Robinson+Cole

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Also admitted in Massachusetts

December 9, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
1664 Gold Star Memorial Highway, Groton, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 149-foot level of the existing 150-foot tower at 1664 Gold Star Memorial Highway in Groton, Connecticut (the "Property"). The tower is owned by SBA Communications Corporation ("SBA"). The Council approved Cellco's use of the tower in 2007. Cellco now intends to modify its facility by replacing three (3) of its existing antennas with three (3) model LNX-6514DS, 700 MHz antennas at the same level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") and one (1) HYBRIFLEX™ fiber optic 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 Groton's Town Manager, Mark R. Oefinger. A copy of this letter is also being sent to Chester G. Couch, Jr., the Property owner and SBA, the tower owner.

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

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located at the 149-foot level on the 150-foot 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/or local criteria.

4. The operation of the modified facility 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 for Cellco's modified facility is included behind 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:
Mark R. Oefinger, Town Manager
Chester G. Couch, Jr.
SBA
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.8	15.9
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	12.4	11.2
Beam Tilt, degrees	0–10	0–10
USLS, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	23	23
CPR at Sector, dB	12	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**
Gain by all Beam Tilts, average, dBi	15.6	15.7
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 15.7	0 ° | 15.9
	5 ° | 15.7	5 ° | 15.8
	10 ° | 15.3	10 ° | 15.3
Beamwidth, Horizontal Tolerance, degrees	±0.9	±1.4
Beamwidth, Vertical Tolerance, degrees	±0.8	±0.6
USLS, dB	18	20
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	25	24
CPR at Sector, dB	15	12

* 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®
Band	Single band
Brand	DualPol® | Teletilt®

Product Specifications

LNX-6514DS-VTM

Operating Frequency Band	698 – 896 MHz
Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	180.5 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight	14.2 kg | 31.3 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
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

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

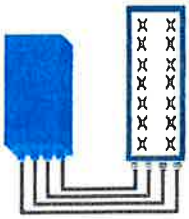
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

Alcatel·Lucent

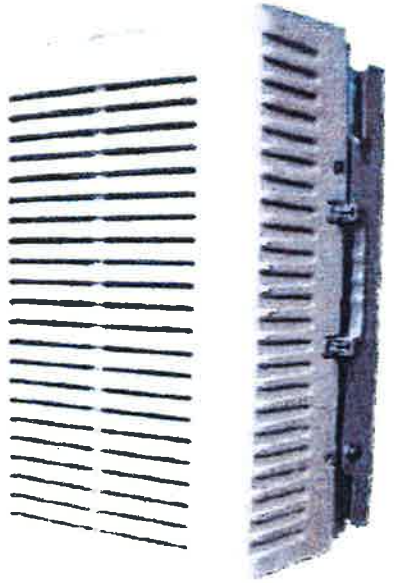
Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.) Volume in L Weight in kg (lb) (w/o mounting HW)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield) 38 (with solar shield) 26 (57.2) (with solar shield)
DC voltage range DC power consumption	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions Wind load (@150km/h or 93mph)	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal: <200N / Lateral : <150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

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	2 Branch RX – LA6.0.1
	1900A HW version	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)



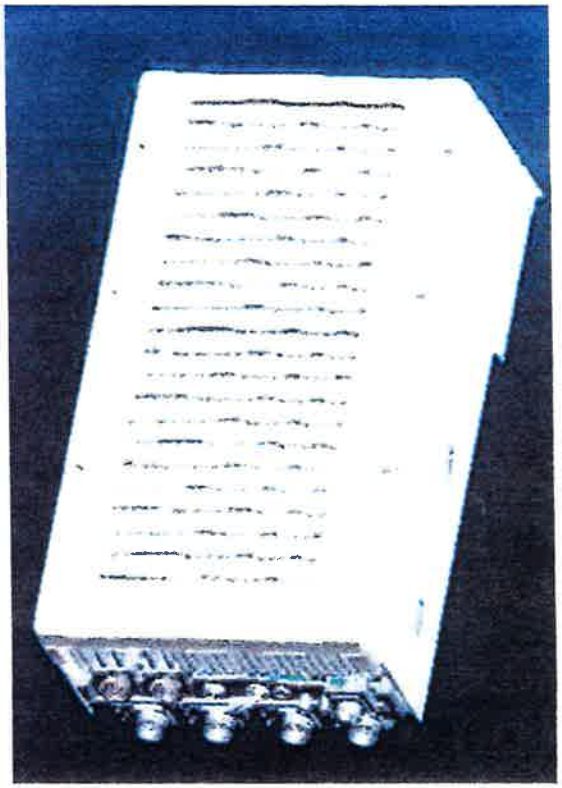
** Not a Verizon Wireless deployed product

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.)

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-95-658 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)

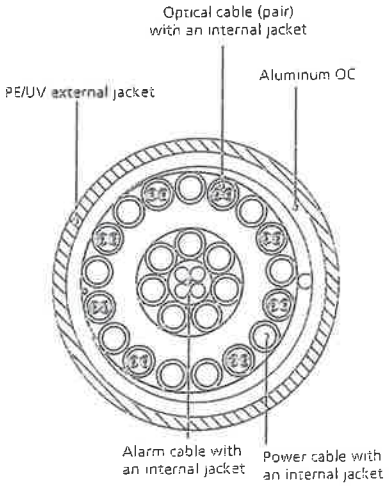


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Groton 6								
Tower Height: 150ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	128	0.0273	880	0.5867	0.47%	
*AT&T UMTS	2	875	128	0.0423	1900	1.0000	0.42%	
*AT&T GSM	1	283	128	0.0068	880	0.5867	0.12%	
*AT&T GSM	4	525	128	0.0507	1900	1.0000	0.51%	
*AT&T LTE	1	1375	128	0.0332	734	0.4893	0.68%	
*Clearwire	6	286	139	0.0349	2500	1.0000	0.35%	
Verizon PCS	**1**	**1892**	**149**	**0.0306**	**1970**	**1.0000**	**3.06%**	
Verizon Cellular	**9**	**259**	**149**	**0.0378**	**869**	**0.5793**	**6.52%**	
Verizon AWS	**1**	**2378**	**149**	**0.0385**	**2145**	**1.0000**	**3.85%**	
Verizon 700	**1**	**1028**	**149**	**0.0166**	**746**	**0.4973**	**3.35%**	
								19.32%
* Source: Siting Council								

ATTACHMENT 3

TES

Tower Engineering Solutions

Phone (972) 483-0607, Fax (972) 975-9615
8445 Freeport Parkway, Suite 375, Irving, Texas 75063

Structural Analysis Report

Existing 150 ft. Radian Monopole

Customer Name: SBA Communications Corp

Customer Site Number: CT13073-A

Customer Site Name: Groton North

Carrier Name: Verizon

Carrier Site ID / Name: Groton 6

Site Location: 1662 Route 184

Groton, Connecticut

New London County

Latitude: 41.385666

Longitude: -72.013306

Analysis Result:

Max Structural Usage: 72.2% [Pass]

Max Foundation Usage: 72.4% [Pass]

Report Prepared By : Kyle Wyant

Introduction

The purpose of this report is to summarize the analysis results on the 150 ft. Radian Monopole to support the proposed antennas and transmission lines in addition to those currently installed. Any modification listed under Sources of Information was assumed completed and was included in this analysis.

Sources of Information

Tower Drawings	Radian, File Nos. 060-3663 & 57974EH, Drawing No. A070130, dated March 16, 2007
Foundation Drawing	Radian, File Nos. 060-3663 & 57974EH, Drawing No. A070131, dated March 16, 2007
Geotechnical Report	Gemini Geotechnical Associates, Inc., Project No. 07022CT, dated March 13, 2007
Modification Drawings	N/A
Previous Analysis	FDH Engineering, Inc., Project No. 146GSC1400, dated November 18, 2014

Analysis Criteria

The analysis was performed in accordance with the requirements and stipulations of the ANSI/TIA/EIA-222-F. In accordance with this standard, the structure was analyzed using **TESPoles,** a proprietary analysis software. The program considers the structure as an elastic 3-D model with second-order effects and temperature effects incorporated in the analysis. The analysis was performed using multiple wind directions.

Basic Wind Speed Used in the Analysis:	85 mph (Fastest Mile)
Basic Wind Speed with Ice:	74 mph (Fastest Mile) with 1/2" Radial Ice Concurrent
Operational Wind Speed:	50 mph + 0" Radial Ice
Standard/Codes:	ANSI/TIA/EIA 222-F / 2005 Connecticut State Building Code

Existing Antennas, Mounts and Transmission Lines

The table below summarizes the antennas, mounts and transmission lines that were considered in the analysis as existing on the tower.

Items	Elevation (ft)	Qty.	Antenna Descriptions	Mount Type & Qty.	Transmission Lines [1]	Owner
1	149.0	3	Antel BXA-70063-6CF	(1) 12' Low Profile Platform	(12) 1 5/8" (1) 1 5/8" Hybrid	Verizon
2		3	Commscope HBXX-6517DS-VTM			
3		3	Commscope HBXX-6516DS-VTM			
5		3	Commscope LNX-6512DS-A1M			
6		3	ALU RRH2X60-AWS			
9		6	RFS FD9R6004/2C-3L			
10		1	RFS DB-T1-6Z-8AB-0Z			
11	139.0	3	KMW HB-X-AW-17-65-00T	(3) Dual Mount Standoffs	(6) 1 5/8"	Clearwire
12		3	TTLNA			
13	128.0	2	Andrew SBNH 1D6565C	(1) 14' Low Profile Platform	(12) 1 5/8" (2) 3/4" DC Power (1) 7/16" Fiber	AT&T
14		6	Ericsson RRUS 11			
15		1	KMW AM-X-CD-14-65-00T-RET			
16		6	Powerwave 7770			
17		6	Powerwave LGP21401			
18		6	Powerwave LGP21903			
19		1	Raycap DC6-48-60-18-8F			

1. Transmission lines are installed inside of the pole shafts unless otherwise noted.

Proposed Carrier's Final Configuration of Antennas, Mounts and Transmission Lines

Information pertaining to the proposed carrier's final configuration of antennas and transmission lines was provided by SBA Communications Corp. The proposed antennas and lines are listed below.

Items	Elevation (ft)	Qty.	Antenna Descriptions	Mount Type & Qty.	Transmission Lines	Owner
2	149.0	3	Commscope HBXX-6517DS-A2M - Panel	(1) 12' Low Profile Platform	(6) 1 5/8" (2) 1 5/8" Fiber	Verizon
3		3	Commscope HBXX-6516DS-A2M - Panel			
4		3	Commscope LNX-6514DS-A1M - Panel			
5		3	Andrew LNX-6512DS-A1M - Panel			
6		3	Alcatel Lucent RRH2X60-AWS - RRU			
7		3	Alcatel Lucent RRH2X60-PCS - RRU			
8		3	Alcatel Lucent RRH2X60-700 - RRU			
9		6	RFS FD9R6004/2C-3L - Diplexer			
10		1	RFS DB-T1-6Z-8AB-0Z			

All transmission lines are considered running inside of the pole shafts. See the attached coax layout for the line placement considered in the analysis.

Analysis Results

The results of the structural analysis, performed for the wind and ice loading and antenna equipment as defined above, are summarized as the following:

	Pole shafts	Anchor Bolts	Base Plate
Max. Usage:	**46.9%**	**51.9%**	**72.2%**
Pass/Fail	**Pass**	**Pass**	**Pass**

Foundations

	Moment (Kip-Ft)	Shear (Kips)	Axial (Kips)
Original Design Reactions	6114.4	55.6	94.8
Analysis Reactions	2762.5	25.9	48.5
% of Design Reactions	45.2%	46.5%	51.1%

The foundation has been investigated using the supplied documents and soils report and was found adequate. Therefore, no modification to the foundation will be required.

Operational Condition (Rigidity):

Operational characteristics of the tower are found to be within the limits prescribed by ANSI/TIA/EIA 222-F for the installed antennas. The maximum twist/sway at the elevation of the proposed equipment is 0.8491 degrees under the operational wind speed as specified in the Analysis Criteria.

Conclusions

Based on the analysis results, the existing structure and its foundation were found to be adequate to safely support the existing and proposed equipment and meet the minimum requirements per the ANSI/TIA/EIA-222-F Standard and the 2005 Connecticut State Building Code under the design basic wind speed as specified in the Analysis Criteria.

Standard Conditions

1. This analysis was performed based on the information supplied to **(TES) Tower Engineering Solutions, LLC.** Verification of the information provided was not included in the Scope of Work for **TES**. The accuracy of the analysis is dependent on the accuracy of the information provided.

2. The analysis is based on the presumption that the tower members and components along with any existing reinforcement items have been correctly and properly designed, manufactured, installed and maintained.

3. All the existing structural members were assumed to be in good condition with no physical damage or deterioration associated with corrosion.

4. An initial tension of 10% of the break strength on all the existing guy wires was assumed in all the structural analyses of guyed towers unless different values were provided by the client. **TES** cannot take responsibility for the deviations in the analysis results because of differences in the initial tension forces of the existing guy wires.

5. Secondary component or connection secondary components, welds and bolts are assumed to be able to carry their intended original design loads. **TES** cannot take responsibility for verification of the adequacy on the connections, bolts and welds present in the structure.

6. The analyses will be performed based on the codes as specified by the client or based on the best knowledge of the engineering staff of **TES**. In the absence of information to the contrary, all work will be performed in accordance with the latest relevant revision of ANSI/TIA-222. If wind speed or/and ice loads are different from the minimum values recommended by the EIA/TIA-222 standard or other codes, **TES** should be notified in writing and the applicable minimum values provided by the client.

