Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

May 12, 2015

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification**
1021 Straights Turnpike, Middlebury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 169-foot level on an existing 195-foot self-supporting lattice tower at 1021 Straights Turnpike in Middlebury, Connecticut (the "Property"). The tower is owned by T-Mobile. Cellco's use of the tower was approved by the Council in 2000. Cellco now intends to modify its facility by replacing three (3) of its existing antennas with three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and adding three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, for a total of fifteen (15) antennas, all at the same 169-foot level on the tower. Cellco also intends to add six (6) remote radio heads ("RRHs"), one (1) each behind its 1900 MHz and 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Edward B. St. John, First Selectman for the Town of Middlebury. The Town of Middlebury is the owner of the Property.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be installed on Cellco's existing antenna T-arm at the 169-foot level on the tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

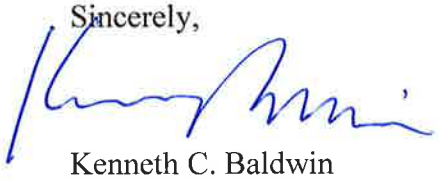
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table with Cellco's modified facility is included in Attachment 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,



Kenneth C. Baldwin

Enclosures
Copy to:
Edward B. St. John, Middlebury First Selectman
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6517DS-VTM

Andrew® Quad Port Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain, dBi	19.0	19.1	19.2
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	21	22	21
CPR at Sector, dB	10	11	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4	0 ° | 18.4	0 ° | 18.7
	3 ° | 18.7	3 ° | 18.7	3 ° | 18.9
	6 ° | 18.4	6 ° | 18.5	6 ° | 18.6
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6517DS-VTM

Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1903.0 mm | 74.9 in
Width	305.0 mm | 12.0 in
Net Weight	19.5 kg | 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-93-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

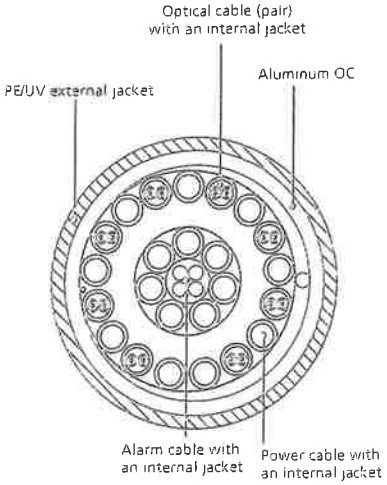


Figure 2: Construction Detail

* This data is provisional and subject to change

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

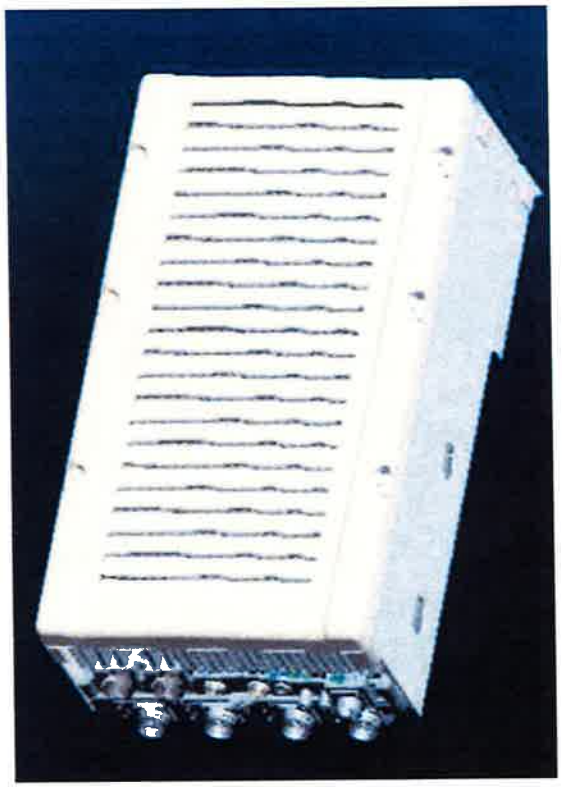
	RRH2x60
RF Output Power	2x60W
Instantaneous Bandwidth	20MHz
Transmitter	2 TX
Receiver 1900 HW version 1900A HW version	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3
Features	AISG 2.0 for RET/TMA
	Internal Smart Bias-T
Power	-48VDC
CPRI Ports	2 CPRI Rate 3 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

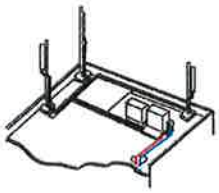
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

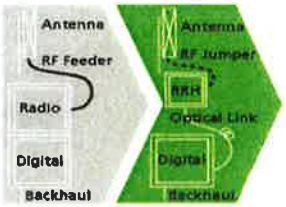
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

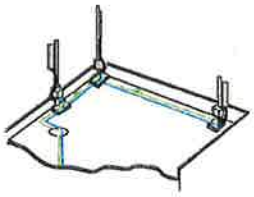
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

AT THE SPEED OF IDEAS™

Alcatel·Lucent

ATTACHMENT 2

	General	Power	Density					
Site Name: Middlebury								
Tower Height: 195Ft.								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*AT&T UMTS	2	565	188	0.0115	880	0.5867	1.96%	
*AT&T UMTS	2	875	188	0.0178	1900	1.0000	1.78%	
*AT&T GSM	1	283	188	0.0029	880	0.5867	0.49%	
*AT&T GSM	4	525	188	0.0214	1900	1.0000	2.14%	
*AT&T LTE	1	1615	188	0.0164	734	0.4893	3.36%	
*Pocket (now MetroPCS)	3	631	145	0.0324	2130	1.0000	3.24%	
*T-Mobile PCS/AWS	6	639	195	0.0363	1900	1.0000	3.63%	
*T-Mobile 700 MHz	1	445	193	0.0043	700	0.4667	0.92%	
*Sprint CDMA/LTE	2	693	150.4	0.0220	1900	1.0000	2.20%	
*Sprint CDMA/LTE	1	390	150.4	0.0062	850	0.5667	1.09%	
*Sprint Nextel iDEN	12	100	175	0.0141	851	0.5673	2.48%	
*Sprint Nextel WiMAX	3	562	175	0.0198	2657	1.0000	1.98%	
Verizon PCS	**7**	**366**	**169**	**0.0323**	**1970**	**1.0000**	**3.23%**	
Verizon Cellular	**9**	**371**	**169**	**0.0420**	**869**	**0.5793**	**7.26%**	
Verizon AWS	**1**	**2812**	**169**	**0.0354**	**2145**	**1.0000**	**3.54%**	
Verizon 700	**1**	**788**	**169**	**0.0099**	**746**	**0.4973**	**1.99%**	
								41.28%
* Source: Siting Council								

ATTACHMENT 3

REVIEWED
By JACKIE DONAHUE at 3:21 pm, Apr 30, 2015

Date: **April 29, 2015**

Kenneth Fann
T-Mobile Towers
12920 SE 38th Street
Bellevue, WA 98006
(425) 383-3978

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

Subject: **Structural Analysis Report – Revision 16**

Carrier Designation:	***Verizon Reconfiguration***	
	Carrier Site Name:	Middlebury
	Carrier Site Number:	N/A
T-Mobile Designation:	**T-Mobile Site Name:**	Middlebury I-84
	T-Mobile Site Number:	CT11128E
Engineering Firm Designation:	**TEP Project Number:**	25628_22635
Site Data:	**1021 Straits Turnpike, Middlebury, New Haven County, CT 06762**	
	Latitude 41° 32' 8.78", Longitude -73° 05' 21.27"	
	195 Foot - Self Supporting Tower	

Dear Mr. Fann,

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 and foundation, 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
97.9%	Diagonal T10 (113.3' - 120')

The analysis has been performed in accordance with the ANSI/TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, ASCE 7-05 Minimum Design Loads for Buildings and Other Structures and the 2005 Connecticut State Building Code based upon a wind speed of 85 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 and the attached drawing 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 *T-Mobile Towers*. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Christopher Bean

Respectfully submitted by:

Graham M. Andres, P.E.

Revision #	Date Issued	Description
14	November 24, 2014	Revised T-Mobile Loading
15	January 22, 2015	Revised Sprint and T-Mobile Loading
16	April 29, 2015	Verizon Reconfiguration

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 195-ft self-support tower designed by Fred A. Nudd Corporation in May of 1998. The tower was originally designed for a fastest mile wind speed of 85 mph per ANSI/EIA/TIA-222-F for the appurtenances listed in Table 2. TEP visited the site in June of 2010 to gather existing steel and appurtenance information. This tower has been modified multiple times in the past to accommodate additional loading. All 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/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and ASCE 7-05 Minimum Design Loads for Buildings and Other Structures using a fastest mile wind speed of 85 mph with no ice, 38 mph with 0.75 inch escalating ice thickness, and 50 mph under service loads.

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	195.0	3	RFS APX16DWV-16DWVS	(3) 12.5' Sector Frames	18	1-5/8	AB Face	T-Mobile
		6	Ericsson KRY-112-71					
	193.0	3	Commscope LNX-6515DS-VTM					
Existing	188.0	6	Powerwave 7770	(3) 15.0' T-Frames with Catwalk	12 1 2	1-5/8 7/16"Ø Fiber 3/8"Ø Power	CA Face	AT&T
		3	Powerwave P65-17-XLH-RR					
		6	Powerwave LGP 13519 Diplexers					
		6	Powerwave LGP 21401 TMA					
		6	Ericsson RRUS-11					
		1	Raycap DC6-48-60-18-8F					
Proposed	***169.0***	***2***	***Antel BXA-70063-6CF***	(3) 15.0' T-Frames with Catwalk	***12 1***	***1-5/8 Fiber***	***AB Face***	***Verizon***
		4	***Decibel DB844G65ZAXY***					
		1	***Antel BXA 70080/6CF***					
		2	***Decibel DB846F65ZAXY***					
		6	***RFS FD9R6004/2C-3L***					
		3	***ALU RRH2x60-AWS***					
		3	***ALU RRH2x60-PCS***					
		1	***RFS DB-T1-6Z-8AB-0Z***					
		6	***HBXX-6517DS-A2M***					
Existing	152.0	3	RFS APXVTM14-C-120	(3) 12.0' Sector Frames	7	1-1/4"Ø Fiber	BC Face	Sprint
		3	Decibel DB980H90T3E-M					
		3	RFS APXVSPP18-C-A20					
		3	RFS RRU 800MHz 2x50W					
		3	ALU TD-RRH 8x20-25					
		3	RFS RRU 1900MHz 2x40W					
Existing	75.5	1	GPS Antenna	4.5' Standoff	1	5/8"Ø	BC Face	Unknown

Notes:
1) See "Appendix B – Coax Configuration" for assumed coax configuration.

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
195.0	195.0	12	Swedcom	ALP 9011	12	1-5/8	Unknown
185.0	185.0	12	Swedcom	ALP 9011	12	1-5/8	Unknown
175.0	175.0	12	Swedcom	ALP 9011	12	1-5/8	Unknown
165.0	165.0	12	Swedcom	ALP 9011	12	1-5/8	Unknown
155.0	155.0	12	Swedcom	ALP 9011	12	1-5/8	Unknown

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Tower and Foundation Drawings	Fred A. Nudd Corporation, dated May 5, 1998 Drawing No. 98-5974-1	-	T-Mobile
Structural Modification Drawings	Fred A. Nudd Corporation, dated April 30, 1999 Drawing No. 99-6726-1	-	T-Mobile
Steel and Appurtenance Mapping	Tower Engineering Professionals, dated June 3, 2010	102056	TEP
Geotechnical Report	Dr. Clarence Welti, P.E., P.C., dated April 17, 1998	-	T-Mobile
Structural Modification Drawings	Tower Engineering Professionals, Inc. dated August 29, 2011	102056	TEP
Structural Modification Drawings	Tower Engineering Professionals, Inc. dated July 26, 2012	102056	TEP
Structural Modification Analysis	Tower Engineering Professionals, Inc. dated August 1, 2013	25628_4865	TEP
Previous Structural Analysis	Tower Engineering Professionals, Inc. dated January 22, 2015	25628_22635	TEP
Correspondence	Correspondence with T-Mobile with regards to the existing and proposed loading, SAW dated January 26, 2015	-	T-Mobile

3.1) Analysis Method

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

3.2) Assumptions

1) 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) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by the standard.
5) All tower components are in sufficient condition to carry their full design capacity.
6) 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.
7) 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 verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.

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)	SF*P_{allow} (lb)	% Capacity	Pass / Fail
T1	195 - 180	Leg	PIPE 2.5 STD (SCH 40)	3	-29719.30	61065.26	48.7	Pass
T2	180 - 175	Leg	PIPE 2.5 STD (SCH 40)	45	-32993.60	66232.77	49.8	Pass
T3	175 - 170	Leg	PIPE 2.5 STD (SCH 40)	57	-40983.70	66319.28	61.8	Pass
T4	170 - 160	Leg	2.5SCH40 w/ 3SCH80 Half Sleeve	Note 2	Note 2	Note 2	76.1	Pass
T5	160 - 150	Leg	Pipe 3.5 Std (SCH40)	90	-84070.20	109240.81	77.0	Pass
T6	150 - 140	Leg	3.5SCH40 w/ 4SCH40 Half Sleeve	Note 2	Note 2	Note 2	68.5	Pass
T7	140 - 133.333	Leg	5 STD w/ 6 XH Half Sleeve	Note 2	Note 2	Note 2	46.2	Pass
T8	133.333 - 126.667	Leg	5 STD w/ 6 XH Half Sleeve	Note 2	Note 2	Note 2	51.6	Pass
T9	126.667 - 120	Leg	5 STD w/ 6 XH Half Sleeve	Note 2	Note 2	Note 2	56.8	Pass
T10	120 - 113.333	Leg	PIPE 6 STD (SCH40)	159	-161650.00	232356.55	69.6	Pass
T11	113.333 - 106.667	Leg	PIPE 6 STD (SCH40)	171	-174393.00	232391.21	75.0	Pass
T12	106.667 - 100	Leg	PIPE 6 STD (SCH40)	183	-186243.00	232421.87	80.1	Pass
T13	100 - 80	Leg	6 STD w/ 7 XH Half Sleeve	Note 2	Note 2	Note 2	62.3	Pass
T14	80 - 60	Leg	PIPE 8 STD (SCH40)	225	-256430.00	336506.51	76.2	Pass
T15	60 - 50	Leg	PIPE 8 STD (SCH40)	246	-268742.00	345717.53	77.7	Pass
T16	50 - 40	Leg	PIPE 8 STD (SCH40)	258	-285244.00	345770.85	82.5	Pass
T17	40 - 20	Leg	PIPE 8 X-STR (SCH80)	270	-317855.00	473586.89	67.1	Pass
T18	20 - 0	Leg	PIPE 8 X-STR (SCH80)	285	-357208.00	474086.76	75.3 85.6 (b)	Pass
T1	195 - 180	Diagonal	5/8	12	7269.94	8833.52	82.3	Pass
T2	180 - 175	Diagonal	L1 1/2x1 1/2x3/16	48	-3333.83	6385.59	52.2 67.7 (b)	Pass
T3	175 - 170	Diagonal	L2x2x3/16	60	-2562.46	12345.57	20.8 50.5 (b)	Pass
T4	170 - 160	Diagonal	2L1 1/2x1 1/2x3/16x1/4	75	-4913.61	16655.43	29.5 68.8 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_{allow} (lb)	% Capacity	Pass / Fail
T5	160 - 150	Diagonal	2L2x2x3/16x1/4	96	-5637.04	25694.51	21.9 73.7 (b)	Pass
T6	150 - 140	Diagonal	2L2x2x3/16x1/4	123	-6289.46	25233.69	24.9 84.2 (b)	Pass
T7	140 - 133.333	Diagonal	L2 1/2x2 1/2x1/4	135	-6542.78	16497.61	39.7 59.2 (b)	Pass
T8	133.333 - 126.667	Diagonal	L2 1/2x2 1/2x1/4	144	-6697.06	14316.29	46.8 60.5 (b)	Pass
T9	126.667 - 120	Diagonal	L2 1/2x2 1/2x3/16	153	-6489.40	9979.96	65.0 94.4 (b)	Pass
T10	120 - 113.333	Diagonal	L3x3x3/16	162	-7262.85	15433.74	47.1 97.9 (b)	Pass
T11	113.333 - 106.667	Diagonal	L3x3x3/16	174	-7119.97	14812.43	48.1 97.4 (b)	Pass
T12	106.667 - 100	Diagonal	L2 1/2x2 1/2x1/4	186	-7580.18	10183.75	74.4	Pass
T13	100 - 80	Diagonal	L3 1/2x3 1/2x1/4	198	-7473.24	27500.05	27.2 44.9 (b)	Pass
T14	80 - 60	Diagonal	L3 1/2x3 1/2x1/4	228	-8019.70	23594.23	34.0 46.7 (b)	Pass
T15	60 - 50	Diagonal	L3x3x5/16	249	-9971.03	12260.08	81.3	Pass
T16	50 - 40	Diagonal	L3x3x5/16	261	-9984.21	11351.93	88.0	Pass
T17	40 - 20	Diagonal	L4x4x3/8	273	-9882.33	25488.16	38.8 57.5 (b)	Pass
T18	20 - 0	Diagonal	L5x5x5/16	288	-11136.30	34335.95	32.4 64.8 (b)	Pass
T1	195 - 180	Horizontal	L1 1/2x1 1/2x3/16	17	-4942.77	6723.25	73.5	Pass
T2	180 - 175	Secondary Horizontal	L2x2x3/16	53	572.18	16652.77	3.4 9.4 (b)	Pass
T3	175 - 170	Secondary Horizontal	L2x2x3/16	65	-710.74	16534.80	4.3 11.7 (b)	Pass
T4	170 - 160	Secondary Horizontal	L2x2x3/16	77	-1079.97	15123.02	7.1 17.8 (b)	Pass
T5	160 - 150	Secondary Horizontal	L2x2x3/16	98	-1457.96	13544.21	10.8 24.0 (b)	Pass
T6	150 - 140	Secondary Horizontal	L2x2x3/16	119	-1884.28	11810.53	16.0 31.0 (b)	Pass
T10	120 - 113.333	Secondary Horizontal	L3x3x3/16	167	-2803.36	19651.09	14.3 41.3 (b)	Pass
T11	113.333 - 106.667	Secondary Horizontal	L3x3x3/16	179	-3024.34	18513.50	16.3 37.1 (b)	Pass
T12	106.667 - 100	Secondary Horizontal	L3x3x3/16	191	-3229.85	6723.76	48.0	Pass
T13	100 - 80	Secondary Horizontal	L3x3x1/4	203	-3857.70	17794.35	21.7 44.9 (b)	Pass
T15	60 - 50	Secondary Horizontal	L4x4x1/4	254	-4660.55	10544.16	44.2	Pass
T16	50 - 40	Secondary Horizontal	L4x4x1/4	266	-4946.73	9490.00	52.1	Pass
T1	195 - 180	Top Girt	L1 1/2x1 1/2x3/16	5	-874.33	6723.25	13.0	Pass
T1	195 - 180	Bottom Girt	L1 1/2x1 1/2x3/16	8	-2434.08	6723.25	36.2	Pass
							Summary	
						Leg (T18)	85.6	Pass
						Diagonal (T10)	97.9	Pass
						Horizontal (T1)	73.5	Pass
						Secondary Horizontal (T16)	52.1	Pass
						Top Girt (T1)	13.0	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_{allow} (lb)	% Capacity	Pass / Fail
						Bottom Girt (T1)	36.2	Pass
						Bolt Checks	97.9	Pass
						RATING =	**97.9**	**Pass**

