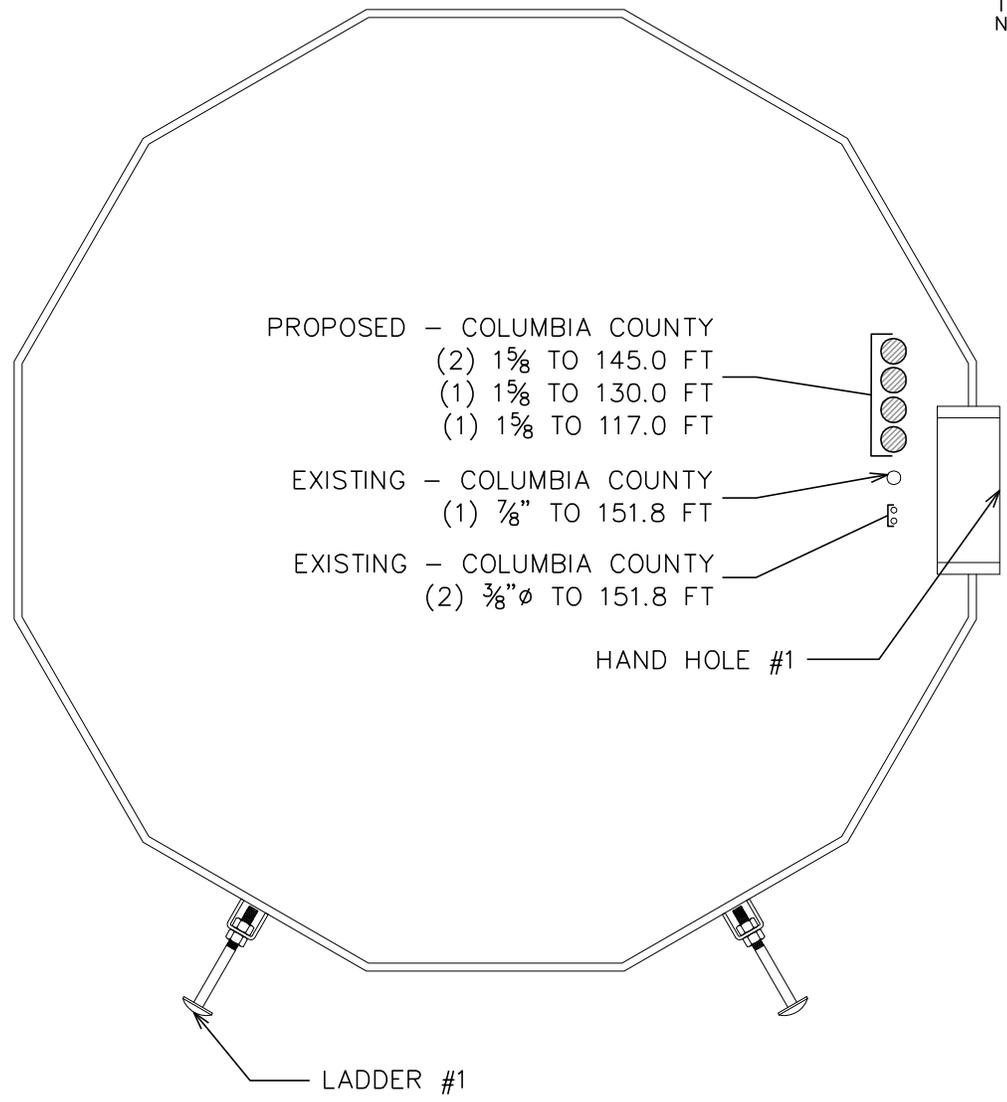
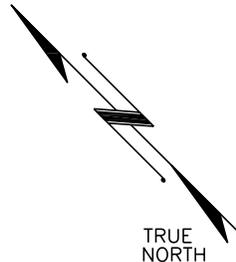
Section No.	Elevation	Size	Actual V _a	φV _a	Ratio V _a /φV _a	Actual T _a	φT _a	Ratio T _a /φT _a
	ft		lb	lb		lb-ft	lb-ft	
L1	148.833 - 96.0433 (1)	TP30.48x14x0.25	10862.30	772346.00	0.014	14498.50	1853033.33	0.008
L2	96.0433 - 47.0033 (2)	TP45.41x28.8093x0.3125	17441.00	1311050.00	0.013	15655.83	4697416.67	0.003
L3	47.0033 - 0 (3)	TP59.71x43.024x0.3438	25359.60	1681510.00	0.015	15609.42	8264900.00	0.002

Pole Interaction Design Data

Section No.	Elevation	Ratio P _a /φP _n	Ratio M _{ax} /φM _{ax}	Ratio M _{xy} /φM _{xy}	Ratio V _a /φV _a	Ratio T _a /φT _a	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	148.833 - 96.0433 (1)	0.003	0.417	0.000	0.014	0.008	0.421	1.000	4.8.2 ✓
L2	96.0433 - 47.0033 (2)	0.005	0.450	0.000	0.013	0.003	0.455	1.000	4.8.2 ✓
L3	47.0033 - 0 (3)	0.008	0.532	0.000	0.015	0.002	0.541	1.000	4.8.2 ✓

Section Capacity Table

APPENDIX B
COAX CONFIGURATION



COAX CONFIGURATION- N.T.S.

<p>PREPARED BY:</p> <p>TOWER ENGINEERING PROFESSIONALS 326 TRYON ROAD RALEIGH, NC 27603-3530 (919) 661-6351 www.tepgroup.net</p>	<p>PREPARED FOR:</p> <p>CENTRAL COMMUNICATIONS, INC. 263 NW LAKE CITY AVE. LAKE CITY, FL 32055</p>	<p>PROJECT INFORMATION:</p> <p>LULU LULU COMM CENTER LULU, FL 32054 (COLUMBIA COUNTY)</p>	<p>REVISION: 0</p> <p>TEP #: 67865_45994</p> <p>SHEET NUMBER:</p> <p>S-1</p>
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