7. The configuration of the existing mounts, antennas, coax and other appurtenances were supplied by the customer for the current structural analysis. **TES** has not visited the tower site to verify the adequacy of the information provided. If there is any discrepancy found in the report regarding the existing conditions, **TES** should be notified immediately to evaluate the effect of the discrepancy on the analysis results.

8. The client will assume responsibility for rework associated with the differences in initially provided information, including tower and foundation information, existing and/or proposed equipment and transmission lines.

9. If a feasibility analysis was performed, final acceptance of changed conditions shall be based upon a rigorous structural analysis.

Usage Diagram - Max Stress 46.9% at 0.0ft

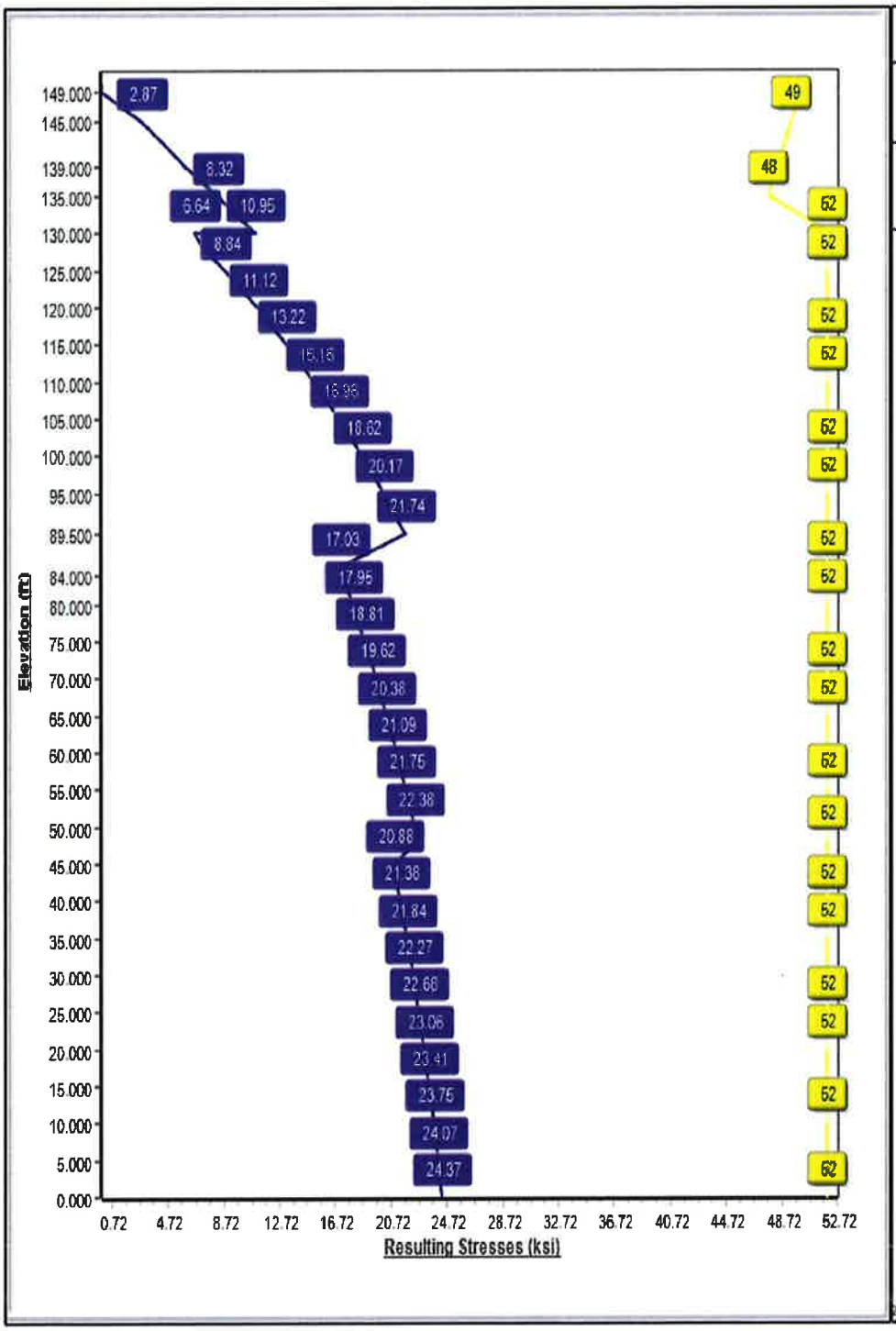
Structure:	CT13073-A-SBA	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)			Page: 1	

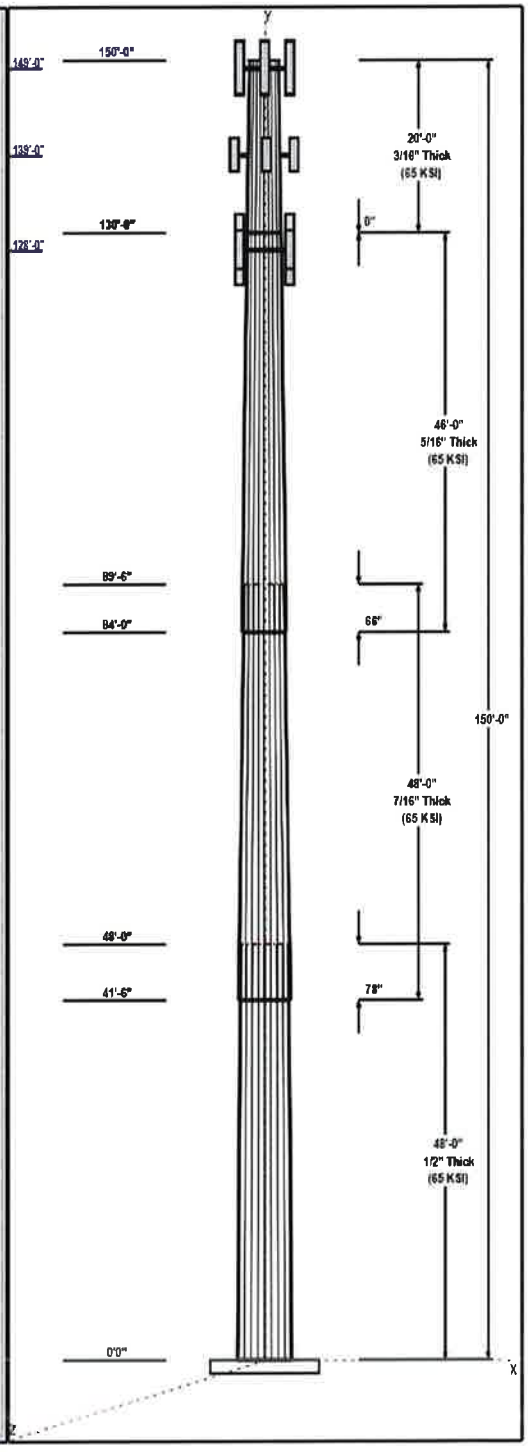
Tower Engineering Solutions

Dead Load Factor:	1.00
Wind Load Factor:	1.00
52 Alllowable Stress	
24 Resulting Stress	

Load Case : 85 mph Wind with 0 in Ice

Iterations: 21





Structure: CT13073-A-SBA

Type: Custom
Site Name: Groton North
Height: 150.00 (ft)
Base Elev: 0.00 (ft)

Base Shape: 18 Sided
Taper: 0.20967

9/4/2015

Tower Engineering Solutions

Shaft Properties

Seq	Length (ft)	Top (in)	Bottom (in)	Thick (in)	Joint Type	Taper	Grade (ksi)
1	48.00	49.94	60.00	0.500		0.20967	65
2	48.00	42.11	52.17	0.438	Slip	0.20967	65
3	46.00	34.24	43.89	0.313	Slip	0.20967	65
4	20.00	30.00	34.24	0.188	Butt	0.21215	65

Discrete Appurtenances

Attach Elev (ft)	Force Elev (ft)	Qty	Description	Carrier
149.00	149.00	1	DB-T1-6Z-8AB-0Z	Verizon
149.00	149.00	6	FD9R6004/2C-3L (3.1 lbs)	Verizon
149.00	149.00	3	HBXX-6516DS-VTM	Verizon
149.00	149.00	3	HBXX-6517DS-VTM	Verizon
149.00	149.00	3	LNX-6512DS-VTM	Verizon
149.00	149.00	3	LNX-6514DS-VTM (72.7"	Verizon
149.00	149.00	1	Low Profile Platform	Verizon
149.00	149.00	3	RRH2X60-AWS	Verizon
149.00	149.00	3	RRH2X60-AWS	Verizon
149.00	149.00	3	RRH2X60-PCS	Verizon
139.00	139.00	3	Dual Mount Standoffs	Clearwire
139.00	139.00	3	HB-X-AW-17-65-00T	Clearwire
139.00	139.00	3	TTLNA	Clearwire
128.00	128.00	2	Andrew SBNH 1D6565C	AT&T
128.00	128.00	6	Ericsson RRUS 11	AT&T
128.00	128.00	1	KMW	AT&T
128.00	128.00	1	Low Profile Platform	AT&T
128.00	128.00	6	Powerwave 7770	AT&T
128.00	128.00	6	Powerwave LGP21401	AT&T
128.00	128.00	6	Powerwave LGP21903	AT&T
128.00	128.00	1	Raycap DC6-48-60-18-8F	AT&T

Linear Appurtenances

Elev From (ft)	Elev To (ft)	Placement	Description	Carrier
0.00	149.00	Inside	1 5/8" Coax	Verizon
0.00	149.00	Inside	1 5/8" Fiber	Verizon
0.00	139.00	Inside	1 5/8" Coax	Clearwire
0.00	128.00	Inside	1 5/8" Coax	AT&T
0.00	128.00	Inside	3/4" DC	AT&T
0.00	128.00	Inside	7/16" Fiber	AT&T

Anchor Bolts

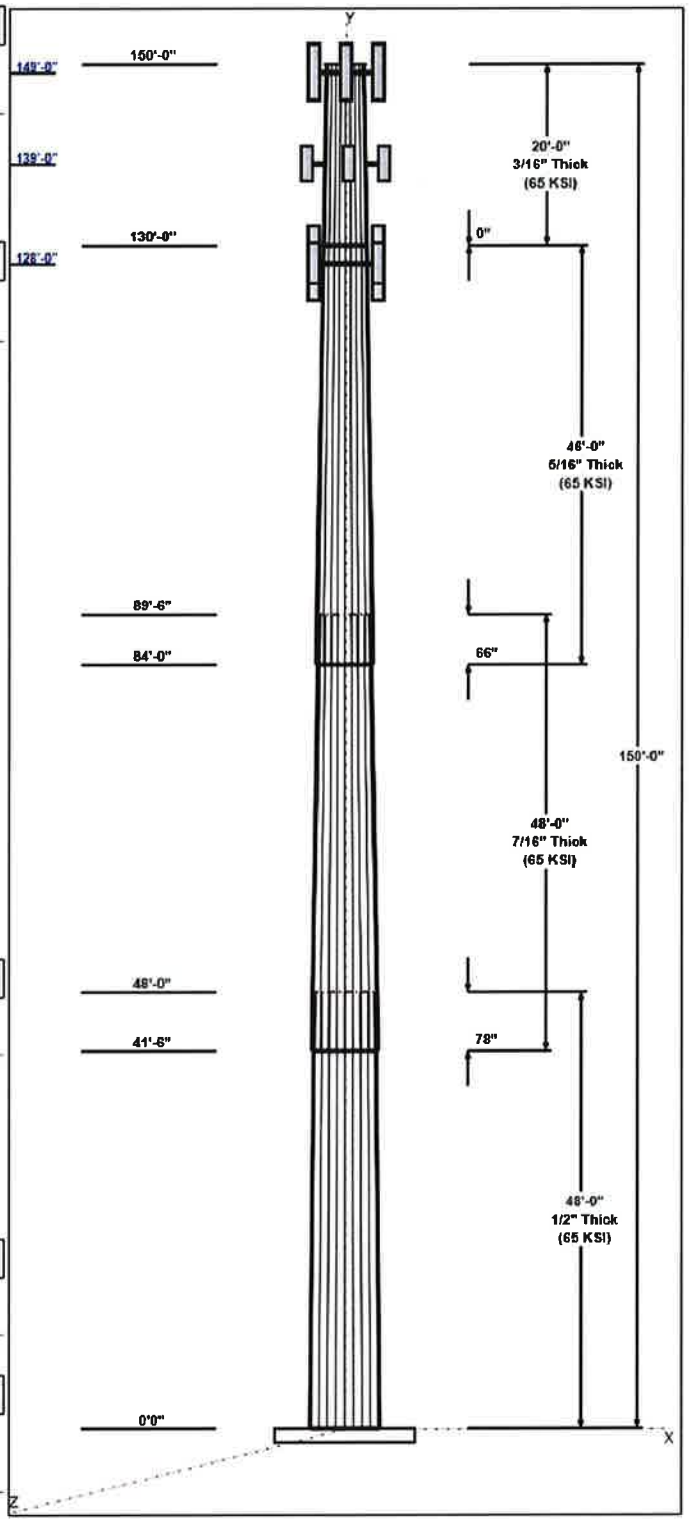
Qty	Specifications	Grade (ksi)	Arrangement
34	1.5" F1554 105	105.0	Radial