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
-	Anchor Rods	-	81.3	Pass
2	Base Foundation - Soil Interaction	-	43.0	Pass
2	Base Foundation - Structural	-	61.8	Pass

Notes:
2) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.

Structure Rating (max from all components) =	**97.9%**

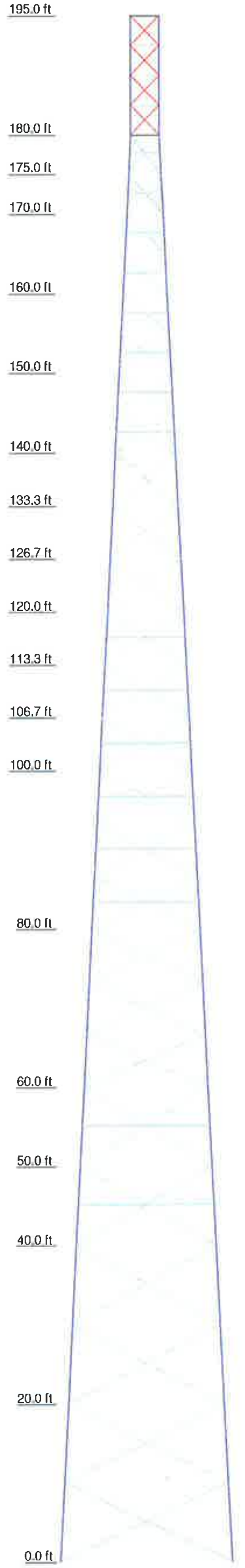
4.1) Recommendations

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.

APPENDIX A

TNXTOWER OUTPUT

Section (ft)	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Bottom Girts	Horizontals	Sec. Horizontals	Face Width (ft)	# Panels @ (ft)	Weight (lb)
195.0–180.0	PIPE 2.5 STD (SCH 40)	A572-55	SR 5/8	A36	L1 1/2x1 1/2x3/16	L1 1/2x1 1/2x3/16	L1 1/2x1 1/2x3/16	N.A.	3.5	4 @ 3.75	484.2
180.0–175.0			F		N.A.	N.A.	N.A.	L2x2x3/16	4	8 @ 5	181.8
175.0–170.0			G						4.5		214.0
170.0–160.0	A	A53-B-35	H						5.5		705.9
160.0–150.0	B	A572-55	2L2x2x3/16x1/4						6.5		817.6
150.0–140.0	C	A500-50							7.5		1040.7
140.0–133.3	D	A500-46	L2 1/2x2 1/2x1/4					N.A.	8.16667	12 @ 6.66667	829.5
133.3–126.7									8.83333		842.1
126.7–120.0			I						9.5		788.4
120.0–113.3	PIPE 6 STD (SCH40)	A572-55	L3x3x3/16					L3x3x3/16	10.1667		754.5
113.3–106.7									10.8333		774.3
106.7–100.0			J						11.5		820.9
100.0–80.0	E	A53-B-42	L3 1/2x3 1/2x1/4					L3x3x1/4	13.5		4303.5
80.0–60.0	PIPE 8 STD (SCH40)	A572-55						N.A.	15.5		3370.0
60.0–50.0			L3x3x5/16					L4x4x1/4	16.5	4 @ 10	1861.2
50.0–40.0									17.5		1912.1
40.0–20.0	PIPE 8 X-STR (SCH80)		L4x4x3/8					N.A.	19.5		5068.0
20.0–0.0			L5x5x5/16						21.5	2 @ 9.95833	5431.4
Total											30200.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Sector Mount [SM 802-3]	195	BXA-70080/6CF w/ Mount Pipe	169
HSS Top Mount	195	DB846F65ZAXY w/Mount Pipe	169
APX16DWV-16DWVS-A	195	DB846F65ZAXY w/Mount Pipe	169
APX16DWV-16DWVS-A	195	(2) FD9R6004	169
APX16DWV-16DWVS-A	195	(2) FD9R6004	169
(2) KRY 112 71	195	(2) FD9R6004	169
(2) KRY 112 71	195	(3) Sector Mounts 169-ft	169
(2) KRY 112 71	195	(2) BXA-70063/6CF w/ Mount Pipe	169
LNX-6515DS-VTM w/ Mount Pipe	193	(2) DB844G65ZAXY w/Mount Pipe	169
LNX-6515DS-VTM w/ Mount Pipe	193	(2) DB844G65ZAXY w/Mount Pipe	169
LNX-6515DS-VTM w/ Mount Pipe	193	DB-B1/T1 w/ Mount Pipe	169
(3) Sector Mounts 188-ft	188	(2) HBXX-6517DS-A2M w/ Mount Pipe	169
(2) 7770.00 w/ Mount Pipe	188	(2) HBXX-6517DS-A2M w/ Mount Pipe	169
(2) 7770.00 w/ Mount Pipe	188	TD-RRH8x20-25	152
(2) 7770.00 w/ Mount Pipe	188	TD-RRH8x20-25	152
P65-17-XLH-RR w/Mount Pipe	188	TD-RRH8x20-25	152
P65-17-XLH-RR w/Mount Pipe	188	1900MHz 2X40W RRH	152
P65-17-XLH-RR w/Mount Pipe	188	DB980H90T2E-M w/ Mount Pipe	152
(2) LGP13519	188	DB980H90T2E-M w/ Mount Pipe	152
(2) LGP13519	188	DB980H90T2E-M w/ Mount Pipe	152
(2) LGP13519	188	APXVTM14-C-120 w/ Mount Pipe	152
(2) LGP21401	188	APXVTM14-C-120 w/ Mount Pipe	152
(2) LGP21401	188	APXVTM14-C-120 w/ Mount Pipe	152
(2) LGP21401	188	800MHZ 2X50W RRH	152
(2) RRUS-11	188	1900MHz 2X40W RRH	152
(2) RRUS-11	188	1900MHz 2X40W RRH	152
(2) RRUS-11	188	Sector Mount [SM 502-3]	152
DC6-48-60-18-8F	188	APXVSPP18-C-A20 w/ Mount Pipe	152
(2) HBXX-6517DS-A2M w/ Mount Pipe	169	APXVSPP18-C-A20 w/ Mount Pipe	152
RRH2x60-AWS	169	APXVSPP18-C-A20 w/ Mount Pipe	152
RRH2x60-AWS	169	800MHZ 2X50W RRH	152
RRH2x60-AWS	169	800MHZ 2X50W RRH	152
RRH2X60-PCS	169	GPS0015	75.5
RRH2X60-PCS	169	1.75" Dia x 5-ft Pipe	75.5
RRH2X60-PCS	169		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	2.5SCH40 w/ 3SCH80 Half Sleeve	F	L1 1/2x1 1/2x3/16
B	Pipe 3.5 Std (SCH40)	G	L2x2x3/16
C	3.5SCH40 w/ 4SCH40 Half Sleeve	H	2L1 1/2x1 1/2x3/16x1/4
D	5 STD w/ 6 XH Half Sleeve	I	L2 1/2x2 1/2x3/16
E	6 STD w/ 7 XH Half Sleeve	J	L2 1/2x2 1/2x1/4

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-55	55 ksi	70 ksi	A500-50	50 ksi	62 ksi
A36	36 ksi	58 ksi	A500-46	46 ksi	62 ksi
A53-B-35	35 ksi	63 ksi	A53-B-42	42 ksi	63 ksi

MAX. CORI
DOWN: 355796 lb
SHEAR: 34951 lb

UPLIFT:
SHEAR:

AXIA
10029

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 97.9%

SHEAR 16581 lb *MOMENT 2021374 lb-ft*

TORQUE 13016 lb-ft
38 mph WIND - 0.7500 in ICE

AXIAL 49977 lb

SHEAR 54914 lb *MOMENT 6314587 lb-ft*

TORQUE 48760 lb-ft
REACTIONS - 85 mph WIND

Tower Engineering Professionals	**Tower Engineering Professionals, Inc.** 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job: **Middlebury I-84 (CT11128E)** Project: **TEP No. 25628_22635, Revision 16** Client: T-Mobile Towers — Drawn by: Christopher Bean — App'd: Code: TIA/EIA-222-F — Date: 04/28/15 — Scale: N Path: — Dwg No.

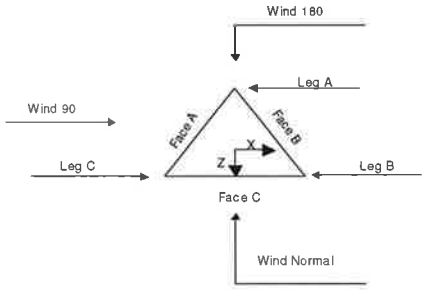
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 195.00 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 3.50 ft at the top and 21.50 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	√ Assume Rigid Index Plate	√ Calculate Redundant Bracing Forces
Use Moment Magnification	√ Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
√ Use Code Stress Ratios	√ Use Clear Spans For KL/r	√ SR Leg Bolts Resist Compression
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	All Leg Panels Have Same Allowable
√ Escalate Ice	√ Bypass Mast Stability Checks	√ Offset Girt At Foundation
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Consider Feedline Torque
Use Special Wind Profile	√ Project Wind Area of Appurt.	√ Include Angle Block Shear Check
√ Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Poles
Leg Bolts Are At Top Of Section	√ SR Members Have Cut Ends	Include Shear-Torsion Interaction
√ Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination	Use TIA-222-G Tension Splice Capacity Exemption	



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	195.00-180.00			3.50	1	15.00
T2	180.00-175.00			3.50	1	5.00
T3	175.00-170.00			4.00	1	5.00
T4	170.00-160.00			4.50	1	10.00
T5	160.00-150.00			5.50	1	10.00
T6	150.00-140.00			6.50	1	10.00
T7	140.00-133.33			7.50	1	6.67
T8	133.33-126.67			8.17	1	6.67
T9	126.67-120.00			8.83	1	6.67
T10	120.00-113.33			9.50	1	6.67
T11	113.33-106.67			10.17	1	6.67
T12	106.67-100.00			10.83	1	6.67
T13	100.00-80.00			11.50	1	20.00
T14	80.00-60.00			13.50	1	20.00
T15	60.00-50.00			15.50	1	10.00
T16	50.00-40.00			16.50	1	10.00
T17	40.00-20.00			17.50	1	20.00
T18	20.00-0.00			19.50	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	195.00-180.00	3.75	TX Brace	No	Yes	0.0000	0.0000
T2	180.00-175.00	5.00	X Brace	No	Yes	0.0000	0.0000
T3	175.00-170.00	5.00	X Brace	No	Yes	0.0000	0.0000
T4	170.00-160.00	5.00	X Brace	No	Yes	0.0000	0.0000
T5	160.00-150.00	5.00	X Brace	No	Yes	0.0000	0.0000
T6	150.00-140.00	5.00	X Brace	No	Yes	0.0000	0.0000
T7	140.00-133.33	6.67	X Brace	No	No	0.0000	0.0000
T8	133.33-126.67	6.67	X Brace	No	No	0.0000	0.0000
T9	126.67-120.00	6.67	X Brace	No	No	0.0000	0.0000
T10	120.00-113.33	6.67	X Brace	No	Yes	0.0000	0.0000
T11	113.33-106.67	6.67	X Brace	No	Yes	0.0000	0.0000
T12	106.67-100.00	6.67	X Brace	No	Yes	0.0000	0.0000
T13	100.00-80.00	6.67	X Brace	No	Yes	0.0000	0.0000
T14	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T15	60.00-50.00	10.00	X Brace	No	Yes	0.0000	0.0000
T16	50.00-40.00	10.00	X Brace	No	Yes	0.0000	0.0000
T17	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T18	20.00-0.00	9.96	X Brace	No	No	0.0000	1.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 195.00-180.00	Pipe	PIPE 2.5 STD (SCH 40)	A572-55 (55 ksi)	Solid Round	5/8	A36 (36 ksi)
T2 180.00-175.00	Pipe	PIPE 2.5 STD (SCH 40)	A572-55 (55 ksi)	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)
T3 175.00-170.00	Pipe	PIPE 2.5 STD (SCH 40)	A572-55 (55 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T4 170.00-160.00	Arbitrary Shape	2.5SCH40 w/ 3SCH80 Half Sleeve	A53-B-35 (35 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16x1/4	A36 (36 ksi)
T5 160.00-150.00	Pipe	Pipe 3.5 Std (SCH40)	A572-55 (55 ksi)	Double Angle	2L2x2x3/16x1/4	A36 (36 ksi)
T6 150.00-140.00	Arbitrary Shape	3.5SCH40 w/ 4SCH40 Half Sleeve	A500-50 (50 ksi)	Double Angle	2L2x2x3/16x1/4	A36 (36 ksi)
T7 140.00-133.33	Arbitrary Shape	5 STD w/ 6 XH Half Sleeve	A500-46 (46 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T8 133.33-126.67	Arbitrary Shape	5 STD w/ 6 XH Half Sleeve	A500-46 (46 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T9 126.67-120.00	Arbitrary Shape	5 STD w/ 6 XH Half Sleeve	A500-46 (46 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T10 120.00-113.33	Pipe	PIPE 6 STD (SCH40)	A572-55 (55 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T11 113.33-106.67	Pipe	PIPE 6 STD (SCH40)	A572-55 (55 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T12 106.67-100.00	Pipe	PIPE 6 STD (SCH40)	A572-55 (55 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T13 100.00-80.00	Arbitrary Shape	6 STD w/ 7 XH Half Sleeve	A53-B-42 (42 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T14 80.00-60.00	Pipe	PIPE 8 STD (SCH40)	A572-55 (55 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T15 60.00-50.00	Pipe	PIPE 8 STD (SCH40)	A572-55 (55 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T16 50.00-40.00	Pipe	PIPE 8 STD (SCH40)	A572-55 (55 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T17 40.00-20.00	Pipe	PIPE 8 X-STR (SCH80)	A572-55	Equal Angle	L4x4x3/8	A36