Base Plate

Thickness (in)	Specifications (in)	Grade (ksi)	Geometry
1.7500	69.5	50.0	Round

Reactions

Load Case	Moment	Shear	Axial
85 mph Wind with 0" Ice	2762.5	25.9	41.9



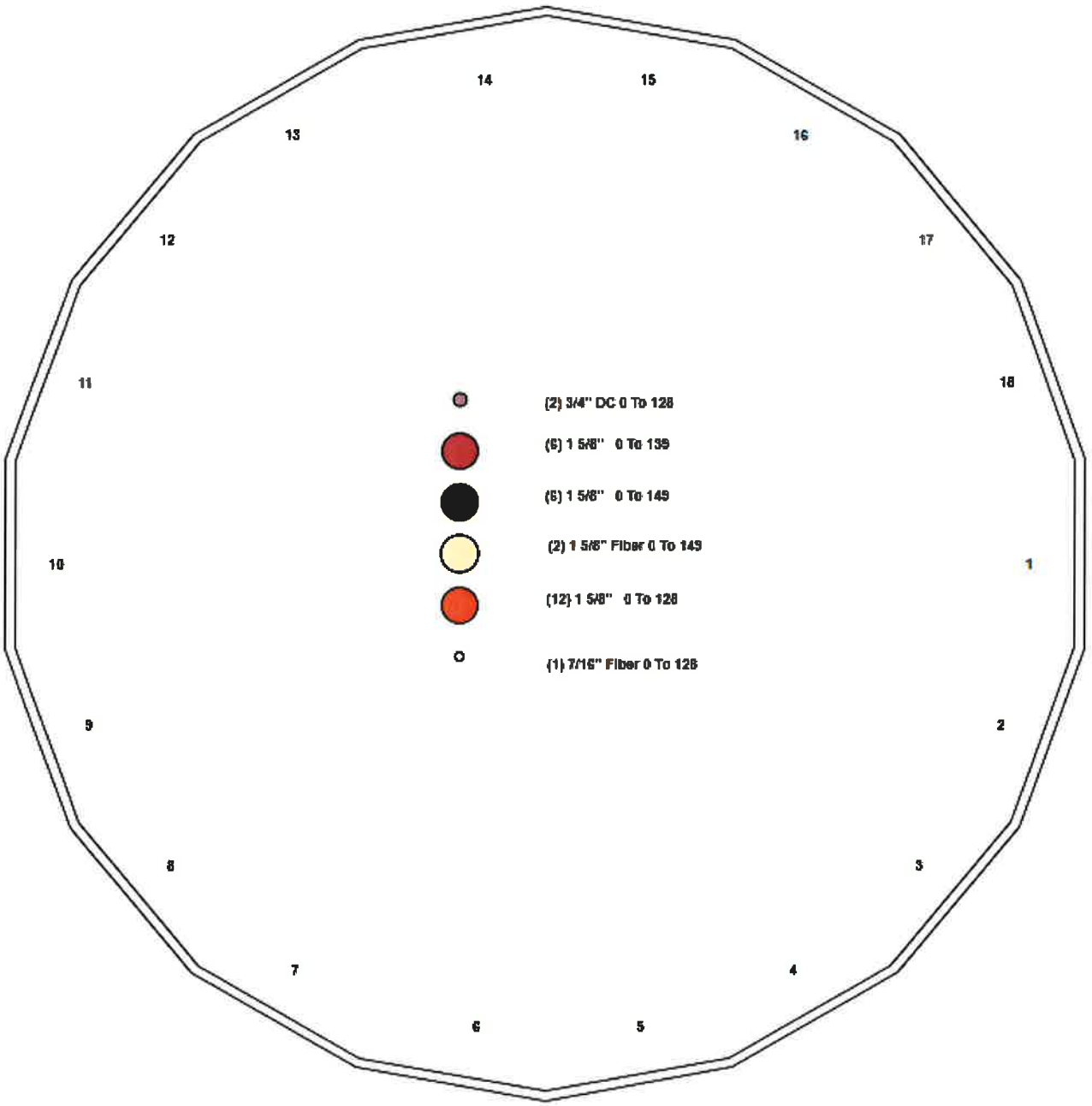
73.61 mph Wind with 0.5" Ice	2281.0	20.9	48.5
50 mph Wind with 0" Ice	956.1	9.0	42.0

Structure: CT13073-A-SBA - Coax Line Placement

Type: Monopole
Site Name: Groton North
Height: 150.00 (ft)

9/4/2015

Tower Engineering Solutions



Shaft Properties

Structure:	CT13073-A-SBA	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 5	

TES Tower Engineering Solutions

Sec. No.	Shape	Length (ft)	Thick (in)	Fy (ksi)	Joint Type	Overlap (in)	Weight (lb)
1	18	48.000	0.5000	65		0.00	14,118
2	18	48.000	0.4375	65	Slip	78.00	10,593
3	18	46.000	0.3125	65	Slip	66.00	6,016
4	18	20.000	0.1875	65	Flange	0.00	1,293
					Total Shaft Weight:		**32,020**

	Bottom						Top						
Sec. No.	Dia (in)	Elev (ft)	Area (sqin)	Ix (in^4)	W/t Ratio	D/t Ratio	Dia (in)	Elev (ft)	Area (sqin)	Ix (in^4)	W/t Ratio	D/t Ratio	Taper
1	60.00	0.00	94.42	42234.30	19.74	120	49.94	48.00	78.45	24223.7	16.19	99.87	0.209669
2	52.17	41.50	71.84	24294.43	19.61	119.2	42.11	89.50	57.86	12695.7	15.56	96.25	0.209669
3	43.89	84.00	43.22	10368.48	23.35	140.4	34.24	130.0	33.65	4895.14	17.91	109.5	0.209669
4	34.24	130.0	20.27	2969.66	30.79	182.6	30.00	150.0	17.74	1992.24	26.80	160	0.212150

Loading Summary

Structure:	CT13073-A-SBA	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 6	

Tower Engineering Solutions

Discrete Appurtenances

				No Ice			Ice				
No.	Elev (ft)	Description	Qty	Weight (lb)	CaAa (sf)	CaAa Factor	Weight (lb)	CaAa (sf)	CaAa Factor	Hor. Ecc. (ft)	Vert Ecc (ft)
1	149.0	DB-T1-6Z-8AB-0Z	1	44.00	5.60	1.00	80.00	5.870	1.00	0.00	0.00
2	149.0	FD9R6004/2C-3L (3.1 lbs)	6	3.10	0.36	0.67	5.40	0.500	0.72	0.00	0.00
3	149.0	HBXX-6516DS-VTM	3	56.60	6.29	0.87	98.90	6.790	0.90	0.00	0.00
4	149.0	HBXX-6517DS-VTM	3	70.30	8.89	0.89	129.40	9.590	0.92	0.00	0.00
5	149.0	LNX-6512DS-VTM	3	50.10	5.80	0.89	90.00	6.220	0.91	0.00	0.00
6	149.0	LNX-6514DS-VTM (72.7" height)	3	72.10	8.80	0.92	132.80	9.430	0.95	0.00	0.00
7	149.0	Low Profile Platform	1	1500.00	22.00	1.00	1800.00	27.00	1.00	0.00	0.00
8	149.0	RRH2X60-AWS	3	60.00	3.96	0.76	80.10	4.230	0.81	0.00	0.00
9	149.0	RRH2X60-AWS	3	60.00	3.96	0.76	80.10	4.230	0.81	0.00	0.00
10	149.0	RRH2X60-PCS	3	55.00	2.57	0.89	70.90	2.760	0.94	0.00	0.00
11	139.0	Dual Mount Standoffs	3	150.00	2.78	0.80	250.00	3.500	0.85	0.00	0.00
12	139.0	HB-X-AW-17-65-00T	3	42.10	1.89	1.26	67.30	2.240	1.27	0.00	0.00
13	139.0	TTLNA	3	16.00	0.17	0.90	25.00	0.230	0.95	0.00	0.00
14	128.0	Andrew SBNH 1D6565C	2	99.40	11.45	0.96	175.30	12.37	0.98	0.00	0.00
15	128.0	Ericsson RRUS 11	6	50.70	2.94	0.76	66.00	3.140	0.81	0.00	0.00
16	128.0	KMW AM-X-CD-14-65-00T-RET	1	58.70	5.70	0.85	96.30	6.130	0.78	0.00	0.00
17	128.0	Low Profile Platform	1	1600.00	24.00	1.00	1800.00	27.00	1.00	0.00	0.00
18	128.0	Powerwave 7770	6	57.30	5.96	0.84	96.00	6.530	0.87	0.00	0.00
19	128.0	Powerwave LGP21401	6	14.10	1.29	0.67	21.20	1.530	0.72	0.00	0.00
20	128.0	Powerwave LGP21903	6	5.50	0.27	0.87	7.90	0.380	0.92	0.00	0.00
21	128.0	Raycap DC6-48-60-18-8F	1	31.80	1.47	1.00	49.50	1.670	1.00	0.00	0.00
		Totals:	**67**	**6,114.10**			**8,428.90**				

Linear Appurtenances

			No Ice		Ice		
Bottom Elev. (ft)	Top Elev. (ft)	Description	Weight (lb/ft)	CaAa (sf/ft)	Weight (lb/ft)	CaAa (sf/ft)	Exposed
0.00	149.0	(6) 1 5/8" Coax	6.24	0.00	6.24	0.00	Inside
0.00	149.0	(2) 1 5/8" Fiber	2.20	0.00	2.20	0.00	Inside
0.00	139.0	(6) 1 5/8" Coax	6.24	0.00	6.24	0.00	Inside
0.00	128.0	(12) 1 5/8" Coax	12.48	0.00	12.48	0.00	Inside
0.00	128.0	(2) 3/4" DC	0.80	0.00	0.80	0.00	Inside
0.00	128.0	(1) 7/16" Fiber	0.07	0.00	0.07	0.00	Inside
		Totals:	**3,833.72**		**3,833.72**		

Shaft Section Properties

Structure: CT13073-A-SBA
Site Name: Groton North
Height: 150.00 (ft)
Base Elev: 0.000 (ft)
Code: EIA/TIA-222-F
Exposure: C
Gh: 1.69
Struct Class: II
9/4/2015

Tower Engineering Solutions

Increment Length: 5 (ft)

Elev (ft)	Description	Thick (in)	Dia (in)	Area (in^2)	Ix (in^4)	W/t Ratio	D/t Ratio	Fy (ksi)	Fb (ksi)	Weight (lb)
0.00		0.5000	60.000	94.423	42234.3	19.75	120.00	65	52	0.0
5.00		0.5000	58.952	92.759	40041.0	19.38	117.90	65	52	1592.4
10.00		0.5000	57.903	91.096	37925.0	19.01	115.81	65	52	1564.0
15.00		0.5000	56.855	89.432	35884.8	18.64	113.71	65	52	1535.7
20.00		0.5000	55.807	87.768	33919.2	18.27	111.61	65	52	1507.4
25.00		0.5000	54.758	86.105	32026.7	17.90	109.52	65	52	1479.1
30.00		0.5000	53.710	84.441	30205.9	17.53	107.42	65	52	1450.8
35.00		0.5000	52.662	82.777	28455.5	17.16	105.32	65	52	1422.5
40.00		0.5000	51.613	81.114	26774.1	16.79	103.23	65	52	1394.2
41.50	Bot - Section 2	0.5000	51.299	80.615	26282.9	16.68	102.60	65	52	412.7
45.00		0.5000	50.565	79.450	25160.2	16.42	101.13	65	52	1802.7
48.00	Top - Section 1	0.4375	50.811	69.947	22424.6	19.07	116.14	65	52	1524.5
50.00		0.4375	50.392	69.365	21869.3	18.90	115.18	65	52	474.0
55.00		0.4375	49.343	67.909	20521.1	18.48	112.78	65	52	1167.8
60.00		0.4375	48.295	66.454	19229.5	18.05	110.39	65	52	1143.0
65.00		0.4375	47.247	64.998	17993.3	17.63	107.99	65	52	1118.2
70.00		0.4375	46.198	63.542	16811.2	17.21	105.60	65	52	1093.5
75.00		0.4375	45.150	62.086	15682.1	16.79	103.20	65	52	1068.7
80.00		0.4375	44.101	60.631	14604.7	16.36	100.80	65	52	1043.9
84.00	Bot - Section 3	0.4375	43.263	59.466	13779.2	16.03	98.89	65	52	817.3
85.00		0.4375	43.053	59.175	13577.8	15.94	98.41	65	52	348.6
89.50	Top - Section 2	0.3125	42.735	42.076	9566.9	22.70	136.75	65	52	1547.5
90.00		0.3125	42.630	41.972	9496.1	22.64	136.42	65	52	71.5
95.00		0.3125	41.581	40.932	8807.7	22.05	133.06	65	52	705.3
100.00		0.3125	40.533	39.892	8153.4	21.46	129.71	65	52	687.6
105.00		0.3125	39.485	38.853	7532.3	20.87	126.35	65	52	669.9
110.00		0.3125	38.436	37.813	6943.6	20.28	123.00	65	52	652.2
115.00		0.3125	37.388	36.773	6386.4	19.69	119.64	65	52	634.5
120.00		0.3125	36.340	35.733	5859.8	19.09	116.29	65	52	616.8
125.00		0.3125	35.291	34.693	5363.0	18.50	112.93	65	52	599.1
128.00		0.3125	34.662	34.070	5078.9	18.15	110.92	65	52	351.0
130.00	Top - Section 3	0.0000	0.000	0.000	0.0	NAN	NAN	0	0	230.4
130.00	Bot - Section 4	0.3125	34.243	33.654	4895.1	17.91	109.58	65	52	
135.00		0.1875	33.182	19.635	2700.7	29.79	176.97	65	48	339.4
139.00		0.1875	32.334	19.130	2497.7	29.00	172.45	65	48	263.8
140.00		0.1875	32.122	19.004	2448.5	28.80	171.31	65	49	64.9
145.00		0.1875	31.061	18.373	2212.5	27.80	165.66	65	49	318.0
149.00		0.1875	30.212	17.868	2035.1	27.00	161.13	65	50	246.6
150.00		0.1875	30.000	17.742	1992.2	26.80	160.00	65	50	60.6
										32020.4

Wind Loading - Shaft

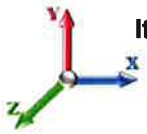
Structure: CT13073-A-SBA
Site Name: Groton North
Height: 150.00 (ft)
Base Elev: 0.000 (ft)

Code: EIA/TIA-222-F
Exposure: C
Gh: 1.69
Struct Class: II

9/4/2015

TES Tower Engineering Solutions

Load Case: 85 mph Wind with 0" Ice
Dead Load Factor 1.00
Wind Load Factor 1.00



Iterations: 21

Elev (ft)	Description	Kzt	Kz	qz (psf)	qzGh (psf)	C (mph-ft)	Cf	Ice Thick (in)	Tributary (ft)	Aa (sf)	CfAa (sf)	Wind Force X (lb)	Dead Load Ice (lb)	Tot Dead Load (lb)
0.00		0.00	1.00	18.496	31.26	425.00	0.650	0.000	0.00	0.000	0.00	0.0	0.0	0.0
5.00		0.00	1.00	18.496	31.26	417.57	0.650	0.000	5.00	24.782	16.11	503.5	0.0	1592.4
10.00		0.00	1.00	18.496	31.26	410.15	0.650	0.000	5.00	24.345	15.82	494.6	0.0	1564.0
15.00		0.00	1.00	18.496	31.26	402.72	0.650	0.000	5.00	23.908	15.54	485.8	0.0	1535.7
20.00		0.00	1.00	18.496	31.26	395.30	0.650	0.000	5.00	23.471	15.26	476.9	0.0	1507.4
25.00		0.00	1.00	18.496	31.26	387.87	0.650	0.000	5.00	23.034	14.97	468.0	0.0	1479.1
30.00		0.00	1.00	18.496	31.26	380.45	0.650	0.000	5.00	22.598	14.69	459.1	0.0	1450.8
35.00		0.00	1.02	18.810	31.79	376.17	0.650	0.000	5.00	22.161	14.40	457.9	0.0	1422.5
40.00		0.00	1.06	19.541	33.02	375.78	0.650	0.000	5.00	21.724	14.12	466.3	0.0	1394.2
41.50	Bot - Section 2	0.00	1.07	19.748	33.37	375.46	0.650	0.000	1.50	6.432	4.18	139.5	0.0	412.7
45.00		0.00	1.09	20.210	34.15	374.39	0.650	0.000	3.50	15.110	9.82	335.5	0.0	1802.7
48.00	Top - Section 1	0.00	1.11	20.586	34.79	373.16	0.650	0.000	3.00	12.781	8.31	289.0	0.0	1524.5
50.00		0.00	1.13	20.827	35.20	378.77	0.650	0.000	2.00	8.434	5.48	193.0	0.0	474.0
55.00		0.00	1.16	21.402	36.17	375.97	0.650	0.000	5.00	20.778	13.51	488.5	0.0	1167.8
60.00		0.00	1.19	21.941	37.08	372.59	0.650	0.000	5.00	20.341	13.22	490.3	0.0	1143.0
65.00		0.00	1.21	22.449	37.94	368.69	0.650	0.000	5.00	19.904	12.94	490.8	0.0	1118.2
70.00		0.00	1.24	22.929	38.75	364.35	0.650	0.000	5.00	19.468	12.65	490.3	0.0	1093.5
75.00		0.00	1.26	23.386	39.52	359.61	0.650	0.000	5.00	19.031	12.37	488.9	0.0	1068.7
80.00		0.00	1.29	23.821	40.26	354.51	0.650	0.000	5.00	18.594	12.09	486.6	0.0	1043.9
84.00	Bot - Section 3	0.00	1.31	24.155	40.82	350.20	0.650	0.000	4.00	14.561	9.46	386.4	0.0	817.3
85.00		0.00	1.31	24.237	40.96	349.09	0.650	0.000	1.00	3.649	2.37	97.1	0.0	348.6
89.50	Top - Section 2	0.00	1.33	24.597	41.57	343.97	0.650	0.000	4.50	16.202	10.53	437.8	0.0	1547.5
90.00		0.00	1.33	24.636	41.63	348.50	0.650	0.000	0.50	1.778	1.16	48.1	0.0	71.5
95.00		0.00	1.35	25.020	42.28	342.56	0.650	0.000	5.00	17.544	11.40	482.2	0.0	705.3
100.00		0.00	1.37	25.389	42.91	336.38	0.650	0.000	5.00	17.107	11.12	477.1	0.0	687.6
105.00		0.00	1.39	25.745	43.51	329.97	0.650	0.000	5.00	16.670	10.84	471.5	0.0	669.9
110.00		0.00	1.41	26.090	44.09	323.35	0.650	0.000	5.00	16.234	10.55	465.2	0.0	652.2
115.00		0.00	1.43	26.423	44.66	316.54	0.650	0.000	5.00	15.797	10.27	458.5	0.0	634.5
120.00		0.00	1.45	26.747	45.20	309.54	0.650	0.000	5.00	15.360	9.98	451.3	0.0	616.8
125.00		0.00	1.46	27.060	45.73	302.37	0.650	0.000	5.00	14.923	9.70	443.6	0.0	599.1
128.00	Appurtenance(s)	0.00	1.47	27.244	46.04	297.99	0.650	0.000	3.00	8.744	5.68	261.7	0.0	351.0
130.00	Top - Section 3	0.00	1.48	27.365	46.25	295.03	0.650	0.000	2.00	5.742	3.73	172.6	0.0	230.4
135.00		0.00	1.50	27.662	46.75	287.44	0.650	0.000	5.00	14.047	9.13	426.8	0.0	339.4
139.00	Appurtenance(s)	0.00	1.51	27.894	47.14	281.26	0.650	0.000	4.00	10.919	7.10	334.6	0.0	263.8
140.00		0.00	1.51	27.951	47.24	279.70	0.650	0.000	1.00	2.686	1.75	82.5	0.0	64.9
145.00		0.00	1.53	28.233	47.71	271.82	0.650	0.000	5.00	13.163	8.56	408.2	0.0	318.0
149.00	Appurtenance(s)	0.00	1.54	28.453	48.09	265.43	0.650	0.000	4.00	10.212	6.64	319.2	0.0	246.6
150.00		0.00	1.54	28.507	48.18	263.81	0.650	0.000	1.00	2.509	1.63	78.6	0.0	60.6
								Totals:	**150.00**			**14,007.5**		**32,020.4**

Discrete Appurtenance Forces

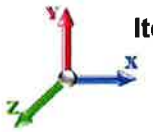
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 9	

Tower Engineering Solutions

Load Case: 85 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 21

No.	Elev (ft)	Description	Qty	qz (psf)	qzGh (psf)	CaAa Factor	Total CaAa (sf)	Dead Load (lb)	Horiz Ecc (ft)	Vert Ecc (ft)	Wind FX (lb)	Mom Y (lb-ft)	Mom Z (lb-ft)
1	149.00	RRH2X60-PCS	3	28.453	48.085	0.89	6.86	165.00	0.000	0.000	329.96	0.00	0.00
2	149.00	RRH2X60-AWS	3	28.453	48.085	0.76	9.03	180.00	0.000	0.000	434.15	0.00	0.00
3	149.00	RRH2X60-AWS	3	28.453	48.085	0.76	9.03	180.00	0.000	0.000	434.15	0.00	0.00
4	149.00	Low Profile Platform	1	28.453	48.085	1.00	22.00	1500.00	0.000	0.000	1057.88	0.00	0.00
5	149.00	LNX-6514DS-VTM (72.7"	3	28.453	48.085	0.92	24.16	216.30	0.000	0.000	1161.55	0.00	0.00
6	149.00	LNX-6512DS-VTM	3	28.453	48.085	0.89	15.50	150.30	0.000	0.000	745.49	0.00	0.00
7	149.00	HBXX-6517DS-VTM	3	28.453	48.085	0.89	23.68	210.90	0.000	0.000	1138.81	0.00	0.00
8	149.00	HBXX-6516DS-VTM	3	28.453	48.085	0.87	16.49	169.80	0.000	0.000	793.04	0.00	0.00
9	149.00	FD9R6004/2C-3L (3.1 lbs)	6	28.453	48.085	0.67	1.45	18.60	0.000	0.000	69.59	0.00	0.00
10	149.00	DB-T1-6Z-8AB-0Z	1	28.453	48.085	1.00	5.60	44.00	0.000	0.000	269.28	0.00	0.00
11	139.00	TTLNA	3	27.894	47.140	0.90	0.46	48.00	0.000	0.000	21.64	0.00	0.00
12	139.00	HB-X-AW-17-65-00T	3	27.894	47.140	1.26	7.16	126.30	0.000	0.000	337.32	0.00	0.00
13	139.00	Dual Mount Standoffs	3	27.894	47.140	0.80	6.67	450.00	0.000	0.000	314.52	0.00	0.00
14	128.00	Raycap DC6-48-60-18-8F	1	27.244	46.043	1.00	1.47	31.80	0.000	0.000	67.68	0.00	0.00
15	128.00	Powerwave LGP21903	6	27.244	46.043	0.87	1.41	33.00	0.000	0.000	64.89	0.00	0.00
16	128.00	Powerwave LGP21401	6	27.244	46.043	0.67	5.19	84.60	0.000	0.000	238.77	0.00	0.00
17	128.00	Powerwave 7770	6	27.244	46.043	0.84	30.22	343.80	0.000	0.000	1391.29	0.00	0.00
18	128.00	Low Profile Platform	1	27.244	46.043	1.00	24.00	1600.00	0.000	0.000	1105.03	0.00	0.00
19	128.00	KMW	1	27.244	46.043	0.85	4.86	58.70	0.000	0.000	223.60	0.00	0.00
20	128.00	Ericsson RRUS 11	6	27.244	46.043	0.76	13.41	304.20	0.000	0.000	617.27	0.00	0.00
21	128.00	Andrew SBNH 1D6565C	2	27.244	46.043	0.96	21.98	198.80	0.000	0.000	1012.21	0.00	0.00
						Totals:		**6,114.10**			**11,828.13**		

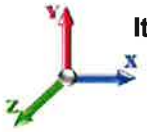
Total Applied Force Summary

Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 10	

Load Case: 85 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 21

Elev (ft)	Description	Lateral FX (-) (lb)	Axial FY (-) (lb)	Torsion MY (lb-ft)	Moment MZ (lb-ft)
0.00		0.00	0.00	0.00	0.00
5.00		503.51	1732.50	0.00	0.00
10.00		494.63	1704.20	0.00	0.00
15.00		485.76	1675.89	0.00	0.00
20.00		476.88	1647.59	0.00	0.00
25.00		468.01	1619.28	0.00	0.00
30.00		459.13	1590.97	0.00	0.00
35.00		457.89	1562.67	0.00	0.00
40.00		466.32	1534.36	0.00	0.00
41.50		139.53	454.79	0.00	0.00
45.00		335.46	1900.79	0.00	0.00
48.00		289.03	1608.55	0.00	0.00
50.00		192.95	530.11	0.00	0.00
55.00		488.50	1307.93	0.00	0.00
60.00		490.27	1283.17	0.00	0.00
65.00		490.84	1258.40	0.00	0.00
70.00		490.34	1233.63	0.00	0.00
75.00		488.88	1208.86	0.00	0.00
80.00		486.55	1184.10	0.00	0.00
84.00		386.36	929.45	0.00	0.00
85.00		97.14	376.60	0.00	0.00
89.50		437.78	1673.67	0.00	0.00
90.00		48.13	85.51	0.00	0.00
95.00		482.18	845.41	0.00	0.00
100.00		477.12	827.72	0.00	0.00
105.00		471.46	810.03	0.00	0.00
110.00		465.25	792.34	0.00	0.00
115.00		458.52	774.65	0.00	0.00
120.00		451.29	756.96	0.00	0.00
125.00		443.60	739.26	0.00	0.00
128.00	(29) appurtenances	4982.45	3089.97	0.00	0.00
130.00		172.61	259.81	0.00	0.00
135.00		426.84	412.84	0.00	0.00
139.00	(9) appurtenances	1008.06	946.84	0.00	0.00
140.00		82.46	73.32	0.00	0.00
145.00		408.23	360.16	0.00	0.00
149.00	(29) appurtenances	6753.09	3115.30	0.00	0.00
150.00		78.57	60.59	0.00	0.00
	Totals:	**25,835.64**	**41,968.21**	**0.00**	**0.00**

Resulting Forces and Deflections

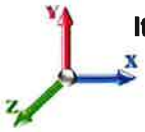
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 11	