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T18 20.00-0.00	Pipe	PIPE 8 X-STR (SCH80)	(55 ksi) A572-55 (55 ksi)	Equal Angle	L5x5x5/16	(36 ksi) A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 195.00-180.00	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 195.00-180.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T2 180.00-175.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 175.00-170.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T4 170.00-160.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T5 160.00-150.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T6 150.00-140.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T10 120.00-113.33	Equal Angle	L3x3x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T11 113.33-106.67	Equal Angle	L3x3x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T12 106.67-100.00	Equal Angle	L3x3x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T13 100.00-80.00	Equal Angle	L3x3x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T15 60.00-50.00	Equal Angle	L4x4x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Elevation	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
ft						
T16 50.00-40.00	Equal Angle	L4x4x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft²	in					in	in
T1 195.00-180.00	0.00	0.0000	A36 (36 ksi)	1	1	1	0.0000	0.0000
T2 180.00-175.00	0.00	0.2500	A36 (36 ksi)	1	1	1	0.0000	0.0000
T3 175.00-170.00	0.00	0.2500	A36 (36 ksi)	1	1	1	0.0000	0.0000
T4 170.00-160.00	0.00	0.2500	A36 (36 ksi)	1	1	1	Mid-Pt	0.0000
T5 160.00-150.00	0.00	0.2500	A36 (36 ksi)	1	1	1	Mid-Pt	0.0000
T6 150.00-140.00	0.00	0.2500	A36 (36 ksi)	1	1	1	Mid-Pt	0.0000
T7 140.00-133.33	0.00	0.3750	A36 (36 ksi)	1	1	1	0.0000	0.0000
T8 133.33-126.67	0.00	0.3750	A36 (36 ksi)	1	1	1	0.0000	0.0000
T9 126.67-120.00	0.00	0.3750	A36 (36 ksi)	1	1	1	0.0000	0.0000
T10 120.00-113.33	0.00	0.3750	A36 (36 ksi)	1	1	1	0.0000	0.0000
T11 113.33-106.67	0.00	0.3750	A36 (36 ksi)	1	1	1	0.0000	0.0000
T12 106.67-100.00	0.00	0.3750	A36 (36 ksi)	1	1	1	0.0000	0.0000
T13 100.00-80.00	0.00	0.4375	A36 (36 ksi)	1	1	1	0.0000	0.0000
T14 80.00-60.00	0.00	0.4375	A36 (36 ksi)	1	1	1	0.0000	0.0000
T15 60.00-50.00	0.00	0.4375	A36 (36 ksi)	1	1	1	0.0000	0.0000
T16 50.00-40.00	0.00	0.4375	A36 (36 ksi)	1	1	1	0.0000	0.0000
T17 40.00-20.00	0.00	0.4375	A36 (36 ksi)	1	1	1	0.0000	0.0000
T18 20.00-0.00	0.00	0.4375	A36 (36 ksi)	1	1	1	0.0000	0.0000

Tower Section Geometry *(cont'd)*

K Factors[1]

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	X Brace Diags X	X Brace Diags Y	K Brace Diags X	K Brace Diags Y	Single Diags X	Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
ft																	
T1 195.00-180.00	Yes	Yes	1	1	1	1	1	1	1	0.96	0.96	0.96	0.96	1	1	1	1
T2 180.00-175.00	No	Yes	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T3 175.00-170.00	No	Yes	1	1.09	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T4 170.00-160.00	No	Yes	1	1.15	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T5 160.00-150.00	No	Yes	1	1.25	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T6 150.00-140.00	No	Yes	1	1.22	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T7 140.00-133.33	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T8 133.33-126.67	No	Yes	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T9 126.67-120.00	No	Yes	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T10 120.00-113.33	No	Yes	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T11 113.33-106.67	No	Yes	1	0.98	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T12 106.67-100.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T13 100.00-80.00	No	Yes	1	0.85	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T14 80.00-60.00	No	Yes	1	0.85	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T15 60.00-50.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T16 50.00-40.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T17 40.00-20.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T18 20.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1	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 ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 195.00-180.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	0.75	0.0000	1	0.0000	1
T2 180.00-175.00	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 175.00-170.00	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 Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
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
170.00-160.00														
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
160.00-150.00														
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
150.00-140.00														
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
140.00-133.33														
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
133.33-126.67														
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
126.67-120.00														
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
120.00-113.33														
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
113.33-106.67														
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
106.67-100.00														
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
100.00-80.00														
T14	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														
T15	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
60.00-50.00														
T16	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
50.00-40.00														
T17	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														
T18 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 ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1	Flange	0.7500	4	0.0000	0	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	0
195.00-180.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T2	Flange	0.7500	0	0.5000	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
180.00-175.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T3	Flange	0.7500	0	0.5000	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
175.00-170.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T4	Flange	0.7500	6	0.5000	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
170.00-160.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T5	Flange	1.0000	0	0.5000	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
160.00-150.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T6	Flange	1.0000	6	0.5000	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
150.00-140.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T7	Flange	1.0000	0	0.6250	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
140.00-133.33		A325N		A325X		A325N		A325N		A325N		A325N		A325N	

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T8	Flange	1.0000	0	0.6250	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
133.33-126.67		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T9	Flange	1.0000	8	0.6250	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
126.67-120.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T10	Flange	1.0000	0	0.6250	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
120.00-113.33		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T11	Flange	1.0000	0	0.6250	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.7500	1
113.33-106.67		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T12	Flange	1.0000	8	0.6250	1	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	0
106.67-100.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	
T13	Flange	1.2500	8	0.6250	2	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	1
100.00-80.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T14	Flange	1.2500	8	0.6250	2	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.7500	1
80.00-60.00		A325N		A325N		A325N		A325N		A325N		A325N		A325X	
T15	Flange	1.2500	0	0.6250	2	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	0
60.00-50.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T16	Flange	1.2500	8	0.6250	2	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	0
50.00-40.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T17	Flange	1.2500	8	0.6250	2	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	0
40.00-20.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T18 20.00-0.00	Flange	1.5000	8	0.6250	2	0.0000	0	0.0000	0	0.6250	0	0.0000	0	0.6250	0
		A36		A325N		A325N		A325N		A325N		A325N		A325N	

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM)	B	Yes	Ar (CfAe)	169.00 - 8.00	-2.0000	-0.35	12	12	0.5000	1.9800		0.82
HB158-1-08U8-S8J18(1-5/8)	B	Yes	Ar (CfAe)	169.00 - 8.00	-4.0000	-0.29	1	1	0.5000	0.0001		1.30
WG Rail 1.5x1.5x1/4 **** ****	B	Yes	Af (CfAe)	170.00 - 8.00	-2.0000	-0.35	2	2	36.5000	1.5000	6.0000	2.40
LDF7-50A (1-5/8 FOAM)	B	Yes	Ar (CfAe)	195.00 - 8.00	0.0000	0	18	6	0.5000	1.9800		0.82
WG Rail 1.5x1.5x3/16 ****	B	Yes	Af (CfAe)	181.00 - 0.00	0.0000	0	2	2	36.0000	1.5000	6.0000	1.81
5/8" dia. coax	C	Yes	Ar (CfAe)	75.50 - 10.00	0.0000	0	1	1	0.5000	0.6250		0.15
1 1/4" Fiber	C	Yes	Ar (CfAe)	152.00 - 10.00	0.0000	0.04	7	4	0.5000	1.2500		0.38
WG Rail 1.5x1.5x3/16 **** ****	C	Yes	Af (CfAe)	160.00 - 0.00	0.0000	0.1	2	2	35.0000	1.5000	6.0000	1.81
LDF7-50A (1-5/8 FOAM)	A	Yes	Ar (CfAe)	188.00 - 8.00	0.0000	0.3	12	6	0.5000	1.9800		0.82
7/16" Fiber Cable (24 fibers Max)	A	Yes	Ar (CfAe)	188.00 - 8.00	0.0000	0.375	1	1	0.5000	0.4375		0.03
8AWG7	A	Yes	Ar (CfAe)	188.00 - 8.00	0.0000	0.35	2	2	0.5000	0.3750		0.15

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Fmc FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
WG Rail 1.5x1.5x1/8	A	Yes	Af (CfAe)	180.00 - 2.00	0.0000	0.3	2	2	36.0000	1.5000	6.0000	1.23
****												
****												
***												
Safety Line 3/8	A	No	Ar (Leg)	195.00 - 0.00	0.0000	0	1	1	0.3750	0.3750		0.22
Step Pegs (5/8" SR) 7-in w/30" step	A	No	Ar (Leg)	195.00 - 0.00	0.0000	0	1	1	0.3500	0.3500		0.49
Step Pegs (5/8" SR) 7-in w/30" step	B	No	Ar (Leg)	60.00 - 0.00	0.0000	0	1	1	0.3500	0.3500		0.49
Step Pegs (5/8" SR) 7-in w/30" step	C	No	Ar (Leg)	60.00 - 0.00	0.0000	0	1	1	0.3500	0.3500		0.49
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Rung L1.5x1.5x1/8 (36.25"w, 34"s)	B	Yes	Ar (CfAe)	170.00 - 8.00	-2.0000	-0.35	1	1	0.5000	0.0001		1.31
Rung L1.5x1.5x1/8 (36"w, 34"s)	B	Yes	Ar (CfAe)	181.00 - 0.00	0.0000	0	1	1	0.5000	0.0001		1.29
Rung L2x1.5x1/8 (35"w, 48"s)	C	Yes	Ar (CfAe)	160.00 - 0.00	0.0000	0.1	1	1	0.5000	0.0001		1.05
Rung L1.5x1.5x1/8 (36"w, 34"s)	A	Yes	Ar (CfAe)	180.00 - 2.00	0.0000	0.3	1	1	0.5000	0.0001		1.29
****												

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C_AA_A ft²/ft	Weight plf
****							

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	195.00-180.00	A	9.618	0.000	0.000	0.000	91.97
		B	15.756	0.250	0.000	0.000	226.32
		C	0.000	0.000	0.000	0.000	0.00
T2	180.00-175.00	A	5.747	1.250	0.000	0.000	73.16
		B	5.252	1.250	0.000	0.000	98.38
		C	0.000	0.000	0.000	0.000	0.00
T3	175.00-170.00	A	5.747	1.250	0.000	0.000	73.16
		B	5.252	1.250	0.000	0.000	98.38

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
		C	0.000	0.000	0.000	0.000	0.00
T4	170.00-160.00	A	11.494	2.500	0.000	0.000	146.32
		B	28.324	5.000	0.000	0.000	358.14
		C	0.000	0.000	0.000	0.000	0.00
T5	160.00-150.00	A	11.494	2.500	0.000	0.000	146.32
		B	30.304	5.000	0.000	0.000	369.28
		C	0.833	2.500	0.000	0.000	51.97
T6	150.00-140.00	A	11.494	2.500	0.000	0.000	146.32
		B	30.304	5.000	0.000	0.000	369.28
		C	4.167	2.500	0.000	0.000	73.16
T7	140.00-133.33	A	7.663	1.667	0.000	0.000	97.55
		B	20.203	3.333	0.000	0.000	246.19
		C	2.778	1.667	0.000	0.000	48.77
T8	133.33-126.67	A	7.663	1.667	0.000	0.000	97.55
		B	20.203	3.333	0.000	0.000	246.19
		C	2.778	1.667	0.000	0.000	48.77
T9	126.67-120.00	A	7.663	1.667	0.000	0.000	97.55
		B	20.203	3.333	0.000	0.000	246.19
		C	2.778	1.667	0.000	0.000	48.77
T10	120.00-113.33	A	7.663	1.667	0.000	0.000	97.55
		B	20.203	3.333	0.000	0.000	246.19
		C	2.778	1.667	0.000	0.000	48.77
T11	113.33-106.67	A	7.663	1.667	0.000	0.000	97.55
		B	20.203	3.333	0.000	0.000	246.19
		C	2.778	1.667	0.000	0.000	48.77
T12	106.67-100.00	A	7.663	1.667	0.000	0.000	97.55
		B	20.203	3.333	0.000	0.000	246.19
		C	2.778	1.667	0.000	0.000	48.77
T13	100.00-80.00	A	22.988	5.000	0.000	0.000	292.64
		B	60.609	10.000	0.000	0.000	738.56
		C	8.334	5.000	0.000	0.000	146.32
T14	80.00-60.00	A	22.988	5.000	0.000	0.000	292.64
		B	60.609	10.000	0.000	0.000	738.56
		C	9.141	5.000	0.000	0.000	148.65
T15	60.00-50.00	A	11.786	2.500	0.000	0.000	146.32
		B	30.596	5.000	0.000	0.000	374.15
		C	5.271	2.500	0.000	0.000	79.53
T16	50.00-40.00	A	11.786	2.500	0.000	0.000	146.32
		B	30.596	5.000	0.000	0.000	374.15
		C	5.271	2.500	0.000	0.000	79.53
T17	40.00-20.00	A	23.571	5.000	0.000	0.000	292.64
		B	61.192	10.000	0.000	0.000	748.30
		C	10.542	5.000	0.000	0.000	159.06
T18	20.00-0.00	A	14.859	4.500	0.000	0.000	203.77
		B	37.432	8.000	0.000	0.000	492.20
		C	5.854	5.000	0.000	0.000	131.07

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	195.00-180.00	A	0.924	11.083	8.850	0.000	0.000	358.97
		B		10.464	15.955	0.000	0.000	724.39
		C		0.000	0.000	0.000	0.000	0.00
T2	180.00-175.00	A	0.918	6.055	7.801	0.000	0.000	265.45
		B		4.186	7.436	0.000	0.000	300.19
		C		0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T3	175.00-170.00	A	0.915	6.039	7.798	0.000	0.000	264.82
		B		4.176	7.433	0.000	0.000	299.71
		C		0.000	0.000	0.000	0.000	0.00
T4	170.00-160.00	A	0.910	12.029	15.584	0.000	0.000	527.70
		B		14.050	39.837	0.000	0.000	1118.52
		C		0.000	0.000	0.000	0.000	0.00
T5	160.00-150.00	A	0.903	11.961	15.569	0.000	0.000	524.99
		B		14.439	42.080	0.000	0.000	1156.22
		C		2.014	5.382	0.000	0.000	148.11
T6	150.00-140.00	A	0.896	11.889	15.553	0.000	0.000	522.13
		B		14.355	42.048	0.000	0.000	1151.15
		C		4.028	8.866	0.000	0.000	247.93
T7	140.00-133.33	A	0.889	7.884	10.359	0.000	0.000	346.42
		B		9.521	28.013	0.000	0.000	764.46
		C		2.671	5.901	0.000	0.000	164.40
T8	133.33-126.67	A	0.884	7.848	10.351	0.000	0.000	345.02
		B		9.479	27.997	0.000	0.000	761.97
		C		2.659	5.893	0.000	0.000	163.66
T9	126.67-120.00	A	0.879	7.811	10.343	0.000	0.000	343.56
		B		9.436	27.981	0.000	0.000	759.37
		C		2.647	5.885	0.000	0.000	162.88
T10	120.00-113.33	A	0.873	7.772	10.335	0.000	0.000	342.03
		B		9.391	27.964	0.000	0.000	756.65
		C		2.634	5.876	0.000	0.000	162.07
T11	113.33-106.67	A	0.867	7.731	10.325	0.000	0.000	340.43
		B		9.343	27.945	0.000	0.000	753.79
		C		2.620	5.867	0.000	0.000	161.22
T12	106.67-100.00	A	0.860	7.688	10.316	0.000	0.000	338.75
		B		9.293	27.926	0.000	0.000	750.79
		C		2.606	5.858	0.000	0.000	160.33
T13	100.00-80.00	A	0.846	22.782	30.885	0.000	0.000	1005.29
		B		27.548	83.653	0.000	0.000	2232.75
		C		7.723	17.510	0.000	0.000	475.16
T14	80.00-60.00	A	0.821	22.279	30.773	0.000	0.000	986.01
		B		26.961	83.430	0.000	0.000	2198.12
		C		10.483	17.398	0.000	0.000	489.72
T15	60.00-50.00	A	0.797	12.526	15.335	0.000	0.000	484.15
		B		14.828	41.611	0.000	0.000	1099.12
		C		8.791	8.647	0.000	0.000	259.16
T16	50.00-40.00	A	0.778	12.305	15.292	0.000	0.000	477.05
		B		14.575	41.526	0.000	0.000	1085.81
		C		8.633	8.605	0.000	0.000	254.42
T17	40.00-20.00	A	0.750	23.946	30.458	0.000	0.000	933.10
		B		28.392	82.800	0.000	0.000	2132.07
		C		16.792	17.083	0.000	0.000	494.88
T18	20.00-0.00	A	0.750	18.834	20.775	0.000	0.000	639.41
		B		21.752	53.013	0.000	0.000	1377.27
		C		12.729	12.708	0.000	0.000	367.49