TES Tower Engineering Solutions

Load Case: 85 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 21

Elev (ft)	Lateral FX (-) (kips)	Axial FY (-) (kips)	Lateral FZ (kips)	Moment MX (ft-kips)	Torsion MY (ft-kips)	Moment MZ (ft-kips)	Deflect X (in)	Deflect Z (in)	Deflect Resultant (in)	Rotation Sway (deg)	Rotation Twist (deg)
0.00	-25.870	-41.947	0.000	0.000	0.000	-2762.4	0.000	0.000	0.000	0.000	0.000
5.00	-25.429	-40.175	0.000	0.000	0.000	-2633.1	-0.049	0.000	0.049	-0.091	0.000
10.00	-24.991	-38.432	0.000	0.000	0.000	-2505.9	-0.194	0.000	0.194	-0.182	0.000
15.00	-24.558	-36.718	0.000	0.000	0.000	-2381.0	-0.434	0.000	0.434	-0.274	0.000
20.00	-24.128	-35.035	0.000	0.000	0.000	-2258.2	-0.770	0.000	0.770	-0.366	0.000
25.00	-23.702	-33.381	0.000	0.000	0.000	-2137.5	-1.203	0.000	1.203	-0.458	0.000
30.00	-23.280	-31.757	0.000	0.000	0.000	-2019.0	-1.733	0.000	1.733	-0.550	0.000
35.00	-22.855	-30.162	0.000	0.000	0.000	-1902.6	-2.359	0.000	2.359	-0.643	0.000
40.00	-22.400	-28.610	0.000	0.000	0.000	-1788.4	-3.082	0.000	3.082	-0.735	0.000
41.50	-22.277	-28.139	0.000	0.000	0.000	-1754.8	-3.317	0.000	3.317	-0.763	0.000
45.00	-21.943	-26.220	0.000	0.000	0.000	-1676.8	-3.901	0.000	3.901	-0.828	0.000
48.00	-21.650	-24.598	0.000	0.000	0.000	-1611.0	-4.440	0.000	4.440	-0.884	0.000
50.00	-21.477	-24.046	0.000	0.000	0.000	-1567.7	-4.819	0.000	4.819	-0.921	0.000
55.00	-21.006	-22.710	0.000	0.000	0.000	-1460.3	-5.837	0.000	5.837	-1.020	0.000
60.00	-20.528	-21.402	0.000	0.000	0.000	-1355.3	-6.957	0.000	6.957	-1.117	0.000
65.00	-20.045	-20.120	0.000	0.000	0.000	-1252.6	-8.180	0.000	8.180	-1.214	0.000
70.00	-19.559	-18.865	0.000	0.000	0.000	-1152.4	-9.502	0.000	9.502	-1.309	0.000
75.00	-19.070	-17.638	0.000	0.000	0.000	-1054.6	-10.924	0.000	10.924	-1.402	0.000
80.00	-18.577	-16.440	0.000	0.000	0.000	-959.30	-12.442	0.000	12.442	-1.494	0.000
84.00	-18.178	-15.507	0.000	0.000	0.000	-885.00	-13.724	0.000	13.724	-1.565	0.000
85.00	-18.083	-15.118	0.000	0.000	0.000	-866.82	-14.054	0.000	14.054	-1.583	0.000
89.50	-17.608	-13.444	0.000	0.000	0.000	-785.45	-15.585	0.000	15.585	-1.661	0.000
90.00	-17.572	-13.341	0.000	0.000	0.000	-776.64	-15.759	0.000	15.759	-1.670	0.000
95.00	-17.088	-12.479	0.000	0.000	0.000	-688.78	-17.568	0.000	17.568	-1.780	0.000
100.00	-16.605	-11.638	0.000	0.000	0.000	-603.35	-19.490	0.000	19.490	-1.884	0.000
105.00	-16.124	-10.818	0.000	0.000	0.000	-520.32	-21.517	0.000	21.517	-1.982	0.000
110.00	-15.646	-10.019	0.000	0.000	0.000	-439.70	-23.642	0.000	23.642	-2.073	0.000
115.00	-15.172	-9.241	0.000	0.000	0.000	-361.47	-25.859	0.000	25.859	-2.155	0.000
120.00	-14.702	-8.485	0.000	0.000	0.000	-285.61	-28.156	0.000	28.156	-2.227	0.000
125.00	-14.235	-7.753	0.000	0.000	0.000	-212.11	-30.522	0.000	30.522	-2.287	0.000
128.00	-9.135	-4.862	0.000	0.000	0.000	-169.40	-31.970	0.000	31.970	-2.318	0.000
130.00	-8.954	-4.605	0.000	0.000	0.000	-151.13	-32.945	0.000	32.945	-2.336	0.000
135.00	-8.513	-4.204	0.000	0.000	0.000	-106.36	-35.412	0.000	35.412	-2.373	0.000
139.00	-7.468	-3.297	0.000	0.000	0.000	-72.311	-37.418	0.000	37.418	-2.411	0.000
140.00	-7.384	-3.225	0.000	0.000	0.000	-64.843	-37.924	0.000	37.924	-2.419	0.000
145.00	-6.961	-2.881	0.000	0.000	0.000	-27.926	-40.473	0.000	40.473	-2.446	0.000
149.00	-0.081	-0.057	0.000	0.000	0.000	-0.081	-42.527	0.000	42.527	-2.453	0.000
150.00	-0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	43.040	-2.453	0.000

Resulting Stresses

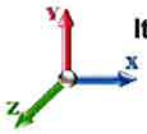
Structure:	CT13073-A-SBA	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 12	

Tower Engineering Solutions

Load Case: 85 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 21

	Applied Stresses								
Elev (ft)	fa Axial (Y) (ksi)	fvx Shear (X) (ksi)	fvz Shear (Z) (ksi)	fvt Torsion (ksi)	fbx Bending (X) (ksi)	fbz Bending (Z) (ksi)	fb Combined (ksi)	Allow Stress (ksi)	f/Fb Stress Ratio
0.00	0.44	0.55	0.00	0.00	0.00	23.91	24.37	52.0	0.469
5.00	0.43	0.55	0.00	0.00	0.00	23.62	24.07	52.0	0.463
10.00	0.42	0.55	0.00	0.00	0.00	23.31	23.75	52.0	0.457
15.00	0.41	0.55	0.00	0.00	0.00	22.98	23.41	52.0	0.450
20.00	0.40	0.55	0.00	0.00	0.00	22.64	23.06	52.0	0.444
25.00	0.39	0.55	0.00	0.00	0.00	22.27	22.68	52.0	0.436
30.00	0.38	0.56	0.00	0.00	0.00	21.87	22.27	52.0	0.428
35.00	0.36	0.56	0.00	0.00	0.00	21.45	21.84	52.0	0.420
40.00	0.35	0.56	0.00	0.00	0.00	21.00	21.38	52.0	0.411
41.50	0.35	0.56	0.00	0.00	0.00	20.87	21.24	52.0	0.409
45.00	0.33	0.56	0.00	0.00	0.00	20.53	20.88	52.0	0.402
48.00	0.35	0.62	0.00	0.00	0.00	22.24	22.62	52.0	0.435
50.00	0.35	0.62	0.00	0.00	0.00	22.01	22.38	52.0	0.431
55.00	0.33	0.62	0.00	0.00	0.00	21.39	21.75	52.0	0.419
60.00	0.32	0.62	0.00	0.00	0.00	20.74	21.09	52.0	0.406
65.00	0.31	0.62	0.00	0.00	0.00	20.04	20.38	52.0	0.392
70.00	0.30	0.62	0.00	0.00	0.00	19.30	19.62	52.0	0.377
75.00	0.28	0.62	0.00	0.00	0.00	18.50	18.81	52.0	0.362
80.00	0.27	0.62	0.00	0.00	0.00	17.65	17.95	52.0	0.345
84.00	0.26	0.62	0.00	0.00	0.00	16.93	17.22	52.0	0.331
85.00	0.26	0.62	0.00	0.00	0.00	16.75	17.03	52.0	0.328
89.50	0.32	0.84	0.00	0.00	0.00	21.38	21.74	52.0	0.418
90.00	0.32	0.84	0.00	0.00	0.00	21.24	21.61	52.0	0.416
95.00	0.30	0.84	0.00	0.00	0.00	19.81	20.17	52.0	0.388
100.00	0.29	0.84	0.00	0.00	0.00	18.27	18.62	52.0	0.358
105.00	0.28	0.84	0.00	0.00	0.00	16.62	16.96	52.0	0.326
110.00	0.26	0.83	0.00	0.00	0.00	14.83	15.16	52.0	0.292
115.00	0.25	0.83	0.00	0.00	0.00	12.89	13.22	52.0	0.254
120.00	0.24	0.83	0.00	0.00	0.00	10.79	11.12	52.0	0.214
125.00	0.22	0.83	0.00	0.00	0.00	8.50	8.84	52.0	0.170
128.00	0.14	0.54	0.00	0.00	0.00	7.04	7.25	52.0	0.139
130.00	0.14	0.54	0.00	0.00	0.00	6.44	6.64	52.0	0.128
130.00	0.14	0.54	0.00	0.00	0.00	6.44	6.64	52.0	0.211
135.00	0.21	0.87	0.00	0.00	0.00	7.96	8.32	47.8	0.174
139.00	0.17	0.79	0.00	0.00	0.00	5.70	6.03	48.4	0.125
140.00	0.17	0.78	0.00	0.00	0.00	5.18	5.52	48.6	0.114
145.00	0.16	0.76	0.00	0.00	0.00	2.39	2.87	49.4	0.058
149.00	0.00	0.01	0.00	0.00	0.00	0.01	0.02	50.1	0.000
150.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	50.3	0.000

Wind Loading - Shaft

Structure: CT13073-A-SBA
Site Name: Groton North
Height: 150.00 (ft)
Base Elev: 0.000 (ft)

Code: EIA/TIA-222-F
Exposure: C
Gh: 1.69
Struct Class: II

9/4/2015
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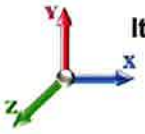
Tower Engineering Solutions

Load Case: 73.61 mph Wind with 0.5" Ice
Dead Load Factor 1.00
Wind Load Factor 1.00



Iterations: 20

Elev (ft)	Description	Kzt	Kz	qz (psf)	qzGh (psf)	C (mph-ft)	Cf	Ice Thick (in)	Tributary (ft)	Aa (sf)	CfAa (sf)	Wind Force X (lb)	Dead Load Ice (lb)	Tot Dead Load (lb)
0.00		0.00	1.00	13.871	23.44	368.05	0.650	0.500	0.00	0.000	0.00	0.0	0.0	0.0
5.00		0.00	1.00	13.871	23.44	361.62	0.650	0.500	5.00	25.198	16.38	384.0	183.5	1775.8
10.00		0.00	1.00	13.871	23.44	355.19	0.650	0.500	5.00	24.761	16.09	377.3	180.2	1744.3
15.00		0.00	1.00	13.871	23.44	348.76	0.650	0.500	5.00	24.325	15.81	370.6	177.0	1712.7
20.00		0.00	1.00	13.871	23.44	342.33	0.650	0.500	5.00	23.888	15.53	364.0	173.7	1681.2
25.00		0.00	1.00	13.871	23.44	335.90	0.650	0.500	5.00	23.451	15.24	357.3	170.5	1649.6
30.00		0.00	1.00	13.871	23.44	329.47	0.650	0.500	5.00	23.014	14.96	350.7	167.3	1618.1
35.00		0.00	1.02	14.106	23.84	325.76	0.650	0.500	5.00	22.577	14.68	349.9	164.0	1586.6
40.00		0.00	1.06	14.655	24.77	325.43	0.650	0.500	5.00	22.141	14.39	356.4	160.8	1555.0
41.50	Bot - Section 2	0.00	1.07	14.810	25.03	325.15	0.650	0.500	1.50	6.557	4.26	106.7	48.0	460.7
45.00		0.00	1.09	15.156	25.61	324.23	0.650	0.500	3.50	15.402	10.01	256.4	112.2	1914.9
48.00	Top - Section 1	0.00	1.11	15.439	26.09	323.16	0.650	0.500	3.00	13.031	8.47	221.0	95.0	1619.5
50.00		0.00	1.13	15.620	26.40	328.01	0.650	0.500	2.00	8.600	5.59	147.6	62.8	536.9
55.00		0.00	1.16	16.051	27.13	325.59	0.650	0.500	5.00	21.195	13.78	373.7	153.8	1321.6
60.00		0.00	1.19	16.455	27.81	322.66	0.650	0.500	5.00	20.758	13.49	375.2	150.6	1293.6
65.00		0.00	1.21	16.836	28.45	319.29	0.650	0.500	5.00	20.321	13.21	375.8	147.3	1265.6
70.00		0.00	1.24	17.196	29.06	315.53	0.650	0.500	5.00	19.884	12.92	375.6	144.1	1237.6
75.00		0.00	1.26	17.538	29.64	311.42	0.650	0.500	5.00	19.447	12.64	374.7	140.9	1209.6
80.00		0.00	1.29	17.865	30.19	307.01	0.650	0.500	5.00	19.011	12.36	373.1	137.6	1181.6
84.00	Bot - Section 3	0.00	1.31	18.115	30.61	303.27	0.650	0.500	4.00	14.894	9.68	296.4	108.0	925.4
85.00		0.00	1.31	18.177	30.72	302.32	0.650	0.500	1.00	3.732	2.43	74.5	27.3	375.8
89.50	Top - Section 2	0.00	1.33	18.447	31.17	297.88	0.650	0.500	4.50	16.577	10.78	335.9	120.1	1667.6
90.00		0.00	1.33	18.476	31.22	301.80	0.650	0.500	0.50	1.820	1.18	36.9	13.3	84.8
95.00		0.00	1.35	18.764	31.71	296.66	0.650	0.500	5.00	17.961	11.67	370.2	129.9	835.1
100.00		0.00	1.37	19.041	32.18	291.31	0.650	0.500	5.00	17.524	11.39	366.5	126.6	814.2
105.00		0.00	1.39	19.308	32.63	285.76	0.650	0.500	5.00	17.087	11.11	362.4	123.4	793.3
110.00		0.00	1.41	19.566	33.07	280.02	0.650	0.500	5.00	16.650	10.82	357.9	120.1	772.3
115.00		0.00	1.43	19.816	33.49	274.12	0.650	0.500	5.00	16.213	10.54	352.9	116.9	751.4
120.00		0.00	1.45	20.059	33.90	268.06	0.650	0.500	5.00	15.777	10.25	347.6	113.7	730.5
125.00		0.00	1.46	20.294	34.30	261.85	0.650	0.500	5.00	15.340	9.97	342.0	110.4	709.6
128.00	Appurtenance(s)	0.00	1.47	20.432	34.53	258.06	0.650	0.500	3.00	8.994	5.85	201.9	65.1	416.1
130.00	Top - Section 3	0.00	1.48	20.523	34.68	255.50	0.650	0.500	2.00	5.909	3.84	133.2	42.9	273.3
135.00		0.00	1.50	20.745	35.06	248.92	0.650	0.500	5.00	14.464	9.40	329.6	103.9	443.4
139.00	Appurtenance(s)	0.00	1.51	20.919	35.35	243.57	0.650	0.500	4.00	11.253	7.31	258.6	81.1	344.9
140.00		0.00	1.51	20.962	35.43	242.22	0.650	0.500	1.00	2.769	1.80	63.8	20.1	85.0
145.00		0.00	1.53	21.173	35.78	235.40	0.650	0.500	5.00	13.580	8.83	315.8	97.4	415.4
149.00	Appurtenance(s)	0.00	1.54	21.338	36.06	229.86	0.650	0.500	4.00	10.545	6.85	247.2	75.8	322.5
150.00		0.00	1.54	21.379	36.13	228.46	0.650	0.500	1.00	2.592	1.68	60.9	18.8	79.4
								Totals:	**150.00**			**10,744.2**		**36,204.5**

Discrete Appurtenance Forces

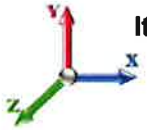
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 14	

Tower Engineering Solutions

Load Case: 73.61 mph Wind with 0.5" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

No.	Elev (ft)	Description	Qty	qz (psf)	qzGh (psf)	CaAa Factor	Total CaAa (sf)	Dead Load (lb)	Horiz Ecc (ft)	Vert Ecc (ft)	Wind FX (lb)	Mom Y (lb-ft)	Mom Z (lb-ft)
1	149.00	RRH2X60-PCS	3	21.338	36.062	0.94	7.78	212.70	0.000	0.000	280.68	0.00	0.00
2	149.00	RRH2X60-AWS	3	21.338	36.062	0.81	10.28	240.30	0.000	0.000	370.68	0.00	0.00
3	149.00	RRH2X60-AWS	3	21.338	36.062	0.81	10.28	240.30	0.000	0.000	370.68	0.00	0.00
4	149.00	Low Profile Platform	1	21.338	36.062	1.00	27.00	1800.00	0.000	0.000	973.67	0.00	0.00
5	149.00	LNX-6514DS-VTM (72.7"	3	21.338	36.062	0.95	26.85	398.40	0.000	0.000	968.16	0.00	0.00
6	149.00	LNX-6512DS-VTM	3	21.338	36.062	0.91	17.06	270.00	0.000	0.000	615.05	0.00	0.00
7	149.00	HBXX-6517DS-VTM	3	21.338	36.062	0.92	26.53	388.20	0.000	0.000	956.58	0.00	0.00
8	149.00	HBXX-6516DS-VTM	3	21.338	36.062	0.90	18.39	296.70	0.000	0.000	663.33	0.00	0.00
9	149.00	FD9R6004/2C-3L (3.1 lbs)	6	21.338	36.062	0.72	2.16	32.40	0.000	0.000	77.89	0.00	0.00
10	149.00	DB-T1-6Z-8AB-0Z	1	21.338	36.062	1.00	5.87	80.00	0.000	0.000	211.68	0.00	0.00
11	139.00	TTLNA	3	20.919	35.353	0.95	0.66	75.00	0.000	0.000	23.17	0.00	0.00
12	139.00	HB-X-AW-17-65-00T	3	20.919	35.353	1.27	8.54	201.90	0.000	0.000	301.96	0.00	0.00
13	139.00	Dual Mount Standoffs	3	20.919	35.353	0.85	8.92	750.00	0.000	0.000	315.53	0.00	0.00
14	128.00	Raycap DC6-48-60-18-8F	1	20.432	34.530	1.00	1.67	49.50	0.000	0.000	57.67	0.00	0.00
15	128.00	Powerwave LGP21903	6	20.432	34.530	0.92	2.10	47.40	0.000	0.000	72.43	0.00	0.00
16	128.00	Powerwave LGP21401	6	20.432	34.530	0.72	6.61	127.20	0.000	0.000	228.23	0.00	0.00
17	128.00	Powerwave 7770	6	20.432	34.530	0.87	33.97	576.00	0.000	0.000	1172.96	0.00	0.00
18	128.00	Low Profile Platform	1	20.432	34.530	1.00	27.00	1800.00	0.000	0.000	932.32	0.00	0.00
19	128.00	KMW	1	20.432	34.530	0.78	4.79	96.30	0.000	0.000	165.53	0.00	0.00
20	128.00	Ericsson RRUS 11	6	20.432	34.530	0.81	15.26	396.00	0.000	0.000	526.94	0.00	0.00
21	128.00	Andrew SBNH 1D6565C	2	20.432	34.530	0.98	24.17	350.60	0.000	0.000	834.63	0.00	0.00
						Totals:		**8,428.90**			**10,119.76**		

Total Applied Force Summary

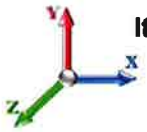
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 15	

TES Tower Engineering Solutions

Load Case: 73.61 mph Wind with 0.5" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

Elev (ft)	Description	Lateral FX (-) (lb)	Axial FY (-) (lb)	Torsion MY (lb-ft)	Moment MZ (lb-ft)
0.00		0.00	0.00	0.00	0.00
5.00		383.96	1915.95	0.00	0.00
10.00		377.30	1884.41	0.00	0.00
15.00		370.65	1852.87	0.00	0.00
20.00		363.99	1821.33	0.00	0.00
25.00		357.33	1789.79	0.00	0.00
30.00		350.68	1758.25	0.00	0.00
35.00		349.86	1726.71	0.00	0.00
40.00		356.43	1695.17	0.00	0.00
41.50		106.67	502.74	0.00	0.00
45.00		256.43	2012.98	0.00	0.00
48.00		221.00	1703.55	0.00	0.00
50.00		147.56	592.92	0.00	0.00
55.00		373.70	1461.74	0.00	0.00
60.00		375.21	1433.73	0.00	0.00
65.00		375.82	1405.73	0.00	0.00
70.00		375.61	1377.73	0.00	0.00
75.00		374.67	1349.73	0.00	0.00
80.00		373.07	1321.73	0.00	0.00
84.00		296.39	1037.48	0.00	0.00
85.00		74.52	403.86	0.00	0.00
89.50		335.92	1793.74	0.00	0.00
90.00		36.94	98.82	0.00	0.00
95.00		370.20	975.26	0.00	0.00
100.00		366.53	954.34	0.00	0.00
105.00		362.41	933.41	0.00	0.00
110.00		357.87	912.48	0.00	0.00
115.00		352.94	891.56	0.00	0.00
120.00		347.63	870.63	0.00	0.00
125.00		341.97	849.71	0.00	0.00
128.00	(29) appurtenances	4192.57	3943.17	0.00	0.00
130.00		133.21	302.69	0.00	0.00
135.00		329.61	516.78	0.00	0.00
139.00	(9) appurtenances	899.24	1430.49	0.00	0.00
140.00		63.76	93.45	0.00	0.00
145.00		315.85	457.55	0.00	0.00
149.00	(29) appurtenances	5735.59	4315.21	0.00	0.00
150.00		60.88	79.41	0.00	0.00
	Totals:	**20,863.96**	**48,467.12**	**0.00**	**0.00**

Resulting Forces and Deflections

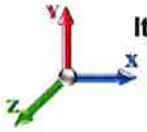
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 16	

Tower Engineering Solutions

Load Case: 73.61 mph Wind with 0.5" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

Elev (ft)	Lateral FX (-) (kips)	Axial FY (-) (kips)	Lateral FZ (kips)	Moment MX (ft-kips)	Torsion MY (ft-kips)	Moment MZ (ft-kips)	Deflect X (in)	Deflect Z (in)	Deflect Resultant (in)	Rotation Sway (deg)	Rotation Twist (deg)
0.00	-20.895	-48.453	0.000	0.000	0.000	-2280.9	0.000	0.000	0.000	0.000	0.000
5.00	-20.571	-46.510	0.000	0.000	0.000	-2176.4	-0.041	0.000	0.041	-0.075	0.000
10.00	-20.249	-44.600	0.000	0.000	0.000	-2073.6	-0.160	0.000	0.160	-0.151	0.000
15.00	-19.929	-42.722	0.000	0.000	0.000	-1972.3	-0.359	0.000	0.359	-0.226	0.000
20.00	-19.611	-40.876	0.000	0.000	0.000	-1872.7	-0.637	0.000	0.637	-0.303	0.000
25.00	-19.295	-39.063	0.000	0.000	0.000	-1774.6	-0.995	0.000	0.995	-0.379	0.000
30.00	-18.982	-37.282	0.000	0.000	0.000	-1678.2	-1.434	0.000	1.434	-0.456	0.000
35.00	-18.665	-35.533	0.000	0.000	0.000	-1583.3	-1.952	0.000	1.952	-0.533	0.000
40.00	-18.321	-33.826	0.000	0.000	0.000	-1489.9	-2.552	0.000	2.552	-0.609	0.000
41.50	-18.231	-33.312	0.000	0.000	0.000	-1462.5	-2.747	0.000	2.747	-0.633	0.000
45.00	-17.979	-31.286	0.000	0.000	0.000	-1398.6	-3.232	0.000	3.232	-0.687	0.000
48.00	-17.757	-29.573	0.000	0.000	0.000	-1344.7	-3.679	0.000	3.679	-0.734	0.000
50.00	-17.631	-28.965	0.000	0.000	0.000	-1309.2	-3.993	0.000	3.993	-0.765	0.000
55.00	-17.276	-27.484	0.000	0.000	0.000	-1221.0	-4.839	0.000	4.839	-0.847	0.000
60.00	-16.915	-26.032	0.000	0.000	0.000	-1134.7	-5.770	0.000	5.770	-0.929	0.000
65.00	-16.550	-24.610	0.000	0.000	0.000	-1050.1	-6.787	0.000	6.787	-1.010	0.000
70.00	-16.182	-23.217	0.000	0.000	0.000	-967.38	-7.887	0.000	7.887	-1.089	0.000
75.00	-15.810	-21.853	0.000	0.000	0.000	-886.47	-9.071	0.000	9.071	-1.168	0.000
80.00	-15.434	-20.521	0.000	0.000	0.000	-807.42	-10.335	0.000	10.335	-1.245	0.000
84.00	-15.127	-19.481	0.000	0.000	0.000	-745.69	-11.404	0.000	11.404	-1.305	0.000
85.00	-15.057	-19.068	0.000	0.000	0.000	-730.56	-11.680	0.000	11.680	-1.320	0.000
89.50	-14.690	-17.274	0.000	0.000	0.000	-662.81	-12.956	0.000	12.956	-1.386	0.000
90.00	-14.666	-17.163	0.000	0.000	0.000	-655.46	-13.102	0.000	13.102	-1.393	0.000
95.00	-14.297	-16.174	0.000	0.000	0.000	-582.13	-14.612	0.000	14.612	-1.486	0.000
100.00	-13.928	-15.209	0.000	0.000	0.000	-510.65	-16.217	0.000	16.217	-1.574	0.000
105.00	-13.559	-14.268	0.000	0.000	0.000	-441.01	-17.911	0.000	17.911	-1.657	0.000
110.00	-13.191	-13.349	0.000	0.000	0.000	-373.22	-19.689	0.000	19.689	-1.734	0.000
115.00	-12.825	-12.454	0.000	0.000	0.000	-307.26	-21.544	0.000	21.544	-1.804	0.000
120.00	-12.462	-11.583	0.000	0.000	0.000	-243.14	-23.468	0.000	23.468	-1.865	0.000
125.00	-12.099	-10.737	0.000	0.000	0.000	-180.83	-25.451	0.000	25.451	-1.917	0.000
128.00	-7.778	-6.935	0.000	0.000	0.000	-144.53	-26.664	0.000	26.664	-1.943	0.000
130.00	-7.638	-6.634	0.000	0.000	0.000	-128.98	-27.481	0.000	27.481	-1.958	0.000
135.00	-7.294	-6.124	0.000	0.000	0.000	-90.792	-29.550	0.000	29.550	-1.990	0.000
139.00	-6.347	-4.724	0.000	0.000	0.000	-61.617	-31.232	0.000	31.232	-2.022	0.000
140.00	-6.281	-4.631	0.000	0.000	0.000	-55.270	-31.657	0.000	31.657	-2.029	0.000
145.00	-5.950	-4.184	0.000	0.000	0.000	-23.865	-33.796	0.000	33.796	-2.052	0.000
149.00	-0.064	-0.077	0.000	0.000	0.000	-0.064	-35.518	0.000	35.518	-2.058	0.000
150.00	-0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.000	35.949	-2.058	0.000

Resulting Stresses

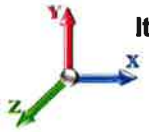
Structure: CT13073-A-SBA
Site Name: Groton North
Height: 150.00 (ft)
Base Elev: 0.000 (ft)

Code: EIA/TIA-222-F
Exposure: C
Gh: 1.69
Struct Class: II

9/4/2015

TES Tower Engineering Solutions

Load Case: 73.61 mph Wind with 0.5" Ice
Dead Load Factor 1.00
Wind Load Factor 1.00