Feed Line Shielding

Section	Elevation ft	Face	A_R ft²	A_R Ice ft²	A_F ft²	A_F Ice ft²
T1	195.00-180.00	A	0.355	3.060	0.363	0.600
		B	0.615	4.459	0.629	0.875
		C	0.000	0.000	0.000	0.000

Section	Elevation ft	Face	A_R ft²	A_R Ice ft²	A_F ft²	A_F Ice ft²
T2	180.00-175.00	A	0.000	1.661	0.781	1.462
		B	0.000	1.365	0.723	1.201
		C	0.000	0.000	0.000	0.000
T3	175.00-170.00	A	0.000	1.560	0.912	1.705
		B	0.000	1.282	0.845	1.402
		C	0.000	0.000	0.000	0.000
T4	170.00-160.00	A	0.000	2.904	1.394	2.602
		B	0.000	6.075	3.407	5.444
		C	0.000	0.000	0.000	0.000
T5	160.00-150.00	A	0.000	2.704	1.609	2.995
		B	0.000	5.959	4.170	6.599
		C	0.000	0.912	0.401	1.009
T6	150.00-140.00	A	0.000	2.566	1.544	2.865
		B	0.000	5.660	4.001	6.319
		C	0.000	1.434	0.769	1.601
T7	140.00-133.33	A	0.000	0.965	0.733	1.356
		B	0.000	2.130	1.898	2.993
		C	0.000	0.539	0.365	0.757
T8	133.33-126.67	A	0.000	0.926	0.709	1.309
		B	0.000	2.046	1.837	2.893
		C	0.000	0.517	0.353	0.731
T9	126.67-120.00	A	0.000	0.893	0.690	1.271
		B	0.000	1.975	1.788	2.810
		C	0.000	0.499	0.343	0.710
T10	120.00-113.33	A	0.000	1.223	1.144	2.102
		B	0.000	2.706	2.964	4.651
		C	0.000	0.682	0.569	1.173
T11	113.33-106.67	A	0.000	1.195	1.128	2.068
		B	0.000	2.645	2.923	4.579
		C	0.000	0.666	0.561	1.153
T12	106.67-100.00	A	0.000	1.169	0.984	1.801
		B	0.000	2.590	2.551	3.990
		C	0.000	0.651	0.490	1.004
T13	100.00-80.00	A	0.000	3.366	3.661	6.658
		B	0.000	7.472	9.489	14.781
		C	0.000	1.874	1.823	3.707
T14	80.00-60.00	A	0.000	2.178	2.580	4.643
		B	0.000	4.851	6.686	10.343
		C	0.000	1.342	1.362	2.862
T15	60.00-50.00	A	0.000	1.065	1.236	2.202
		B	0.000	2.380	3.203	4.922
		C	0.000	0.673	0.663	1.392
T16	50.00-40.00	A	0.000	1.020	1.223	2.162
		B	0.000	2.285	3.170	4.845
		C	0.000	0.643	0.657	1.363
T17	40.00-20.00	A	0.000	1.330	2.030	3.546
		B	0.000	2.991	5.260	7.977
		C	0.000	0.835	1.090	2.227
T18	20.00-0.00	A	0.000	0.884	1.628	2.948
		B	0.000	1.894	4.044	6.314
		C	0.000	0.582	0.898	1.940

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	195.00-180.00	2.4370	-4.7977	0.9739	-3.0959
T2	180.00-175.00	1.5865	-6.5234	0.8832	-4.7814
T3	175.00-170.00	1.6191	-6.6923	0.9227	-5.0299
T4	170.00-160.00	1.8936	-12.0895	1.2687	-9.3582
T5	160.00-150.00	1.8421	-12.0717	1.1398	-9.0744
T6	150.00-140.00	1.9450	-12.1640	1.2489	-9.5037
T7	140.00-133.33	2.1393	-13.0677	1.5875	-11.6278
T8	133.33-126.67	2.3423	-14.0993	1.7470	-12.5619
T9	126.67-120.00	2.5364	-15.0802	1.8993	-13.4450
T10	120.00-113.33	2.3140	-13.6337	1.6647	-11.7336
T11	113.33-106.67	2.4550	-14.3331	1.7734	-12.3516
T12	106.67-100.00	2.7195	-15.7450	1.9552	-13.4494
T13	100.00-80.00	2.6160	-14.9594	1.9494	-13.2196
T14	80.00-60.00	3.2563	-18.1833	2.5662	-16.5771
T15	60.00-50.00	3.5382	-19.3106	2.7222	-16.3716
T16	50.00-40.00	3.7191	-20.1985	2.8808	-17.1998
T17	40.00-20.00	4.2430	-22.8945	3.4202	-20.2076
T18	20.00-0.00	2.9814	-15.7858	2.5501	-14.8240

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
1.75" Dia x 5-ft Pipe	C	From Leg	2.25			-30.0000	75.50	No Ice	0.88	0.88	12.00
			0.00					1/2" Ice	1.32	1.32	19.06
			0.00					1" Ice	1.63	1.63	29.51
								2" Ice	2.28	2.28	61.18
								4" Ice	3.68	3.68	171.86
GPS0015	C	From Leg	4.50			-30.0000	75.50	No Ice	0.10	0.10	0.50
			0.00					1/2" Ice	0.15	0.15	2.29
			0.75					1" Ice	0.22	0.22	4.89
								2" Ice	0.38	0.38	13.15
								4" Ice	0.83	0.83	46.16
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Sector Mount [SM 502-3]	C	None				0.0000	152.00	No Ice	33.02	33.02	1673.10
								1/2" Ice	47.36	47.36	2223.90
								1" Ice	61.70	61.70	2774.70
								2" Ice	90.38	90.38	3876.30
								4" Ice	147.74	147.74	6079.50
APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	5.00			0.0000	152.00	No Ice	8.26	6.71	78.90
			0.00					1/2" Ice	8.81	7.66	144.31
			0.00					1" Ice	9.36	8.49	217.47
								2" Ice	10.50	10.20	390.34
								4" Ice	12.88	13.98	872.84
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	5.00			0.0000	152.00	No Ice	8.26	6.71	78.90
			0.00					1/2" Ice	8.81	7.66	144.31
			0.00					1" Ice	9.36	8.49	217.47
								2" Ice	10.50	10.20	390.34
								4" Ice	12.88	13.98	872.84
APXVSPP18-C-A20 w/	C	From Leg	5.00			0.0000	152.00	No Ice	8.26	6.71	78.90

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
Mount Pipe			0.00					1/2" Ice	8.81	7.66	144.31
			0.00					1" Ice	9.36	8.49	217.47
								2" Ice	10.50	10.20	390.34
								4" Ice	12.88	13.98	872.84
800MHZ 2X50W RRH	A	From Leg	5.00			0.0000	152.00	No Ice	2.49	2.07	53.00
			0.00					1/2" Ice	2.71	2.27	74.19
			0.00					1" Ice	2.93	2.48	98.39
								2" Ice	3.41	2.93	156.61
								4" Ice	4.46	3.93	317.77
800MHZ 2X50W RRH	B	From Leg	5.00			0.0000	152.00	No Ice	2.49	2.07	53.00
			0.00					1/2" Ice	2.71	2.27	74.19
			0.00					1" Ice	2.93	2.48	98.39
								2" Ice	3.41	2.93	156.61
								4" Ice	4.46	3.93	317.77
800MHZ 2X50W RRH	C	From Leg	5.00			0.0000	152.00	No Ice	2.49	2.07	53.00
			0.00					1/2" Ice	2.71	2.27	74.19
			0.00					1" Ice	2.93	2.48	98.39
								2" Ice	3.41	2.93	156.61
								4" Ice	4.46	3.93	317.77
1900MHz 2X40W RRH	A	From Leg	5.00			0.0000	152.00	No Ice	2.71	2.61	59.50
			0.00					1/2" Ice	2.95	2.84	82.62
			0.00					1" Ice	3.20	3.09	108.98
								2" Ice	3.72	3.61	172.17
								4" Ice	4.86	4.74	345.91
1900MHz 2X40W RRH	B	From Leg	5.00			0.0000	152.00	No Ice	2.71	2.61	59.50
			0.00					1/2" Ice	2.95	2.84	82.62
			0.00					1" Ice	3.20	3.09	108.98
								2" Ice	3.72	3.61	172.17
								4" Ice	4.86	4.74	345.91
1900MHz 2X40W RRH	C	From Leg	5.00			0.0000	152.00	No Ice	2.71	2.61	59.50
			0.00					1/2" Ice	2.95	2.84	82.62
			0.00					1" Ice	3.20	3.09	108.98
								2" Ice	3.72	3.61	172.17
								4" Ice	4.86	4.74	345.91
DB980H90T2E-M w/ Mount Pipe	A	From Leg	5.00			0.0000	152.00	No Ice	4.04	3.62	30.40
			0.00					1/2" Ice	4.50	4.48	66.41
			0.00					1" Ice	4.95	5.22	108.76
								2" Ice	5.87	6.74	215.74
								4" Ice	8.05	10.00	549.44
DB980H90T2E-M w/ Mount Pipe	B	From Leg	5.00			0.0000	152.00	No Ice	4.04	3.62	30.40
			0.00					1/2" Ice	4.50	4.48	66.41
			0.00					1" Ice	4.95	5.22	108.76
								2" Ice	5.87	6.74	215.74
								4" Ice	8.05	10.00	549.44
DB980H90T2E-M w/ Mount Pipe	C	From Leg	5.00			0.0000	152.00	No Ice	4.04	3.62	30.40
			0.00					1/2" Ice	4.50	4.48	66.41
			0.00					1" Ice	4.95	5.22	108.76
								2" Ice	5.87	6.74	215.74
								4" Ice	8.05	10.00	549.44
APXVTM14-C-120 w/ Mount Pipe	A	From Leg	5.00			0.0000	152.00	No Ice	6.90	3.61	56.20
			0.00					1/2" Ice	7.35	3.97	95.73
			0.00					1" Ice	7.81	4.33	140.32
								2" Ice	8.75	5.14	245.49
								4" Ice	10.75	6.97	525.21
APXVTM14-C-120 w/ Mount Pipe	B	From Leg	5.00			0.0000	152.00	No Ice	6.90	3.61	56.20
			0.00					1/2" Ice	7.35	3.97	95.73
			0.00					1" Ice	7.81	4.33	140.32

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
						2" Ice	8.75	5.14	245.49
						4" Ice	10.75	6.97	525.21
APXVTM14-C-120 w/ Mount Pipe	C	From Leg	5.00 0.00 0.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.90 7.35 7.81 8.75 10.75	3.61 3.97 4.33 5.14 6.97	56.20 95.73 140.32 245.49 525.21
TD-RRH8x20-25	A	From Leg	5.00 0.00 0.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.15 2.62 3.68	70.00 97.15 127.83 200.54 396.84
TD-RRH8x20-25	B	From Leg	5.00 0.00 0.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.15 2.62 3.68	70.00 97.15 127.83 200.54 396.84
TD-RRH8x20-25	C	From Leg	5.00 0.00 0.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.15 2.62 3.68	70.00 97.15 127.83 200.54 396.84
****									
(3) Sector Mounts 169-ft	C	None		0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	21.56 29.77 37.98 54.40 87.24	21.56 29.77 37.98 54.40 87.24	1395.40 2140.10 2884.80 4374.20 7353.00
(2) BXA-70063/6CF w/ Mount Pipe	A	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.75 8.29 8.85 9.97 12.34	5.18 6.11 6.92 8.59 12.13	38.90 95.39 159.37 313.07 754.05
(2) DB844G65ZAXY w/Mount Pipe	B	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.38 6.07 6.65 7.83 10.34	5.40 6.49 7.30 8.96 12.49	41.55 92.81 150.42 288.32 688.90
(2) DB844G65ZAXY w/Mount Pipe	C	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.38 6.07 6.65 7.83 10.34	5.40 6.49 7.30 8.96 12.49	41.55 92.81 150.42 288.32 688.90
DB-B1/T1 w/ Mount Pipe	C	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.51 6.29 6.87 8.08 10.67	4.56 5.55 6.25 7.69 10.79	57.55 107.53 163.14 294.91 674.64
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	67.23 136.85 214.64 398.47 913.98
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.98 9.65 10.29 11.59	6.96 8.18 9.14 11.02	67.23 136.85 214.64 398.47

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
						4" Ice	14.32	15.03	913.98
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	67.23 136.85 214.64 398.47 913.98
RRH2x60-AWS	A	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	1.82 2.08 2.36 2.96 4.25	60.00 82.72 109.06 173.43 354.26
RRH2x60-AWS	B	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	1.82 2.08 2.36 2.96 4.25	60.00 82.72 109.06 173.43 354.26
RRH2x60-AWS	C	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	1.82 2.08 2.36 2.96 4.25	60.00 82.72 109.06 173.43 354.26
RRH2X60-PCS	A	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	55.00 75.35 98.71 155.23 312.91
RRH2X60-PCS	B	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	55.00 75.35 98.71 155.23 312.91
RRH2X60-PCS	C	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	55.00 75.35 98.71 155.23 312.91
BXA-70080/6CF w/ Mount Pipe	A	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.70 8.24 8.79 9.92 12.28	5.54 6.48 7.30 8.99 12.56	42.90 100.79 166.25 323.17 771.61
DB846F65ZAXY w/Mount Pipe	B	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.27 7.88 8.48 9.72 12.33	7.82 9.01 9.91 11.81 15.98	46.55 113.93 189.25 367.34 867.35
DB846F65ZAXY w/Mount Pipe	C	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.27 7.88 8.48 9.72 12.33	7.82 9.01 9.91 11.81 15.98	46.55 113.93 189.25 367.34 867.35
(2) FD9R6004	A	From Leg	5.00 0.00 0.00	0.0000	169.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	3.10 5.40 8.79 19.61 62.87
(2) FD9R6004	B	From Leg	5.00	0.0000	169.00	No Ice	0.37	0.08	3.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.00					1/2" Ice	0.45	0.14	5.40
			0.00					1" Ice	0.54	0.20	8.79
								2" Ice	0.75	0.34	19.61
								4" Ice	1.28	0.74	62.87
(2) FD9R6004	C	From Leg	5.00			0.0000	169.00	No Ice	0.37	0.08	3.10
			0.00					1/2" Ice	0.45	0.14	5.40
			0.00					1" Ice	0.54	0.20	8.79
								2" Ice	0.75	0.34	19.61
								4" Ice	1.28	0.74	62.87
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(3) Sector Mounts 188-ft	C	None				0.0000	188.00	No Ice	21.56	21.56	1395.40
								1/2" Ice	29.77	29.77	2140.10
								1" Ice	37.98	37.98	2884.80
								2" Ice	54.40	54.40	4374.20
								4" Ice	87.24	87.24	7353.00
(2) 7770.00 w/ Mount Pipe	A	From Leg	5.00			-30.0000	188.00	No Ice	6.22	4.35	56.90
			0.00					1/2" Ice	6.77	5.20	105.42
			3.00					1" Ice	7.30	5.92	160.42
								2" Ice	8.38	7.41	293.10
								4" Ice	10.69	10.76	679.83
(2) 7770.00 w/ Mount Pipe	B	From Leg	5.00			-30.0000	188.00	No Ice	6.22	4.35	56.90
			0.00					1/2" Ice	6.77	5.20	105.42
			3.00					1" Ice	7.30	5.92	160.42
								2" Ice	8.38	7.41	293.10
								4" Ice	10.69	10.76	679.83
(2) 7770.00 w/ Mount Pipe	C	From Leg	5.00			-30.0000	188.00	No Ice	6.22	4.35	56.90
			0.00					1/2" Ice	6.77	5.20	105.42
			3.00					1" Ice	7.30	5.92	160.42
								2" Ice	8.38	7.41	293.10
								4" Ice	10.69	10.76	679.83
P65-17-XLH-RR w/Mount Pipe	A	From Leg	5.00			-30.0000	188.00	No Ice	11.70	8.94	91.85
			0.00					1/2" Ice	12.42	10.45	177.61
			3.00					1" Ice	13.15	11.99	273.25
								2" Ice	14.64	14.31	498.46
								4" Ice	17.91	19.14	1125.60
P65-17-XLH-RR w/Mount Pipe	B	From Leg	5.00			-30.0000	188.00	No Ice	11.70	8.94	91.85
			0.00					1/2" Ice	12.42	10.45	177.61
			3.00					1" Ice	13.15	11.99	273.25
								2" Ice	14.64	14.31	498.46
								4" Ice	17.91	19.14	1125.60
P65-17-XLH-RR w/Mount Pipe	C	From Leg	5.00			-30.0000	188.00	No Ice	11.70	8.94	91.85
			0.00					1/2" Ice	12.42	10.45	177.61
			3.00					1" Ice	13.15	11.99	273.25
								2" Ice	14.64	14.31	498.46
								4" Ice	17.91	19.14	1125.60
(2) LGP13519	A	From Leg	5.00			-30.0000	188.00	No Ice	0.35	0.33	8.04
			0.00					1/2" Ice	0.44	0.47	12.97
			3.00					1" Ice	0.55	0.63	19.68
								2" Ice	0.78	1.01	39.83
								4" Ice	1.37	2.01	119.63
(2) LGP13519	B	From Leg	5.00			-30.0000	188.00	No Ice	0.35	0.33	8.04
			0.00					1/2" Ice	0.44	0.47	12.97
			3.00					1" Ice	0.55	0.63	19.68
								2" Ice	0.78	1.01	39.83
								4" Ice	1.37	2.01	119.63
(2) LGP13519	C	From Leg	5.00			-30.0000	188.00	No Ice	0.35	0.33	8.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.00					1/2" Ice	0.44	0.47	12.97
			3.00					1" Ice	0.55	0.63	19.68
								2" Ice	0.78	1.01	39.83
								4" Ice	1.37	2.01	119.63
(2) LGP21401	A	From Leg	5.00			-30.0000	188.00	No Ice	0.00	0.36	10.00
			0.00					1/2" Ice	0.00	0.48	21.26
			3.00					1" Ice	0.00	0.60	30.32
								2" Ice	0.00	0.87	54.89
								4" Ice	0.00	1.52	135.29
(2) LGP21401	B	From Leg	5.00			-30.0000	188.00	No Ice	0.00	0.36	10.00
			0.00					1/2" Ice	0.00	0.48	21.26
			3.00					1" Ice	0.00	0.60	30.32
								2" Ice	0.00	0.87	54.89
								4" Ice	0.00	1.52	135.29
(2) LGP21401	C	From Leg	5.00			-30.0000	188.00	No Ice	0.00	0.36	10.00
			0.00					1/2" Ice	0.00	0.48	21.26
			3.00					1" Ice	0.00	0.60	30.32
								2" Ice	0.00	0.87	54.89
								4" Ice	0.00	1.52	135.29
(2) RRUS-11	A	From Leg	5.00			-30.0000	188.00	No Ice	2.94	1.25	55.00
			0.00					1/2" Ice	3.17	1.41	74.32
			3.00					1" Ice	3.41	1.59	96.56
								2" Ice	3.91	1.96	150.56
								4" Ice	5.02	2.82	302.12
(2) RRUS-11	B	From Leg	5.00			-30.0000	188.00	No Ice	2.94	1.25	55.00
			0.00					1/2" Ice	3.17	1.41	74.32
			3.00					1" Ice	3.41	1.59	96.56
								2" Ice	3.91	1.96	150.56
								4" Ice	5.02	2.82	302.12
(2) RRUS-11	C	From Leg	5.00			-30.0000	188.00	No Ice	2.94	1.25	55.00
			0.00					1/2" Ice	3.17	1.41	74.32
			3.00					1" Ice	3.41	1.59	96.56
								2" Ice	3.91	1.96	150.56
								4" Ice	5.02	2.82	302.12
DC6-48-60-18-8F	A	From Leg	5.00			-30.0000	188.00	No Ice	1.27	1.27	20.00
			0.00					1/2" Ice	1.46	1.46	35.12
			3.00					1" Ice	1.66	1.66	52.57
								2" Ice	2.09	2.09	95.09
								4" Ice	3.10	3.10	214.90
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Sector Mount [SM 802-3]	C	None				0.0000	195.00	No Ice	24.41	24.41	930.00
								1/2" Ice	31.39	31.39	1362.00
								1" Ice	38.37	38.37	1794.00
								2" Ice	52.33	52.33	2658.00
								4" Ice	80.25	80.25	4386.00
HSS Top Mount	C	None				0.0000	195.00	No Ice	8.08	8.08	328.90
								1/2" Ice	9.70	9.70	415.20
								1" Ice	11.32	11.32	501.50
								2" Ice	14.56	14.56	674.10
								4" Ice	21.04	21.04	1019.30
LNX-6515DS-VTM w/ Mount Pipe	A	From Leg	3.00			25.0000	193.00	No Ice	11.21	9.36	75.35
			0.00					1/2" Ice	11.83	10.68	158.69
			0.00					1" Ice	12.45	11.71	251.57
								2" Ice	13.74	13.82	469.57
								4" Ice	16.75	18.22	1068.51
LNX-6515DS-VTM w/ Mount Pipe	B	From Leg	3.00			25.0000	193.00	No Ice	11.21	9.36	75.35
			0.00					1/2" Ice	11.83	10.68	158.69

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.00			1" Ice	12.45	11.71	251.57
						2" Ice	13.74	13.82	469.57
						4" Ice	16.75	18.22	1068.51
LNX-6515DS-VTM w/ Mount Pipe	C	From Leg	3.00	25.0000	193.00	No Ice	11.21	9.36	75.35
			0.00			1/2" Ice	11.83	10.68	158.69
			0.00			1" Ice	12.45	11.71	251.57
						2" Ice	13.74	13.82	469.57
						4" Ice	16.75	18.22	1068.51
APX16DWV-16DWVS-A	A	From Leg	3.00	25.0000	195.00	No Ice	7.07	2.15	40.70
			0.00			1/2" Ice	7.52	2.49	73.65
			0.00			1" Ice	7.98	2.84	111.47
						2" Ice	8.92	3.55	202.47
						4" Ice	10.91	5.08	451.40
APX16DWV-16DWVS-A	B	From Leg	3.00	25.0000	195.00	No Ice	7.07	2.15	40.70
			0.00			1/2" Ice	7.52	2.49	73.65
			0.00			1" Ice	7.98	2.84	111.47
						2" Ice	8.92	3.55	202.47
						4" Ice	10.91	5.08	451.40
APX16DWV-16DWVS-A	C	From Leg	3.00	25.0000	195.00	No Ice	7.07	2.15	40.70
			0.00			1/2" Ice	7.52	2.49	73.65
			0.00			1" Ice	7.98	2.84	111.47
						2" Ice	8.92	3.55	202.47
						4" Ice	10.91	5.08	451.40
(2) KRY 112 71	A	From Leg	3.00	25.0000	195.00	No Ice	0.73	0.66	18.07
			0.00			1/2" Ice	0.87	0.88	26.97
			0.00			1" Ice	1.03	1.11	38.22
						2" Ice	1.37	1.65	69.33
						4" Ice	2.20	2.95	180.58
(2) KRY 112 71	B	From Leg	3.00	25.0000	195.00	No Ice	0.73	0.66	18.07
			0.00			1/2" Ice	0.87	0.88	26.97
			0.00			1" Ice	1.03	1.11	38.22
						2" Ice	1.37	1.65	69.33
						4" Ice	2.20	2.95	180.58
(2) KRY 112 71	C	From Leg	3.00	25.0000	195.00	No Ice	0.73	0.66	18.07
			0.00			1/2" Ice	0.87	0.88	26.97
			0.00			1" Ice	1.03	1.11	38.22
						2" Ice	1.37	1.65	69.33
						4" Ice	2.20	2.95	180.58
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Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice

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

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	195 - 180	8.983	27	0.5205	0.0852
T2	180 - 175	7.287	27	0.4834	0.0502
T3	175 - 170	6.784	27	0.4542	0.0471
T4	170 - 160	6.325	27	0.4228	0.0451
T5	160 - 150	5.465	27	0.3843	0.0435
T6	150 - 140	4.708	27	0.3294	0.0412
T7	140 - 133.333	4.046	27	0.2910	0.0385
T8	133.333 - 126.667	3.640	27	0.2776	0.0361
T9	126.667 - 120	3.252	27	0.2637	0.0336
T10	120 - 113.333	2.880	27	0.2496	0.0304
T11	113.333 - 106.667	2.535	27	0.2276	0.0275
T12	106.667 - 100	2.221	27	0.2053	0.0247
T13	100 - 80	1.940	27	0.1828	0.0222
T14	80 - 60	1.217	27	0.1492	0.0165
T15	60 - 50	0.655	27	0.1039	0.0108
T16	50 - 40	0.446	27	0.0813	0.0083
T17	40 - 20	0.285	27	0.0588	0.0059
T18	20 - 0	0.081	27	0.0292	0.0028

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

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.00	Sector Mount [SM 802-3]	27	8.983	0.5205	0.0852	22657
193.00	LNX-6515DS-VTM w/ Mount Pipe	27	8.749	0.5180	0.0784	22657
188.00	(3) Sector Mounts 188-ft	27	8.169	0.5099	0.0626	16183
169.00	(3) Sector Mounts 169-ft	27	6.235	0.4179	0.0449	17373
152.00	Sector Mount [SM 502-3]	27	4.851	0.3405	0.0417	11789
75.50	1.75" Dia x 5-ft Pipe	27	1.076	0.1407	0.0153	30319

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	195 - 180	25.707	2	1.4889	0.2325
T2	180 - 175	20.864	2	1.3834	0.1448
T3	175 - 170	19.423	2	1.2997	0.1360
T4	170 - 160	18.110	2	1.2101	0.1303
T5	160 - 150	15.649	2	1.0999	0.1255
T6	150 - 140	13.484	2	0.9427	0.1190
T7	140 - 133.333	11.589	2	0.8326	0.1112
T8	133.333 - 126.667	10.425	2	0.7943	0.1044
T9	126.667 - 120	9.314	2	0.7546	0.0972
T10	120 - 113.333	8.250	2	0.7143	0.0877
T11	113.333 - 106.667	7.263	2	0.6513	0.0796
T12	106.667 - 100	6.363	2	0.5874	0.0715
T13	100 - 80	5.558	2	0.5232	0.0641
T14	80 - 60	3.490	2	0.4268	0.0478
T15	60 - 50	1.879	2	0.2972	0.0312
T16	50 - 40	1.279	2	0.2326	0.0240
T17	40 - 20	0.818	2	0.1682	0.0170
T18	20 - 0	0.233	2	0.0837	0.0082

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.00	Sector Mount [SM 802-3]	2	25.707	1.4889	0.2325	8084
193.00	LNX-6515DS-VTM w/ Mount Pipe	2	25.040	1.4817	0.2154	8084
188.00	(3) Sector Mounts 188-ft	2	23.386	1.4587	0.1753	5774
169.00	(3) Sector Mounts 169-ft	2	17.854	1.1959	0.1295	6074
152.00	Sector Mount [SM 502-3]	2	13.893	0.9745	0.1205	4123
75.50	1.75" Dia x 5-ft Pipe	2	3.085	0.4026	0.0441	10612

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	195	Leg	A325N	0.7500	4	4404.88	19438.60	0.227	1.333	Bolt Tension
T2	180	Diagonal	A325N	0.5000	1	2823.53	3126.56	0.903	1.333	Member Block Shear
		Secondary Horizontal	A325N	0.6250	1	572.18	4553.91	0.126	1.333	Member Block Shear
T3	175	Diagonal	A325X	0.5000	1	2744.96	4078.13	0.673	1.333	Member Bearing
		Secondary Horizontal	A325N	0.6250	1	710.74	4553.91	0.156	1.333	Member Block Shear
T4	170	Leg	A325N	0.7500	6	9228.08	19438.10	0.475	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4988.61	5437.50	0.917	1.333	Gusset Bearing
		Secondary Horizontal	A325N	0.6250	1	1079.97	4553.91	0.237	1.333	Member Block Shear
T5	160	Diagonal	A325X	0.5000	1	5344.07	5437.50	0.983	1.333	Gusset Bearing
		Secondary Horizontal	A325N	0.6250	1	1457.96	4553.91	0.320	1.333	Member Block Shear
T6	150	Leg	A325N	1.0000	6	16141.80	34557.30	0.467	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	6104.61	5437.50	1.123	1.333	Gusset Bearing
		Secondary Horizontal	A325N	0.6250	1	1884.28	4553.91	0.414	1.333	Member Block Shear
T7	140	Diagonal	A325X	0.6250	1	6440.41	8156.25	0.790	1.333	Member Bearing
T8	133.333	Diagonal	A325X	0.6250	1	6576.58	8156.25	0.806	1.333	Member Bearing
T9	126.667	Leg	A325N	1.0000	8	16781.90	34557.50	0.486	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	6415.84	5097.66	1.259	1.333	Member Bearing
T10	120	Diagonal	A325N	0.6250	1	6649.98	5097.66	1.305	1.333	Member Bearing
		Secondary Horizontal	A325N	0.6250	1	2803.36	5097.66	0.550	1.333	Member Bearing
T11	113.333	Diagonal	A325N	0.6250	1	6618.01	5097.66	1.298	1.333	Member Bearing
		Secondary Horizontal	A325N	0.7500	1	3024.34	6117.19	0.494	1.333	Member Bearing
T12	106.667	Leg	A325N	1.0000	8	20835.80	34557.10	0.603	1.333	Bolt Tension
		Diagonal	A325X	0.6250	1	6889.92	8156.25	0.845	1.333	Member Bearing
T13	100	Leg	A325N	1.2500	8	24667.70	53996.00	0.457	1.333	Bolt Tension
		Diagonal	A325N	0.6250	2	3853.11	6442.72	0.598	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.6250	1	3857.70	6442.72	0.599	1.333	Bolt Shear
T14	80	Leg	A325N	1.2500	8	28300.10	53996.10	0.524	1.333	Bolt Tension
		Diagonal	A325N	0.6250	2	4009.85	6442.72	0.622	1.333	Bolt Shear
T15	60	Diagonal	A325N	0.6250	2	4985.52	6442.72	0.774	1.333	Bolt Shear
T16	50	Leg	A325N	1.2500	8	31318.90	53995.90	0.580	1.333	Bolt Tension
		Diagonal	A325N	0.6250	2	4992.11	6442.72	0.775	1.333	Bolt Shear
T17	40	Leg	A325N	1.2500	8	34665.60	53996.10	0.642	1.333	Bolt Tension
		Diagonal	A325N	0.6250	2	4941.17	6442.72	0.767	1.333	Bolt Shear
T18	20	Leg	A36	1.5000	8	38603.00	33823.20	1.141	1.333	Bolt Tension
		Diagonal	A325N	0.6250	2	5568.15	6442.72	0.864	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation	Size	L	L_u	KL/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	PIPE 2.5 STD (SCH 40)	15.00	3.75	47.4 K=1.00	26833.100	1.7072	-29719.30	45810.40	0.649
T2	180 - 175	PIPE 2.5 STD (SCH 40)	5.01	2.67	33.8 K=1.00	29103.699	1.7072	-32993.60	49687.00	0.664
T3	175 - 170	PIPE 2.5 STD (SCH 40)	5.01	2.65	33.5 K=1.00	29141.699	1.7072	-40983.70	49751.90	0.824
T4	170 - 160	2.5SCH40 w/ 3SCH80 Half Sleeve	10.02	2.62	34.2 K=1.00	19124.000	3.2120	-62274.10	61426.70	1.014
T5	160 - 150	Pipe 3.5 Std (SCH40)	10.02	2.60	23.4 K=1.00	30584.000	2.6795	-84070.20	81951.10	1.026
T6	150 - 140	3.5SCH40 w/ 4SCH40 Half Sleeve	10.02	2.59	23.8 K=1.00	27885.500	4.2666	-108653.00	118976.00	0.913
T7	140 - 133.333	5 STD w/ 6 XH Half Sleeve	6.68	6.68	45.4 K=1.00	23299.900	8.5023	-122005.00	198103.00	0.616
T8	133.333 - 126.667	5 STD w/ 6 XH Half Sleeve	6.68	6.68	45.4 K=1.00	23299.900	8.5023	-136220.00	198103.00	0.688
T9	126.667 - 120	5 STD w/ 6 XH Half Sleeve	6.68	6.68	45.4 K=1.00	23299.900	8.5023	-149868.00	198103.00	0.757
T10	120 - 113.333	PIPE 6 STD (SCH40)	6.68	3.45	18.4 K=1.00	31206.400	5.5858	-161650.00	174311.00	0.927
T11	113.333 - 106.667	PIPE 6 STD (SCH40)	6.68	3.44	18.4 K=1.00	31211.000	5.5858	-174393.00	174337.00	1.000
T12	106.667 - 100	PIPE 6 STD (SCH40)	6.68	3.44	18.4 K=1.00	31215.100	5.5858	-186243.00	174360.00	1.068
T13	100 - 80	6 STD w/ 7 XH Half Sleeve	20.03	3.42	19.5 K=1.00	23952.801	11.1773	-222447.00	267728.00	0.831
T14	80 - 60	PIPE 8 STD (SCH40)	20.03	6.68	27.3 K=1.00	30055.500	8.3993	-256430.00	252443.00	1.016
T15	60 - 50	PIPE 8 STD (SCH40)	10.02	5.16	21.1 K=1.00	30878.199	8.3993	-268742.00	259353.00	1.036
T16	50 - 40	PIPE 8 STD (SCH40)	10.02	5.16	21.1 K=1.00	30882.900	8.3993	-285244.00	259393.00	1.100
T17	40 - 20	PIPE 8 X-STR (SCH80)	20.03	10.02	41.7 K=1.00	27820.100	12.7706	-317855.00	355279.00	0.895
T18	20 - 0	PIPE 8 X-STR (SCH80)	20.03	9.97	41.6 K=1.00	27849.500	12.7706	-357208.00	355654.00	1.004