Iterations: 20

Applied Stresses

Elev (ft)	fa Axial (Y) (ksi)	fvx Shear (X) (ksi)	fvz Shear (Z) (ksi)	fvt Torsion (ksi)	fbx Bending (X) (ksi)	fbz Bending (Z) (ksi)	fb Combined (ksi)	Fb Allow Stress (ksi)	f/Fb Stress Ratio
0.00	0.51	0.45	0.00	0.00	0.00	19.74	20.27	52.0	0.390
5.00	0.50	0.45	0.00	0.00	0.00	19.52	20.04	52.0	0.386
10.00	0.49	0.45	0.00	0.00	0.00	19.29	19.79	52.0	0.381
15.00	0.48	0.45	0.00	0.00	0.00	19.04	19.53	52.0	0.376
20.00	0.47	0.45	0.00	0.00	0.00	18.77	19.25	52.0	0.370
25.00	0.45	0.45	0.00	0.00	0.00	18.49	18.96	52.0	0.365
30.00	0.44	0.45	0.00	0.00	0.00	18.18	18.64	52.0	0.359
35.00	0.43	0.45	0.00	0.00	0.00	17.85	18.30	52.0	0.352
40.00	0.42	0.46	0.00	0.00	0.00	17.50	17.93	52.0	0.345
41.50	0.41	0.46	0.00	0.00	0.00	17.39	17.82	52.0	0.343
45.00	0.39	0.46	0.00	0.00	0.00	17.13	17.54	52.0	0.337
48.00	0.42	0.51	0.00	0.00	0.00	18.56	19.01	52.0	0.366
50.00	0.42	0.51	0.00	0.00	0.00	18.38	18.82	52.0	0.362
55.00	0.40	0.51	0.00	0.00	0.00	17.89	18.31	52.0	0.352
60.00	0.39	0.51	0.00	0.00	0.00	17.36	17.78	52.0	0.342
65.00	0.38	0.51	0.00	0.00	0.00	16.80	17.20	52.0	0.331
70.00	0.37	0.51	0.00	0.00	0.00	16.20	16.59	52.0	0.319
75.00	0.35	0.51	0.00	0.00	0.00	15.55	15.93	52.0	0.306
80.00	0.34	0.51	0.00	0.00	0.00	14.85	15.22	52.0	0.293
84.00	0.33	0.51	0.00	0.00	0.00	14.26	14.62	52.0	0.281
85.00	0.32	0.51	0.00	0.00	0.00	14.11	14.46	52.0	0.278
89.50	0.41	0.70	0.00	0.00	0.00	18.04	18.49	52.0	0.356
90.00	0.41	0.70	0.00	0.00	0.00	17.93	18.38	52.0	0.354
95.00	0.40	0.70	0.00	0.00	0.00	16.74	17.18	52.0	0.331
100.00	0.38	0.70	0.00	0.00	0.00	15.47	15.89	52.0	0.306
105.00	0.37	0.70	0.00	0.00	0.00	14.08	14.50	52.0	0.279
110.00	0.35	0.70	0.00	0.00	0.00	12.59	13.00	52.0	0.250
115.00	0.34	0.70	0.00	0.00	0.00	10.96	11.36	52.0	0.219
120.00	0.32	0.70	0.00	0.00	0.00	9.19	9.59	52.0	0.184
125.00	0.31	0.70	0.00	0.00	0.00	7.25	7.66	52.0	0.147
128.00	0.20	0.46	0.00	0.00	0.00	6.01	6.26	52.0	0.121
130.00	0.20	0.46	0.00	0.00	0.00	5.50	5.75	52.0	0.111
130.00	0.20	0.46	0.00	0.00	0.00	5.50	5.75	52.0	0.182
135.00	0.31	0.75	0.00	0.00	0.00	6.80	7.23	47.8	0.151
139.00	0.25	0.67	0.00	0.00	0.00	4.86	5.24	48.4	0.108
140.00	0.24	0.67	0.00	0.00	0.00	4.42	4.80	48.6	0.099
145.00	0.23	0.65	0.00	0.00	0.00	2.04	2.53	49.4	0.051
149.00	0.00	0.01	0.00	0.00	0.00	0.01	0.02	50.1	0.000
150.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	50.3	0.000

Wind Loading - Shaft

Structure: CT13073-A-SBA
Site Name: Groton North
Height: 150.00 (ft)
Base Elev: 0.000 (ft)

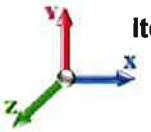
Code: EIA/TIA-222-F
Exposure: C
Gh: 1.69
Struct Class: II

9/4/2015

Tower Engineering Solutions

Load Case: 50 mph Wind with 0" Ice

Dead Load Factor 1.00
Wind Load Factor 1.00



Iterations: 20

Elev (ft)	Description	Kzt	Kz	qz (psf)	qzGh (psf)	C (mph-ft)	Cf	Ice Thick (in)	Tributary (ft)	Aa (sf)	CfAa (sf)	Wind Force X (lb)	Dead Load Ice (lb)	Tot Dead Load (lb)
0.00		0.00	1.00	6.400	10.82	250.00	0.650	0.000	0.00	0.000	0.00	0.0	0.0	0.0
5.00		0.00	1.00	6.400	10.82	245.63	0.650	0.000	5.00	24.782	16.11	174.2	0.0	1592.4
10.00		0.00	1.00	6.400	10.82	241.26	0.650	0.000	5.00	24.345	15.82	171.2	0.0	1564.0
15.00		0.00	1.00	6.400	10.82	236.90	0.650	0.000	5.00	23.908	15.54	168.1	0.0	1535.7
20.00		0.00	1.00	6.400	10.82	232.53	0.650	0.000	5.00	23.471	15.26	165.0	0.0	1507.4
25.00		0.00	1.00	6.400	10.82	228.16	0.650	0.000	5.00	23.034	14.97	161.9	0.0	1479.1
30.00		0.00	1.00	6.400	10.82	223.79	0.650	0.000	5.00	22.598	14.69	158.9	0.0	1450.8
35.00		0.00	1.02	6.509	11.00	221.28	0.650	0.000	5.00	22.161	14.40	158.4	0.0	1422.5
40.00		0.00	1.06	6.762	11.43	221.05	0.650	0.000	5.00	21.724	14.12	161.4	0.0	1394.2
41.50	Bot - Section 2	0.00	1.07	6.833	11.55	220.86	0.650	0.000	1.50	6.432	4.18	48.3	0.0	412.7
45.00		0.00	1.09	6.993	11.82	220.23	0.650	0.000	3.50	15.110	9.82	116.1	0.0	1802.7
48.00	Top - Section 1	0.00	1.11	7.123	12.04	219.51	0.650	0.000	3.00	12.781	8.31	100.0	0.0	1524.5
50.00		0.00	1.13	7.207	12.18	222.81	0.650	0.000	2.00	8.434	5.48	66.8	0.0	474.0
55.00		0.00	1.16	7.406	12.52	221.16	0.650	0.000	5.00	20.778	13.51	169.0	0.0	1167.8
60.00		0.00	1.19	7.592	12.83	219.17	0.650	0.000	5.00	20.341	13.22	169.6	0.0	1143.0
65.00		0.00	1.21	7.768	13.13	216.88	0.650	0.000	5.00	19.904	12.94	169.8	0.0	1118.2
70.00		0.00	1.24	7.934	13.41	214.32	0.650	0.000	5.00	19.468	12.65	169.7	0.0	1093.5
75.00		0.00	1.26	8.092	13.68	211.53	0.650	0.000	5.00	19.031	12.37	169.2	0.0	1068.7
80.00		0.00	1.29	8.242	13.93	208.54	0.650	0.000	5.00	18.594	12.09	168.4	0.0	1043.9
84.00	Bot - Section 3	0.00	1.31	8.358	14.13	206.00	0.650	0.000	4.00	14.561	9.46	133.7	0.0	817.3
85.00		0.00	1.31	8.387	14.17	205.35	0.650	0.000	1.00	3.649	2.37	33.6	0.0	348.6
89.50	Top - Section 2	0.00	1.33	8.511	14.38	202.34	0.650	0.000	4.50	16.202	10.53	151.5	0.0	1547.5
90.00		0.00	1.33	8.525	14.41	205.00	0.650	0.000	0.50	1.778	1.16	16.7	0.0	71.5
95.00		0.00	1.35	8.657	14.63	201.51	0.650	0.000	5.00	17.544	11.40	166.8	0.0	705.3
100.00		0.00	1.37	8.785	14.85	197.87	0.650	0.000	5.00	17.107	11.12	165.1	0.0	687.6
105.00		0.00	1.39	8.908	15.06	194.10	0.650	0.000	5.00	16.670	10.84	163.1	0.0	669.9
110.00		0.00	1.41	9.028	15.26	190.21	0.650	0.000	5.00	16.234	10.55	161.0	0.0	652.2
115.00		0.00	1.43	9.143	15.45	186.20	0.650	0.000	5.00	15.797	10.27	158.7	0.0	634.5
120.00		0.00	1.45	9.255	15.64	182.08	0.650	0.000	5.00	15.360	9.98	156.2	0.0	616.8
125.00		0.00	1.46	9.363	15.82	177.86	0.650	0.000	5.00	14.923	9.70	153.5	0.0	599.1
128.00	Appurtenance(s)	0.00	1.47	9.427	15.93	175.29	0.650	0.000	3.00	8.744	5.68	90.6	0.0	351.0
130.00	Top - Section 3	0.00	1.48	9.469	16.00	173.55	0.650	0.000	2.00	5.742	3.73	59.7	0.0	230.4
135.00		0.00	1.50	9.572	16.18	169.08	0.650	0.000	5.00	14.047	9.13	147.7	0.0	339.4
139.00	Appurtenance(s)	0.00	1.51	9.652	16.31	165.45	0.650	0.000	4.00	10.919	7.10	115.8	0.0	263.8
140.00		0.00	1.51	9.672	16.35	164.53	0.650	0.000	1.00	2.686	1.75	28.5	0.0	64.9
145.00		0.00	1.53	9.769	16.51	159.90	0.650	0.000	5.00	13.163	8.56	141.3	0.0	318.0
149.00	Appurtenance(s)	0.00	1.54	9.845	16.64	156.13	0.650	0.000	4.00	10.212	6.64	110.4	0.0	246.6
150.00		0.00	1.54	9.864	16.67	155.18	0.650	0.000	1.00	2.509	1.63	27.2	0.0	60.6
								Totals:	**150.00**			**4,846.9**		**32,020.4**

Discrete Appurtenance Forces

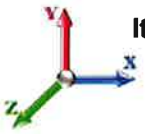
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 19	

TES Tower Engineering Solutions

Load Case: 50 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

No.	Elev (ft)	Description	Qty	qz (psf)	qzGh (psf)	CaAa Factor	Total CaAa (sf)	Dead Load (lb)	Horiz Ecc (ft)	Vert Ecc (ft)	Wind FX (lb)	Mom Y (lb-ft)	Mom Z (lb-ft)
1	149.00	RRH2X60-PCS	3	9.845	16.639	0.89	6.86	165.00	0.000	0.000	114.17	0.00	0.00
2	149.00	RRH2X60-AWS	3	9.845	16.639	0.76	9.03	180.00	0.000	0.000	150.23	0.00	0.00
3	149.00	RRH2X60-AWS	3	9.845	16.639	0.76	9.03	180.00	0.000	0.000	150.23	0.00	0.00
4	149.00	Low Profile Platform	1	9.845	16.639	1.00	22.00	1500.00	0.000	0.000	366.05	0.00	0.00
5	149.00	LNX-6514DS-VTM (72.7"	3	9.845	16.639	0.92	24.16	216.30	0.000	0.000	401.92	0.00	0.00
6	149.00	LNX-6512DS-VTM	3	9.845	16.639	0.89	15.50	150.30	0.000	0.000	257.95	0.00	0.00
7	149.00	HBXX-6517DS-VTM	3	9.845	16.639	0.89	23.68	210.90	0.000	0.000	394.05	0.00	0.00
8	149.00	HBXX-6516DS-VTM	3	9.845	16.639	0.87	16.49	169.80	0.000	0.000	274.41	0.00	0.00
9	149.00	FD9R6004/2C-3L (3.1 lbs)	6	9.845	16.639	0.67	1.45	18.60	0.000	0.000	24.08	0.00	0.00
10	149.00	DB-T1-6Z-8AB-0Z	1	9.845	16.639	1.00	5.60	44.00	0.000	0.000	93.18	0.00	0.00
11	139.00	TTLNA	3	9.652	16.312	0.90	0.46	48.00	0.000	0.000	7.49	0.00	0.00
12	139.00	HB-X-AW-17-65-00T	3	9.652	16.312	1.26	7.16	126.30	0.000	0.000	116.72	0.00	0.00
13	139.00	Dual Mount Standoffs	3	9.652	16.312	0.80	6.67	450.00	0.000	0.000	108.83	0.00	0.00
14	128.00	Raycap DC6-48-60-18-8F	1	9.427	15.932	1.00	1.47	31.80	0.000	0.000	23.42	0.00	0.00
15	128.00	Powerwave LGP21903	6	9.427	15.932	0.87	1.41	33.00	0.000	0.000	22.45	0.00	0.00
16	128.00	Powerwave LGP21401	6	9.427	15.932	0.67	5.19	84.60	0.000	0.000	82.62	0.00	0.00
17	128.00	Powerwave 7770	6	9.427	15.932	0.84	30.22	343.80	0.000	0.000	481.42	0.00	0.00
18	128.00	Low Profile Platform	1	9.427	15.932	1.00	24.00	1600.00	0.000	0.000	382.36	0.00	0.00
19	128.00	KMW	1	9.427	15.932	0.85	4.86	58.70	0.000	0.000	77.37	0.00	0.00
20	128.00	Ericsson RRUS 11	6	9.427	15.932	0.76	13.41	304.20	0.000	0.000	213.59	0.00	0.00
21	128.00	Andrew SBNH 1D6565C	2	9.427	15.932	0.96	21.98	198.80	0.000	0.000	350.25	0.00	0.00
						Totals:		**6,114.10**			**4,092.78**		