Diagonal Design Data (Compression)

Section No.	Elevation	Size	L	L_u	KL/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		psi	in²	lb	lb	
T2	180 - 175	L1 1/2x1 1/2x3/16	6.25	3.13	128.2 K=1.00	9084.010	0.5273	-3333.83	4790.39	0.696
T3	175 - 170	L2x2x3/16	6.56	3.29	100.2 K=1.00	12953.100	0.7150	-2562.46	9261.49	0.277
T4	170 - 160	2L1 1/2x1 1/2x3/16x1/4	7.25	3.60	108.7 K=1.15	11846.800	1.0547	-4913.61	12494.70	0.393
T5	160 - 150	2L2x2x3/16x1/4	8.01	3.95	96.0 K=1.25	13482.500	1.4297	-5637.04	19275.70	0.292
T6	150 - 140	2L2x2x3/16x1/4	8.40	4.13	97.9 K=1.22	13240.600	1.4297	-6289.46	18930.00	0.332

Section No.	Elevation	Size	L	L_u	KL/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		psi	in²	lb	lb	
T7	140 - 133.333	L2 1/2x2 1/2x1/4	10.29	4.87	119.2 K=1.00	10400.300	1.1900	-6542.78	12376.30	0.529
T8	133.333 - 126.667	L2 1/2x2 1/2x1/4	10.80	5.26	128.6 K=1.00	9025.160	1.1900	-6697.06	10739.90	0.624
T9	126.667 - 120	L2 1/2x2 1/2x3/16	11.34	5.53	134.1 K=1.00	8300.260	0.9020	-6489.40	7486.84	0.867
T10	120 - 113.333	L3x3x3/16	11.88	5.81	116.9 K=1.00	10622.200	1.0900	-7262.85	11578.20	0.627
T11	113.333 - 106.667	L3x3x3/16	12.44	6.09	120.2 K=0.98	10194.600	1.0900	-7119.97	11112.10	0.641
T12	106.667 - 100	L2 1/2x2 1/2x1/4	13.01	6.24	152.5 K=1.00	6419.940	1.1900	-7580.18	7639.72	0.992
T13	100 - 80	L3 1/2x3 1/2x1/4	14.76	7.21	106.0 K=0.85	12207.200	1.6900	-7473.24	20630.20	0.362
T14	80 - 60	L3 1/2x3 1/2x1/4	16.57	8.07	118.7 K=0.85	10473.400	1.6900	-8019.70	17700.10	0.453
T15	60 - 50	L3x3x5/16	18.87	9.11	170.0 K=0.92	5167.060	1.7800	-9971.03	9197.36	1.084
T16	50 - 40	L3x3x5/16	19.73	9.54	176.7 K=0.91	4784.310	1.7800	-9984.21	8516.08	1.172
T17	40 - 20	L4x4x3/8	21.47	10.41	149.5 K=0.94	6685.630	2.8600	-9882.33	19120.90	0.517
T18	20 - 0	L5x5x5/16	23.24	11.30	132.5 K=0.97	8501.120	3.0300	-11136.30	25758.40	0.432

Horizontal Design Data (Compression)

Section No.	Elevation	Size	L	L_u	KL/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	L1 1/2x1 1/2x3/16	3.50	3.26	124.9 K=0.94	9564.350	0.5273	-4942.77	5043.70	0.980

Secondary Horizontal Design Data (Compression)

Section No.	Elevation	Size	L	L_u	KL/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		psi	in²	lb	lb	
T2	180 - 175	L2x2x3/16	3.73	3.49	53.2 K=0.50	18064.801	0.7150	-572.18	12916.40	0.044
T3	175 - 170	L2x2x3/16	4.24	4.00	60.8 K=0.50	17348.500	0.7150	-710.74	12404.20	0.057
T4	170 - 160	L2x2x3/16	5.24	4.95	75.3 K=0.50	15867.200	0.7150	-1079.97	11345.10	0.095
T5	160 - 150	L2x2x3/16	6.24	5.91	89.9 K=0.50	14210.700	0.7150	-1457.96	10160.70	0.143
T6	150 - 140	L2x2x3/16	7.24	6.87	104.6 K=0.50	12391.800	0.7150	-1884.28	8860.11	0.213
T10	120 - 113.333	L3x3x3/16	9.82	9.27	93.3 K=0.50	13524.800	1.0900	-2803.36	14742.00	0.190
T11	113.333 - 106.667	L3x3x3/16	10.49	9.94	100.0 K=0.50	12741.900	1.0900	-3024.34	13888.60	0.218

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T12	106.667 - 100	L3x3x3/16	11.16	10.60	179.6 K=0.84	4627.600	1.0900	-3229.85	5044.08	0.640
T13	100 - 80	L3x3x1/4	13.16	12.52	126.9 K=0.50	9270.190	1.4400	-3857.70	13349.10	0.289
T15	60 - 50	L4x4x1/4	15.98	15.27	191.4 K=0.83	4077.370	1.9400	-4660.55	7910.10	0.589
T16	50 - 40	L4x4x1/4	16.99	16.27	201.7 K=0.82	3669.730	1.9400	-4946.73	7119.28	0.695

Top Girt Design Data (Compression)

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	L1 1/2x1 1/2x3/16	3.50	3.26	124.9 K=0.94	9564.350	0.5273	-874.33	5043.70	0.173

Bottom Girt Design Data (Compression)

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	L1 1/2x1 1/2x3/16	3.50	3.26	124.9 K=0.94	9564.350	0.5273	-2434.08	5043.70	0.483

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	PIPE 2.5 STD (SCH 40)	15.00	3.75	47.4	33000.000	1.7072	17619.50	56338.90	0.313
T2	180 - 175	PIPE 2.5 STD (SCH 40)	5.01	2.34	29.5	33000.000	1.7072	30268.40	56338.90	0.537
T3	175 - 170	PIPE 2.5 STD (SCH 40)	5.01	2.36	29.8	33000.000	1.7072	36947.80	56338.90	0.656
T4	170 - 160	2.5SCH40 w/ 3SCH80 Half Sleeve	10.02	2.38	31.1	21000.000	3.2120	55410.10	67452.30	0.821
T5	160 - 150	Pipe 3.5 Std (SCH40)	10.02	2.40	21.6	33000.000	2.6795	74960.20	88424.80	0.848
T6	150 - 140	3.5SCH40 w/ 4SCH40 Half Sleeve	10.02	2.42	22.2	30000.000	4.2666	96923.70	127998.00	0.757
T7	140 - 133.333	5 STD w/ 6 XH Half Sleeve	6.68	6.68	45.4	27600.000	8.5023	109104.00	234663.00	0.465
T8	133.333 - 126.667	5 STD w/ 6 XH Half Sleeve	6.68	6.68	45.4	27600.000	8.5023	122027.00	234663.00	0.520
T9	126.667 - 120	5 STD w/ 6 XH Half Sleeve	6.68	6.68	45.4	27600.000	8.5023	134255.00	234663.00	0.572
T10	120 - 113.333	PIPE 6 STD (SCH40)	6.68	3.23	17.2	33000.000	5.5858	144990.00	184330.00	0.787
T11	113.333 -	PIPE 6 STD (SCH40)	6.68	3.23	17.3	33000.000	5.5858	156298.00	184330.00	0.848

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
	106.667									
T12	106.667 - 100	PIPE 6 STD (SCH40)	6.68	3.24	17.3	33000.000	5.5858	166839.00	184330.00	0.905
T13	100 - 80	6 STD w/ 7 XH Half Sleeve	20.03	3.25	18.6	25200.000	11.1773	197546.00	281668.00	0.701
T14	80 - 60	PIPE 8 STD (SCH40)	20.03	6.68	27.3	33000.000	8.3993	226401.00	277175.00	0.817
T15	60 - 50	PIPE 8 STD (SCH40)	10.02	4.85	19.8	33000.000	8.3993	236946.00	277175.00	0.855
T16	50 - 40	PIPE 8 STD (SCH40)	10.02	4.86	19.9	33000.000	8.3993	250854.00	277175.00	0.905
T17	40 - 20	PIPE 8 X-STR (SCH80)	20.03	10.02	41.7	33000.000	12.7706	277325.00	421429.00	0.658
T18	20 - 0	PIPE 8 X-STR (SCH80)	20.03	0.08	0.3	33000.000	12.7706	308824.00	421429.00	0.733

Diagonal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	5/8	5.13	4.78	366.9	21600.000	0.3068	7269.94	6626.80	1.097
T2	180 - 175	L1 1/2x1 1/2x3/16	6.25	3.13	82.4	29000.000	0.3076	2823.53	8920.90	0.317
T3	175 - 170	L2x2x3/16	6.56	3.29	64.0	29000.000	0.4484	2744.96	13002.40	0.211
T4	170 - 160	2L1 1/2x1 1/2x3/16x1/4	7.25	3.60	94.5	29000.000	0.6152	4988.61	17841.80	0.280
T5	160 - 150	2L2x2x3/16x1/4	8.01	3.95	76.8	29000.000	0.8965	5344.07	25998.00	0.206
T6	150 - 140	2L2x2x3/16x1/4	8.40	4.13	80.3	29000.000	0.8965	6104.61	25998.00	0.235
T7	140 - 133.333	L2 1/2x2 1/2x1/4	10.29	4.87	78.0	29000.000	0.7519	6440.41	21804.40	0.295
T8	133.333 - 126.667	L2 1/2x2 1/2x1/4	10.80	5.26	82.1	29000.000	0.7519	6576.58	21804.40	0.302
T9	126.667 - 120	L2 1/2x2 1/2x3/16	11.34	5.53	85.3	29000.000	0.5710	6415.84	16559.90	0.387
T10	120 - 113.333	L3x3x3/16	11.88	5.81	74.2	29000.000	0.7120	6649.98	20648.90	0.322
T11	113.333 - 106.667	L3x3x3/16	12.44	6.09	77.8	29000.000	0.7120	6618.01	20648.90	0.321
T12	106.667 - 100	L2 1/2x2 1/2x1/4	13.01	6.24	99.5	29000.000	0.7519	6889.92	21804.40	0.316
T13	100 - 80	L3 1/2x3 1/2x1/4	14.76	7.21	79.4	29000.000	1.1269	7288.15	32679.40	0.223
T14	80 - 60	L3 1/2x3 1/2x1/4	16.57	8.07	88.9	29000.000	1.1269	7871.24	32679.40	0.241
T15	60 - 50	L3x3x5/16	18.87	9.11	121.1	29000.000	1.1592	9047.86	33617.30	0.269
T16	50 - 40	L3x3x5/16	19.73	9.54	126.7	29000.000	1.1592	8986.85	33617.30	0.267
T17	40 - 20	L4x4x3/8	21.47	10.41	103.5	29000.000	1.9341	9590.02	56087.80	0.171
T18	20 - 0	L5x5x5/16	23.24	11.30	87.9	29000.000	2.0967	10206.30	60804.80	0.168

Horizontal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T1	195 - 180	L1 1/2x1 1/2x3/16	3.50	3.26	85.7	21600.000	0.5273	514.75	11390.60	0.045

Secondary Horizontal Design Data (Tension)

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio P/P_a
	ft		ft	ft		psi	in²	lb	lb	
T2	180 - 175	L2x2x3/16	3.73	3.49	67.9	29000.000	0.4308	572.18	12492.70	0.046

Section No.	Elevation ft	Size	L ft	L_u ft	KL/r	F_a psi	A in²	Actual P lb	Allow. P_a lb	Ratio P / P_a
T3	175 - 170	L2x2x3/16	4.24	4.00	77.7	29000.000	0.4308	710.74	12492.70	0.057
T4	170 - 160	L2x2x3/16	5.24	4.95	96.2	29000.000	0.4308	1079.97	12492.70	0.086
T5	160 - 150	L2x2x3/16	6.24	5.91	114.9	29000.000	0.4308	1457.96	12492.70	0.117
T6	150 - 140	L2x2x3/16	7.24	6.87	133.5	29000.000	0.4308	1884.28	12492.70	0.151
T10	120 - 113.333	L3x3x3/16	9.82	9.27	118.5	29000.000	0.7120	2803.36	20648.90	0.136
T11	113.333 - 106.667	L3x3x3/16	10.49	9.94	127.0	29000.000	0.6945	3024.34	20139.10	0.150
T12	106.667 - 100	L3x3x3/16	11.16	10.60	135.5	21600.000	1.0900	3229.85	23544.00	0.137
T13	100 - 80	L3x3x1/4	13.16	12.52	161.6	29000.000	0.9394	3857.70	27241.90	0.142
T15	60 - 50	L4x4x1/4	15.98	15.27	146.6	21600.000	1.9400	4660.55	41904.00	0.111
T16	50 - 40	L4x4x1/4	16.99	16.27	156.2	21600.000	1.9400	4946.73	41904.00	0.118

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	KL/r	F_a psi	A in²	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	195 - 180	L1 1/2x1 1/2x3/16	3.50	3.26	85.7	21600.000	0.5273	413.84	11390.60	0.036

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	KL/r	F_a psi	A in²	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	195 - 180	L1 1/2x1 1/2x3/16	3.50	3.26	85.7	21600.000	0.5273	38.84	11390.60	0.003

Section Capacity Table

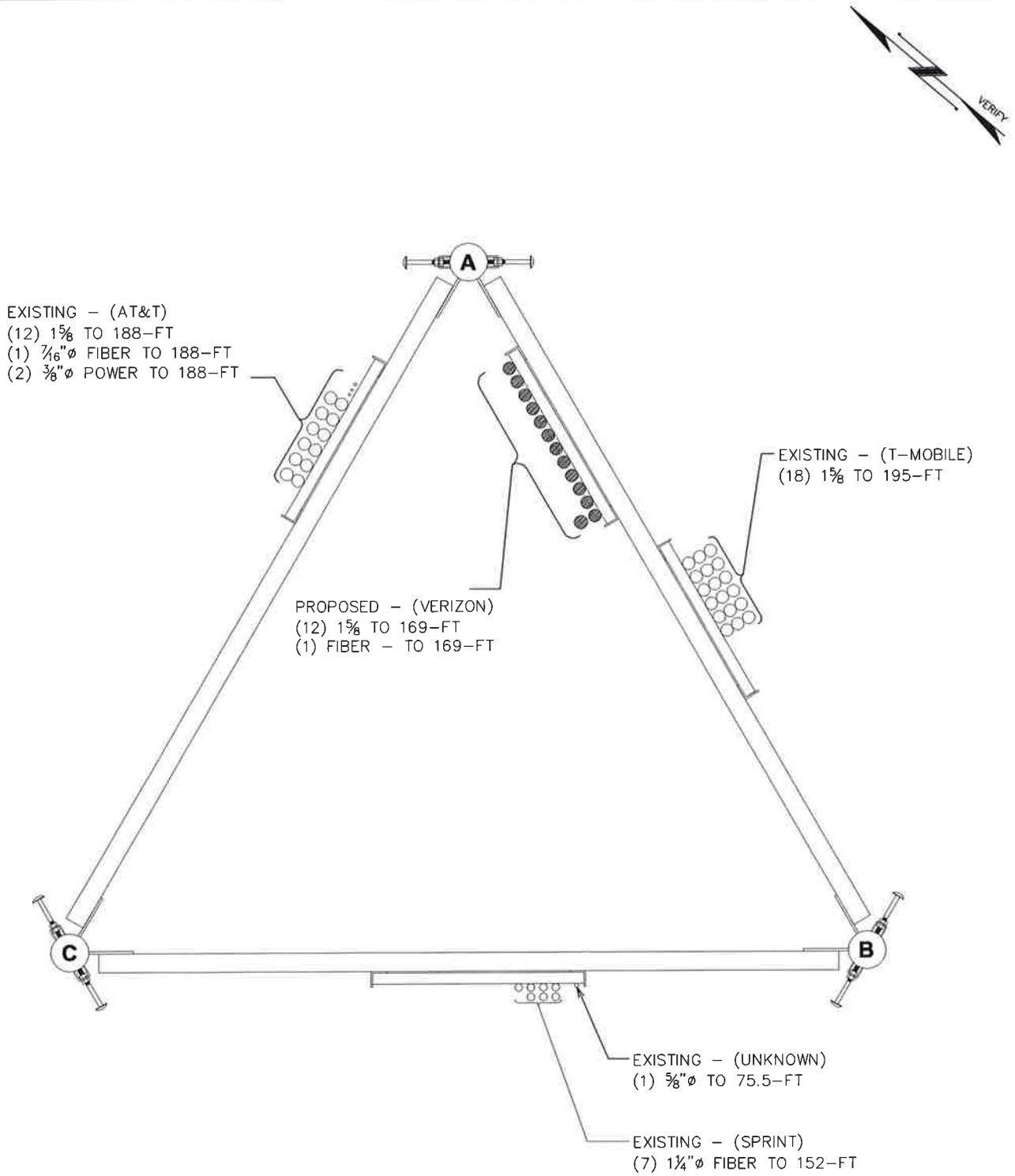
Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	195 - 180	Leg	PIPE 2.5 STD (SCH 40)	3	-29719.30	61065.26	48.7	Pass
T2	180 - 175	Leg	PIPE 2.5 STD (SCH 40)	45	-32993.60	66232.77	49.8	Pass
T3	175 - 170	Leg	PIPE 2.5 STD (SCH 40)	57	-40983.70	66319.28	61.8	Pass
T4	170 - 160	Leg	2.5SCH40 w/ 3SCH80 Half Sleeve	69	-62274.10	81881.79	76.1	Pass
T5	160 - 150	Leg	Pipe 3.5 Std (SCH40)	90	-84070.20	109240.81	77.0	Pass
T6	150 - 140	Leg	3.5SCH40 w/ 4SCH40 Half Sleeve	111	-108653.00	158595.00	68.5	Pass
T7	140 - 133.333	Leg	5 STD w/ 6 XH Half Sleeve	132	-122005.00	264071.29	46.2	Pass
T8	133.333 - 126.667	Leg	5 STD w/ 6 XH Half Sleeve	141	-136220.00	264071.29	51.6	Pass
T9	126.667 - 120	Leg	5 STD w/ 6 XH Half Sleeve	150	-149868.00	264071.29	56.8	Pass
T10	120 - 113.333	Leg	PIPE 6 STD (SCH40)	159	-161650.00	232356.55	69.6	Pass
T11	113.333 - 106.667	Leg	PIPE 6 STD (SCH40)	171	-174393.00	232391.21	75.0	Pass
T12	106.667 - 100	Leg	PIPE 6 STD (SCH40)	183	-186243.00	232421.87	80.1	Pass
T13	100 - 80	Leg	6 STD w/ 7 XH Half Sleeve	195	-222447.00	356881.41	62.3	Pass
T14	80 - 60	Leg	PIPE 8 STD (SCH40)	225	-256430.00	336506.51	76.2	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T15	60 - 50	Leg	PIPE 8 STD (SCH40)	246	-268742.00	345717.53	77.7	Pass
T16	50 - 40	Leg	PIPE 8 STD (SCH40)	258	-285244.00	345770.85	82.5	Pass
T17	40 - 20	Leg	PIPE 8 X-STR (SCH80)	270	-317855.00	473586.89	67.1	Pass
T18	20 - 0	Leg	PIPE 8 X-STR (SCH80)	285	-357208.00	474086.76	75.3 85.6 (b)	Pass
T1	195 - 180	Diagonal	5/8	12	7269.94	8833.52	82.3	Pass
T2	180 - 175	Diagonal	L1 1/2x1 1/2x3/16	48	-3333.83	6385.59	52.2 67.7 (b)	Pass
T3	175 - 170	Diagonal	L2x2x3/16	60	-2562.46	12345.57	20.8 50.5 (b)	Pass
T4	170 - 160	Diagonal	2L1 1/2x1 1/2x3/16x1/4	75	-4913.61	16655.43	29.5 68.8 (b)	Pass
T5	160 - 150	Diagonal	2L2x2x3/16x1/4	96	-5637.04	25694.51	21.9 73.7 (b)	Pass
T6	150 - 140	Diagonal	2L2x2x3/16x1/4	123	-6289.46	25233.69	24.9 84.2 (b)	Pass
T7	140 - 133.333	Diagonal	L2 1/2x2 1/2x1/4	135	-6542.78	16497.61	39.7 59.2 (b)	Pass
T8	133.333 - 126.667	Diagonal	L2 1/2x2 1/2x1/4	144	-6697.06	14316.29	46.8 60.5 (b)	Pass
T9	126.667 - 120	Diagonal	L2 1/2x2 1/2x3/16	153	-6489.40	9979.96	65.0 94.4 (b)	Pass
T10	120 - 113.333	Diagonal	L3x3x3/16	162	-7262.85	15433.74	47.1 97.9 (b)	Pass
T11	113.333 - 106.667	Diagonal	L3x3x3/16	174	-7119.97	14812.43	48.1 97.4 (b)	Pass
T12	106.667 - 100	Diagonal	L2 1/2x2 1/2x1/4	186	-7580.18	10183.75	74.4	Pass
T13	100 - 80	Diagonal	L3 1/2x3 1/2x1/4	198	-7473.24	27500.05	27.2 44.9 (b)	Pass
T14	80 - 60	Diagonal	L3 1/2x3 1/2x1/4	228	-8019.70	23594.23	34.0 46.7 (b)	Pass
T15	60 - 50	Diagonal	L3x3x5/16	249	-9971.03	12260.08	81.3	Pass
T16	50 - 40	Diagonal	L3x3x5/16	261	-9984.21	11351.93	88.0	Pass
T17	40 - 20	Diagonal	L4x4x3/8	273	-9882.33	25488.16	38.8 57.5 (b)	Pass
T18	20 - 0	Diagonal	L5x5x5/16	288	-11136.30	34335.95	32.4 64.8 (b)	Pass
T1	195 - 180	Horizontal	L1 1/2x1 1/2x3/16	17	-4942.77	6723.25	73.5	Pass
T2	180 - 175	Secondary Horizontal	L2x2x3/16	53	572.18	16652.77	3.4 9.4 (b)	Pass
T3	175 - 170	Secondary Horizontal	L2x2x3/16	65	-710.74	16534.80	4.3 11.7 (b)	Pass
T4	170 - 160	Secondary Horizontal	L2x2x3/16	77	-1079.97	15123.02	7.1 17.8 (b)	Pass
T5	160 - 150	Secondary Horizontal	L2x2x3/16	98	-1457.96	13544.21	10.8 24.0 (b)	Pass
T6	150 - 140	Secondary Horizontal	L2x2x3/16	119	-1884.28	11810.53	16.0 31.0 (b)	Pass
T10	120 - 113.333	Secondary Horizontal	L3x3x3/16	167	-2803.36	19651.09	14.3 41.3 (b)	Pass
T11	113.333 - 106.667	Secondary Horizontal	L3x3x3/16	179	-3024.34	18513.50	16.3 37.1 (b)	Pass
T12	106.667 - 100	Secondary Horizontal	L3x3x3/16	191	-3229.85	6723.76	48.0	Pass
T13	100 - 80	Secondary Horizontal	L3x3x1/4	203	-3857.70	17794.35	21.7 44.9 (b)	Pass
T15	60 - 50	Secondary Horizontal	L4x4x1/4	254	-4660.55	10544.16	44.2	Pass
T16	50 - 40	Secondary Horizontal	L4x4x1/4	266	-4946.73	9490.00	52.1	Pass
T1	195 - 180	Top Girt	L1 1/2x1 1/2x3/16	5	-874.33	6723.25	13.0	Pass
T1	195 - 180	Bottom Girt	L1 1/2x1 1/2x3/16	8	-2434.08	6723.25	36.2	Pass
							Summary	
							Leg (T18) 85.6	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
						Diagonal (T10)	97.9	Pass
						Horizontal (T1)	73.5	Pass
						Secondary Horizontal (T16)	52.1	Pass
						Top Girt (T1)	13.0	Pass
						Bottom Girt (T1)	36.2	Pass
						Bolt Checks	97.9	Pass
						RATING =	97.9	Pass

APPENDIX B

COAX CONFIGURATION



COAX CONFIGURATION

SCALE: N.T.S.

PREPARED BY:
TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-3530
(919) 661-6351

PREPARED FOR:
T-Mobile TOWERS
12920 SE 38TH STREET
BELLEVUE, WA 98006

PROJECT INFORMATION:
MIDDLEBURY I-84
SITE#: CT11128E
1021 STRAITS TURNPIKE
MIDDLEBURY, CT 06762
(NEW HAVEN COUNTY)

REVISION: 16
TEP #: 25628_22635
SHEET NUMBER:
S-1

APPENDIX C

ADDITIONAL CALCULATIONS

Project Name:	Middlebury I-84	**Engineer:**	CJB
Project Number:	TEP#25628_22635, Revision 16	**Check:**	RHL
Client Site Number:	CT11128E	**Date:**	4/28/2015
Elevation:	80 - 100ft	**CODE:**	TIA-F

Grouted/Un-Grouted Pipe Leg + Half Sleeve R/F

ASIF: 1.33 - allowable stress increase factor (typically 1.33)
Mast St.: 1.00 - from tnxTower

Input - Loads

$P_{initial}$: 10.226 kips - force from initial load (no wind)
P_{wind}: 222.447 kips - force due to final loading including reinforcement
T_u: 197.546 kips - maximum load on leg

Quick Check

Weld Size:	OK
Weld Connection:	47.7%
Crushing Check:	47.3%
Leg Comp. Check:	47.9%
Sleeve Check:	57.9%
Built-up Check:	54.8%
Slenderness Check:	OK
Leg Tension Check:	45.6%

Input - Tower Leg

6 STD

K: 1.00 - effective length factor for leg
L_u: 3.43 ft - unbraced length of tower leg
F_{y_leg}: 55.00 ksi - minimum specified yield strength of tower leg
F_{u_leg}: 70.00 ksi - minimum specified ultimate strength of tower leg
r: 2.25 in - minimum radius of gyration of tower leg
A_{leg}: 5.58 in^2 - area of tower leg
Di: 6.07 in - inside diameter of tower leg
t_{leg}: 0.28 in - thickness of tower leg
$f`_c$: 0.00 ksi - minimum specified compressive strength of grout (If ungrouted enter 0)

Input - Sleeve R/F

7 XH

Gap Check: OK

F_{y_sleeve}: 42.00 ksi - minimum specified yield strength of sleeve r/f
F_{u_sleeve}: 60.00 ksi - minimum specified ultimate strength of sleeve r/f
r_{x_sleeve}: 1.10 in - minimum radius of gyration of sleeve r/f about the x-axis
r_{y_sleeve}: 2.53 in - minimum radius of gyration of sleeve r/f about the y-axis
A_{sleeve}: 5.60 in^2 - area of sleeve r/f
t_{sleeve}: 0.50 in - thickness of tower leg
Termination: Connected to Flange

Input - Sleeve Connection to Leg

a: 12.00 in - spacing of connectors connecting the sleeve to the leg
D: 5.00 - weld size for the weld connecting the sleeve to the leg (unit = # of 16ths)
Length //: 12.00 in - length of weld on each side of the leg at the termination
Length ⊥: 11.98 in - length of weld at the bottom/top of the leg sleeve at termination (πD/2)
No: 2.00 - number of longitudinal welds per end of the leg (typically near side & far side, so 2)
F_{EXX}: 70.00 ksi - weld electrode classification
Width: 7.63 in - maximum width of the built-up leg
Gap: 0.00 in - length of leg considered for crushing

Input - Built-up Leg Section

6 STD w/7 XH Half Sleeve

r_{x_bu}: 2.10 in - minimum radius of gyration of the built-up section about the x-axis
r_{y_bu}: 2.39 in - minimum radius of gyration of the built-up section about the y-axis

Project Name:	Middlebury I-84	**Engineer:**	CJB
Project Number:	TEP#25628_22635, Revision 16	**Check:**	RHL
Client Site Number:	CT11128E	**Date:**	4/28/2015
Elevation:	120 - 140ft	**CODE:**	TIA-F

Grouted/Un-Grouted Pipe Leg + Half Sleeve R/F

ASIF: 1.33 - allowable stress increase factor (typically 1.33)
Mast St.: 1.00 - from tnxTower

Input - Loads

$P_{initial}$: 6.95659 kips - force from initial load (no wind)
P_{wind}: 149.868 kips - force due to final loading including reinforcement
T_u: 134.255 kips - maximum load on leg

Quick Check

Weld Size:	OK
Weld Connection:	33.2%
Crushing Check:	41.9%
Leg Comp. Check:	42.8%
Sleeve Check:	47.7%
Built-up Check:	53.2%
Slenderness Check:	OK
Leg Tension Check:	39.0%

Input - Tower Leg

5 STD

K: 1.00 - effective length factor for leg
L_u: 6.68 ft - unbraced length of tower leg
F_{y_leg}: 55.00 ksi - minimum specified yield strength of tower leg
F_{u_leg}: 70.00 ksi - minimum specified ultimate strength of tower leg
r: 1.88 in - minimum radius of gyration of tower leg
A_{leg}: 4.30 in^2 - area of tower leg
Di: 5.05 in - inside diameter of tower leg
t_{leg}: 0.26 in - thickness of tower leg
$f`_c$: 0.00 ksi - minimum specified compressive strength of grout (If ungrouted enter 0)

Input - Sleeve R/F

6 XH Gap Check: OK

F_{y_sleeve}: 46.00 ksi - minimum specified yield strength of sleeve r/f
F_{u_sleeve}: 62.00 ksi - minimum specified ultimate strength of sleeve r/f
r_{x_sleeve}: 0.96 in - minimum radius of gyration of sleeve r/f about the x-axis
r_{y_sleeve}: 2.19 in - minimum radius of gyration of sleeve r/f about the y-axis
A_{sleeve}: 4.20 in^2 - area of sleeve r/f
t_{sleeve}: 0.43 in - thickness of tower leg
Termination: Connected to Flange

Input - Sleeve Connection to Leg

a: 15.50 in - spacing of connectors connecting the sleeve to the leg *MI Discrepancy, approved by EOR
D: 5.00 - weld size for the weld connecting the sleeve to the leg (unit = # of 16ths)
Length //: 12.00 in - length of weld on each side of the leg at the termination
Length ⊥: 10.41 in - length of weld at the bottom/top of the leg sleeve at termination (πD/2)
No: 2.00 - number of longitudinal welds per end of the leg (typically near side & far side, so 2)
F_{EXX}: 70.00 ksi - weld electrode classification
Width: 6.63 in - maximum width of the built-up leg
Gap: 0.00 in - length of leg considered for crushing

Input - Built-up Leg Section

5 STD w/6 XH Half Sleeve

r_{x_bu}: 1.77 in - minimum radius of gyration of the built-up section about the x-axis
r_{y_bu}: 2.04 in - minimum radius of gyration of the built-up section about the y-axis

Project Name:	Middlebury I-84	**Engineer:**	CJB
Project Number:	TEP#25628_22635, Revision 16	**Check:**	RHL
Client Site Number:	CT11128E	**Date:**	4/28/2015
Elevation:	140 - 150ft	**CODE:**	TIA-F

Grouted/Un-Grouted Pipe Leg + Half Sleeve R/F

ASIF: 1.33 - allowable stress increase factor (typically 1.33)
Mast St.: 1.00 - from tnxTower

Input - Loads

$P_{initial}$: 5.478 kips - force from initial load (no wind)
P_{wind}: 108.653 kips - force due to final loading including reinforcement
T_u: 96.923 kips - maximum load on leg

Quick Check

Weld Size:	OK
Weld Connection:	33.3%
Crushing Check:	59.6%
Leg Comp. Check:	61.0%
Sleeve Check:	63.7%
Built-up Check:	66.5%
Slenderness Check:	OK
Leg Tension Check:	53.4%

Input - Tower Leg

3.5 STD

K: 1.00 - effective length factor for leg
L_u: 2.60 ft - unbraced length of tower leg
F_{y_leg}: 55.00 ksi - minimum specified yield strength of tower leg
F_{u_leg}: 70.00 ksi - minimum specified ultimate strength of tower leg
r: 1.34 in - minimum radius of gyration of tower leg
A_{leg}: 2.68 in^2 - area of tower leg
D_I: 3.55 in - inside diameter of tower leg
t_{leg}: 0.23 in - thickness of tower leg
$f`_c$: 0.00 ksi - minimum specified compressive strength of grout (If ungrouted enter 0)

Input - Sleeve R/F

4 STD Gap Check: OK

F_{y_sleeve}: 50.00 ksi - minimum specified yield strength of sleeve r/f
F_{u_sleeve}: 65.00 ksi - minimum specified ultimate strength of sleeve r/f
r_{x_sleeve}: 0.66 in - minimum radius of gyration of sleeve r/f about the x-axis
r_{y_sleeve}: 1.51 in - minimum radius of gyration of sleeve r/f about the y-axis
A_{sleeve}: 1.59 in^2 - area of sleeve r/f
t_{sleeve}: 0.24 in - thickness of tower leg
Termination: Connected to Flange

Input - Sleeve Connection to Leg

a: 12.00 in - spacing of connectors connecting the sleeve to the leg
D: 3.00 - weld size for the weld connecting the sleeve to the leg (unit = # of 16ths)
Length //: 12.00 in - length of weld on each side of the leg at the termination
Length ⊥: 7.07 in - length of weld at the bottom/top of the leg sleeve at termination ($\pi D/2$)
No: 2.00 - number of longitudinal welds per end of the leg (typically near side & far side, so 2)
F_{EXX}: 70.00 ksi - weld electrode classification
Width: 4.50 in - maximum width of the built-up leg
Gap: 0.00 in - length of leg considered for crushing

Input - Built-up Leg Section

3.5 STD w/4 STD Half Sleeve

r_{x_bu}: 1.31 in - minimum radius of gyration of the built-up section about the x-axis
r_{y_bu}: 1.40 in - minimum radius of gyration of the built-up section about the y-axis

Project Name:	Middlebury I-84	**Engineer:**	CJB
Project Number:	TEP#25628_22635, Revision 16	**Check:**	RHL
Client Site Number:	CT11128E	**Date:**	4/28/2015
Elevation:	160 - 170ft	**CODE:**	TIA-F

Grouted/Un-Grouted Pipe Leg + Half Sleeve R/F

ASIF: 1.33 - allowable stress increase factor (typically 1.33)
Mast St.: 1.00 - from tnxTower

Input - Loads

$P_{initial}$: 3.40447 kips - force from initial load (no wind)
P_{wind}: 62.274 kips - force due to final loading including reinforcement
T_u: 55.41 kips - maximum load on leg

Quick Check

Weld Size:	OK
Weld Connection:	25.2%
Crushing Check:	46.2%
Leg Comp. Check:	47.8%
Sleeve Check:	69.4%
Built-up Check:	61.8%
Slenderness Check:	OK
Leg Tension Check:	47.3%

Input - Tower Leg

2.5 STD

K: 1.00 - effective length factor for leg
L_u: 2.64 ft - unbraced length of tower leg
F_{y_leg}: 55.00 ksi - minimum specified yield strength of tower leg
F_{u_leg}: 70.00 ksi - minimum specified ultimate strength of tower leg
r: 0.95 in - minimum radius of gyration of tower leg
A_{leg}: 1.70 in^2 - area of tower leg
Di: 2.47 in - inside diameter of tower leg
t_{leg}: 0.20 in - thickness of tower leg
$f`_c$: 0.00 ksi - minimum specified compressive strength of grout (If ungrouted enter 0)

Input - Sleeve R/F

3 XS Gap Check: OK

F_{y_sleeve}: 35.00 ksi - minimum specified yield strength of sleeve r/f
F_{u_sleeve}: 60.00 ksi - minimum specified ultimate strength of sleeve r/f
r_{x_sleeve}: 0.50 in - minimum radius of gyration of sleeve r/f about the x-axis
r_{y_sleeve}: 1.14 in - minimum radius of gyration of sleeve r/f about the y-axis
A_{sleeve}: 1.51 in^2 - area of sleeve r/f
t_{sleeve}: 0.30 in - thickness of tower leg
Termination: Connected to Flange

Input - Sleeve Connection to Leg

a: 12.00 in - spacing of connectors connecting the sleeve to the leg
D: 3.00 - weld size for the weld connecting the sleeve to the leg (unit = # of 16ths)
Length //: 12.00 in - length of weld on each side of the leg at the termination
Length ⊥: 5.50 in - length of weld at the bottom/top of the leg sleeve at termination (πD/2)
No: 2.00 - number of longitudinal welds per end of the leg (typically near side & far side, so 2)
F_{EXX}: 70.00 ksi - weld electrode classification
Width: 3.50 in - maximum width of the built-up leg
Gap: 0.00 in - length of leg considered for crushing

Input - Built-up Leg Section

2.5 STD w/3 XS Half Sleeve

r_{x_bu}: 0.92 in - minimum radius of gyration of the built-up section about the x-axis
r_{y_bu}: 1.04 in - minimum radius of gyration of the built-up section about the y-axis

TOWER ENGINEERING PROFESSIONALS

JOB:	TEP#25628_22635, Rev 16		
SHEET #:	1	OF	2
CALCULATED BY:	CJB	DATE	4/28/2015
CHECKED BY:	RHL	DATE	4/28/2015

Mat Foundation Design for Self Supporting Tower -TIA-222-F

Q_a, ALLOWABLE SOIL PRESS. (ksf)	6
NET OR GROSS BEARING?	NET
SOIL DENSITY (pcf)	125
TOWER FACE WIDTH (ft.)	21.5
Tower Eccentricity (ft)	0.00

Distance between tower centroid and the foundation centroid

F'c (ksi)	3
F'y (ksi)	60

Base Reactions LC1: Maximum Wind

M_u, MOMENT (k-ft)	6314.6
P_t, AXIAL (k)	50.0
H, SHEAR (k)	54.9

Base Reactions LC 2: Ice + Ice Wind

M, MOMENT (k-ft)	2021.4
P_t, AXIAL (k)	100.3
H, SHEAR (k)	16.6

Try:	L (ft.)	B (ft.)	t (ft.)	Soil depth to TOP of mat (ft.)	Soil depth to BOT. of mat (ft.)	Pier dia./width (ft.)	Pier Height, h (ft.)	Pier Shape
	33	33	4	5.416	9.416	4.00	5.67	Square

Wf, WEIGHT OF FOUNDATION (k) =	694.2
Ws, WEIGHT OF SOIL (k) =	704.8

Concrete Volume (cu yd) 171.4

CHECK BEARING CAPACITY:

	LC1	LC2
$P = P_t + Wf + Ws$ =	1449.0 k	1499.3 k
$e = (M_{ot} + P_t * e_t)/P$ =	4.72 ft	1.51 ft
L/6 =	5.50 ft	5.50 ft
90 Axis: q_{max} =	1.30 ksf	0.58 ksf
Diag. Axis: q_{max} =	1.77 ksf	0.73 ksf

Capacity: 29.5%

CHECK OVERTURNING SF:

	LC1	LC2
$M_{ot} = M+H*(t+h)$ =	6845.6 k-ft	2181.7 k-ft
$M_{st}=P*(L/2-e_t)+(W_{f+s}*L/2)$ =	23907.8 k-ft	24738.1 k-ft
$SF = M_{ot}/M_{st}$ =	3.49 > 1.5	11.34 > 1.5

Capacity: 43.0%

TOWER ENGINEERING PROFESSIONALS

JOB:	TEP#25628_22635, Rev 16		
SHEET #:	2	OF	2
CALCULATED BY:	CJB	DATE	4/28/2015
CHECKED BY:	RHL	DATE	4/28/2015

CHECK BEAM SHEAR

Vu =	183.6 k
φVc =	1415.3 k

Vc > Vu **O.K**

Capacity: **13.0%**

CHECK PUNCHING SHEAR

Vu =	325.9 k
φVc =	1404.0 k

Vc > Vu **O.K**

Capacity: **23.2%**

CALCULATE REINFORCING REQUIRED

F'c = 3.0 ksi F'y = 60.0 ksi

Temp & Shrinkage Reinforcement, As, temp = 0.39 in^2/ft (ACI 318 Sec. 10.5.4)

BOTTOM REINFORCING

Bar Size= 8
Bar Spacing = 11.8 in.
d = 43.5 in.

Mu= -687.7 in-k/ft

φMn=0.9*As*Fy*(d-1/2*As*Fy/(0.85*b*F'c))

Solution: As,req = 0.29 in^2/ft
Check, As= 0.80 in^2/ft

Capacity: **36.7%**

TOP REINFORCING

Bar Size= 8
Bar Spacing = 11.8 in.
d= 43.5 in.

Mu= 642.5 in-k/ft

φMn=0.9*As*Fy*d(1-0.59*As*Fy/(b*d*F'c))

Solution: As,req = 0.28 in^2/ft
Check, As= 0.80 in^2/ft

Capacity: **34.3%**

		PASS	PASS			
	Results Summary:	LC1	LC2		Middlebury I-84 (CT11128E)	
	Soil Interaction:	N/A	N/A	TEP #:	25628_22635, Rev 16	
Pier Check	Foundation Structural:	30.5%	61.8%	Analysis:	CJB	4/28/2015
				Check:	RHL	4/28/2015

Code Revisions: TIA-222-F ACI 318-05

Tower Type: Self Support

	LC1	LC2	
Moment:	0.00	0.00	kip-ft
Axial (download):	355.80	0.00	kip
Shear:	34.95	30.60	kip
Axial (uplift):	0.00	307.56	kip

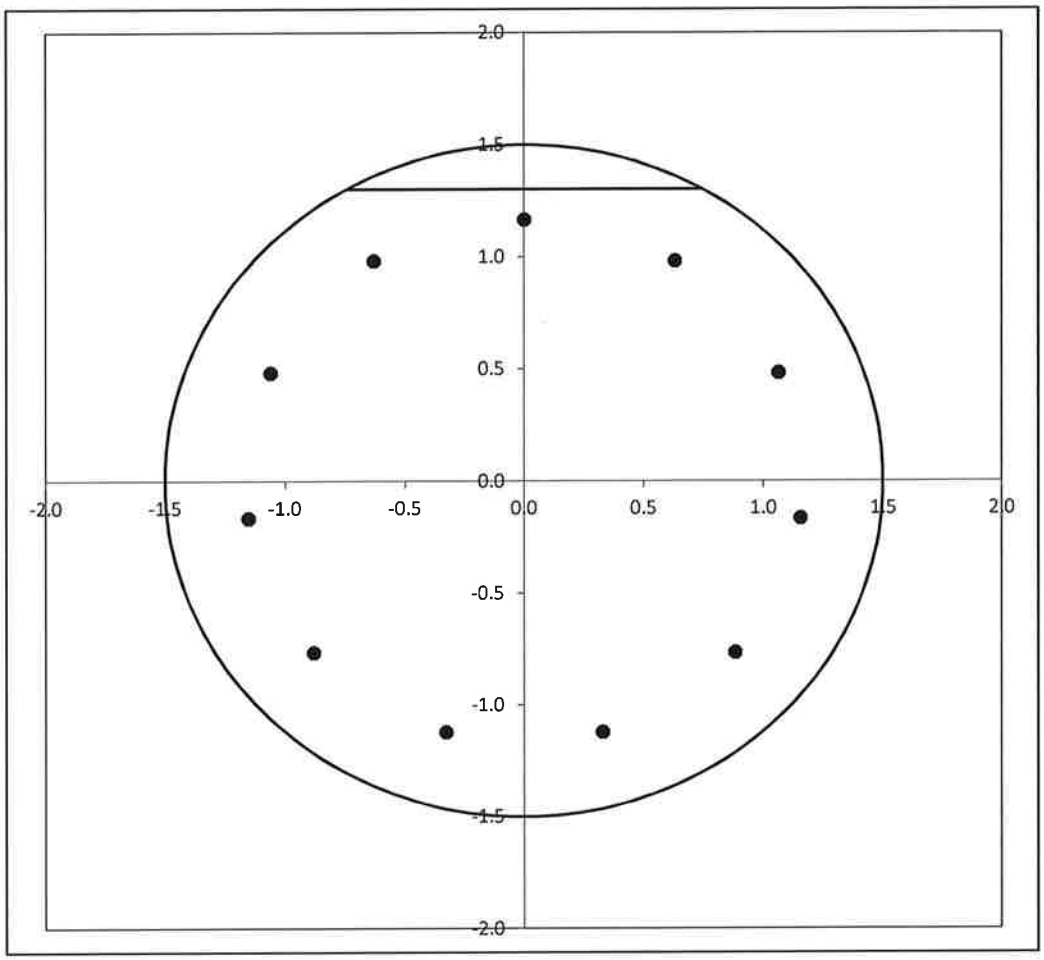
Shaft Information

Diameter:	3.00	ft
Projection:	0.25	ft
Caisson Length:	5.67	ft
f'c:	4.000	ksi
Max εc:	0.003	in/in

Cage 1 Reinforcement

Tie Bar Size:	4	*(fy = 60.0 ksi)*
Clear Cover to Tie:	3.00	*in (Cage Ø = 28.00in)*
Tie Bar Spacing:	16.00	in
Vertical Bar Size:	8	
Vertical Bar Quantity:	11	*(ρ =0.854%)*
fy:	60.0	ksi
E:	29,000	ksi

Reinforcement Capacity



		LC1	LC2	
	Vu =	45.4	45.4	kip
	Vc =	151.3	50.9	kip
fy,tie = 60.0	Vs =	47.1	47.1	kip
	ϕVn =	148.8	73.6	kip
	Capacity =	30.5%	61.8%	
		PASS	PASS	

		LC1	LC2	
	Mu =	0.0	0.0	kip-ft
	ϕMn =	926.4	97.1	kip-ft
	Capacity =	0.0%	0.0%	
		PASS	PASS	