Total Applied Force Summary

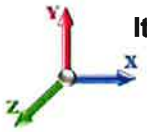
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 20	

TES Tower Engineering Solutions

Load Case: 50 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

Elev (ft)	Description	Lateral FX (-) (lb)	Axial FY (-) (lb)	Torsion MY (lb-ft)	Moment MZ (lb-ft)
0.00		0.00	0.00	0.00	0.00
5.00		174.22	1732.50	0.00	0.00
10.00		171.15	1704.20	0.00	0.00
15.00		168.08	1675.89	0.00	0.00
20.00		165.01	1647.59	0.00	0.00
25.00		161.94	1619.28	0.00	0.00
30.00		158.87	1590.97	0.00	0.00
35.00		158.44	1562.67	0.00	0.00
40.00		161.36	1534.36	0.00	0.00
41.50		48.28	454.79	0.00	0.00
45.00		116.08	1900.79	0.00	0.00
48.00		100.01	1608.55	0.00	0.00
50.00		66.76	530.11	0.00	0.00
55.00		169.03	1307.93	0.00	0.00
60.00		169.64	1283.17	0.00	0.00
65.00		169.84	1258.40	0.00	0.00
70.00		169.67	1233.63	0.00	0.00
75.00		169.16	1208.86	0.00	0.00
80.00		168.36	1184.10	0.00	0.00
84.00		133.69	929.45	0.00	0.00
85.00		33.61	376.60	0.00	0.00
89.50		151.48	1673.67	0.00	0.00
90.00		16.65	85.51	0.00	0.00
95.00		166.84	845.41	0.00	0.00
100.00		165.09	827.72	0.00	0.00
105.00		163.13	810.03	0.00	0.00
110.00		160.99	792.34	0.00	0.00
115.00		158.66	774.65	0.00	0.00
120.00		156.16	756.96	0.00	0.00
125.00		153.50	739.26	0.00	0.00
128.00	(29) appurtenances	1724.03	3089.97	0.00	0.00
130.00		59.73	259.81	0.00	0.00
135.00		147.70	412.84	0.00	0.00
139.00	(9) appurtenances	348.81	946.84	0.00	0.00
140.00		28.53	73.32	0.00	0.00
145.00		141.26	360.16	0.00	0.00
149.00	(29) appurtenances	2336.71	3115.30	0.00	0.00
150.00		27.19	60.59	0.00	0.00
	Totals:	**8,939.67**	**41,968.21**	**0.00**	**0.00**

Resulting Forces and Deflections

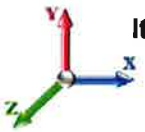
Structure:	CT13073-A-SB	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 21	

TES Tower Engineering Solutions

Load Case: 50 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

Elev (ft)	Lateral FX (-) (kips)	Axial FY (-) (kips)	Lateral FZ (kips)	Moment MX (ft-kips)	Torsion MY (ft-kips)	Moment MZ (ft-kips)	Deflect X (in)	Deflect Z (in)	Deflect Resultant (in)	Rotation Sway (deg)	Rotation Twist (deg)
0.00	-8.951	-41.966	0.000	0.000	0.000	-956.06	0.000	0.000	0.000	0.000	0.000
5.00	-8.798	-40.228	0.000	0.000	0.000	-911.31	-0.017	0.000	0.017	-0.031	0.000
10.00	-8.647	-38.520	0.000	0.000	0.000	-867.31	-0.067	0.000	0.067	-0.063	0.000
15.00	-8.497	-36.839	0.000	0.000	0.000	-824.08	-0.150	0.000	0.150	-0.095	0.000
20.00	-8.349	-35.187	0.000	0.000	0.000	-781.59	-0.267	0.000	0.267	-0.127	0.000
25.00	-8.201	-33.564	0.000	0.000	0.000	-739.85	-0.416	0.000	0.416	-0.158	0.000
30.00	-8.055	-31.969	0.000	0.000	0.000	-698.85	-0.600	0.000	0.600	-0.190	0.000
35.00	-7.908	-30.402	0.000	0.000	0.000	-658.57	-0.816	0.000	0.816	-0.222	0.000
40.00	-7.751	-28.866	0.000	0.000	0.000	-619.03	-1.067	0.000	1.067	-0.254	0.000
41.50	-7.709	-28.409	0.000	0.000	0.000	-607.40	-1.148	0.000	1.148	-0.264	0.000
45.00	-7.593	-26.506	0.000	0.000	0.000	-580.42	-1.350	0.000	1.350	-0.287	0.000
48.00	-7.492	-24.896	0.000	0.000	0.000	-557.64	-1.537	0.000	1.537	-0.306	0.000
50.00	-7.432	-24.363	0.000	0.000	0.000	-542.66	-1.668	0.000	1.668	-0.319	0.000
55.00	-7.269	-23.052	0.000	0.000	0.000	-505.50	-2.020	0.000	2.020	-0.353	0.000
60.00	-7.104	-21.766	0.000	0.000	0.000	-469.15	-2.408	0.000	2.408	-0.387	0.000
65.00	-6.937	-20.505	0.000	0.000	0.000	-433.63	-2.831	0.000	2.831	-0.420	0.000
70.00	-6.769	-19.269	0.000	0.000	0.000	-398.95	-3.289	0.000	3.289	-0.453	0.000
75.00	-6.600	-18.057	0.000	0.000	0.000	-365.10	-3.781	0.000	3.781	-0.485	0.000
80.00	-6.430	-16.872	0.000	0.000	0.000	-332.10	-4.307	0.000	4.307	-0.517	0.000
84.00	-6.292	-15.942	0.000	0.000	0.000	-306.39	-4.751	0.000	4.751	-0.542	0.000
85.00	-6.259	-15.564	0.000	0.000	0.000	-300.09	-4.865	0.000	4.865	-0.548	0.000
89.50	-6.095	-13.890	0.000	0.000	0.000	-271.93	-5.395	0.000	5.395	-0.575	0.000
90.00	-6.082	-13.802	0.000	0.000	0.000	-268.88	-5.455	0.000	5.455	-0.578	0.000
95.00	-5.915	-12.955	0.000	0.000	0.000	-238.47	-6.081	0.000	6.081	-0.616	0.000
100.00	-5.748	-12.126	0.000	0.000	0.000	-208.89	-6.746	0.000	6.746	-0.652	0.000
105.00	-5.582	-11.314	0.000	0.000	0.000	-180.15	-7.448	0.000	7.448	-0.686	0.000
110.00	-5.417	-10.521	0.000	0.000	0.000	-152.24	-8.184	0.000	8.184	-0.718	0.000
115.00	-5.253	-9.746	0.000	0.000	0.000	-125.16	-8.952	0.000	8.952	-0.746	0.000
120.00	-5.090	-8.989	0.000	0.000	0.000	-98.899	-9.747	0.000	9.747	-0.771	0.000
125.00	-4.929	-8.251	0.000	0.000	0.000	-73.447	-10.566	0.000	10.566	-0.792	0.000
128.00	-3.163	-5.185	0.000	0.000	0.000	-58.660	-11.068	0.000	11.068	-0.802	0.000
130.00	-3.100	-4.925	0.000	0.000	0.000	-52.334	-11.405	0.000	11.405	-0.809	0.000
135.00	-2.948	-4.514	0.000	0.000	0.000	-36.832	-12.259	0.000	12.259	-0.822	0.000
139.00	-2.586	-3.572	0.000	0.000	0.000	-25.040	-12.954	0.000	12.954	-0.835	0.000
140.00	-2.557	-3.499	0.000	0.000	0.000	-22.454	-13.129	0.000	13.129	-0.837	0.000
145.00	-2.411	-3.141	0.000	0.000	0.000	-9.670	-14.012	0.000	14.012	-0.847	0.000
149.00	-0.028	-0.060	0.000	0.000	0.000	-0.028	-14.723	0.000	14.723	-0.849	0.000
150.00	-0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.901	-0.849	0.000

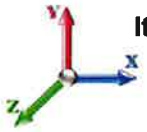
Resulting Stresses

Structure:	CT13073-A-SBA	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 22	

Load Case: 50 mph Wind with 0" Ice

Dead Load Factor 1.00

Wind Load Factor 1.00



Iterations: 20

	Applied Stresses								
Elev (ft)	fa Axial (Y) (ksi)	fvx Shear (X) (ksi)	fvz Shear (Z) (ksi)	fvt Torsion (ksi)	fbx Bending (X) (ksi)	fbz Bending (Z) (ksi)	fb Combined (ksi)	Fb Allow Stress (ksi)	f/Fb Stress Ratio
0.00	0.44	0.19	0.00	0.00	0.00	8.28	8.73	52.0	0.168
5.00	0.43	0.19	0.00	0.00	0.00	8.17	8.61	52.0	0.166
10.00	0.42	0.19	0.00	0.00	0.00	8.07	8.50	52.0	0.163
15.00	0.41	0.19	0.00	0.00	0.00	7.95	8.37	52.0	0.161
20.00	0.40	0.19	0.00	0.00	0.00	7.83	8.24	52.0	0.159
25.00	0.39	0.19	0.00	0.00	0.00	7.71	8.10	52.0	0.156
30.00	0.38	0.19	0.00	0.00	0.00	7.57	7.96	52.0	0.153
35.00	0.37	0.19	0.00	0.00	0.00	7.43	7.80	52.0	0.150
40.00	0.36	0.19	0.00	0.00	0.00	7.27	7.63	52.0	0.147
41.50	0.35	0.19	0.00	0.00	0.00	7.22	7.58	52.0	0.146
45.00	0.33	0.19	0.00	0.00	0.00	7.11	7.45	52.0	0.143
48.00	0.36	0.22	0.00	0.00	0.00	7.70	8.06	52.0	0.155
50.00	0.35	0.22	0.00	0.00	0.00	7.62	7.98	52.0	0.153
55.00	0.34	0.22	0.00	0.00	0.00	7.41	7.75	52.0	0.149
60.00	0.33	0.22	0.00	0.00	0.00	7.18	7.52	52.0	0.145
65.00	0.32	0.22	0.00	0.00	0.00	6.94	7.26	52.0	0.140
70.00	0.30	0.21	0.00	0.00	0.00	6.68	6.99	52.0	0.135
75.00	0.29	0.21	0.00	0.00	0.00	6.40	6.71	52.0	0.129
80.00	0.28	0.21	0.00	0.00	0.00	6.11	6.40	52.0	0.123
84.00	0.27	0.21	0.00	0.00	0.00	5.86	6.14	52.0	0.118
85.00	0.26	0.21	0.00	0.00	0.00	5.80	6.07	52.0	0.117
89.50	0.33	0.29	0.00	0.00	0.00	7.40	7.75	52.0	0.149
90.00	0.33	0.29	0.00	0.00	0.00	7.35	7.70	52.0	0.148
95.00	0.32	0.29	0.00	0.00	0.00	6.86	7.19	52.0	0.138
100.00	0.30	0.29	0.00	0.00	0.00	6.33	6.65	52.0	0.128
105.00	0.29	0.29	0.00	0.00	0.00	5.75	6.07	52.0	0.117
110.00	0.28	0.29	0.00	0.00	0.00	5.13	5.44	52.0	0.105
115.00	0.27	0.29	0.00	0.00	0.00	4.46	4.76	52.0	0.091
120.00	0.25	0.29	0.00	0.00	0.00	3.74	4.02	52.0	0.077
125.00	0.24	0.29	0.00	0.00	0.00	2.94	3.22	52.0	0.062
128.00	0.15	0.19	0.00	0.00	0.00	2.44	2.61	52.0	0.050
130.00	0.15	0.19	0.00	0.00	0.00	2.23	2.40	52.0	0.046
130.00	0.15	0.19	0.00	0.00	0.00	2.23	2.40	52.0	0.076
135.00	0.23	0.30	0.00	0.00	0.00	2.76	3.03	47.8	0.064
139.00	0.19	0.27	0.00	0.00	0.00	1.97	2.21	48.4	0.046
140.00	0.18	0.27	0.00	0.00	0.00	1.79	2.03	48.6	0.042
145.00	0.17	0.26	0.00	0.00	0.00	0.83	1.10	49.4	0.022
149.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	50.1	0.000
150.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	50.3	0.000

Final Analysis Summary

Structure:	CT13073-A-SBA	**Code:**	EIA/TIA-222-F	9/4/2015	
Site Name:	Groton North	**Exposure:**	C		
Height:	150.00 (ft)	**Gh:**	1.69		
Base Elev:	0.000 (ft)	**Struct Class:**	II	Page: 23	

TES Tower Engineering Solutions

Reactions

Load Case	Shear FX (kips)	Shear FZ (kips)	Axial FY (kips)	Moment MX (ft-kips)	Moment MY (ft-kips)	t MZ (ft-kips)
85 mph Wind with 0" Ice	25.9	0.00	41.95	0.00	0.00	2762.46
73.61 mph Wind with 0.5" Ice	20.9	0.00	48.45	0.00	0.00	2280.96
50 mph Wind with 0" Ice	9.0	0.00	41.97	0.00	0.00	956.06

Max Stresses

Load Case	fa Axial (Y) (ksi)	fvx Shear (X) (ksi)	fvz Shear (Z) (ksi)	fvt Torsion (ksi)	fbx Bending (X) (ksi)	fbz Bending (Z) (ksi)	Combined Stress (ksi)	Allowable Stress (ksi)	Elev (ft)	Stress Ratio
85 mph Wind with 0" Ice	0.44	0.55	0.00	0.00	0.00	23.91	24.37	52.0	0.00	0.469
73.61 mph Wind with 0.5" Ice	0.51	0.45	0.00	0.00	0.00	19.74	20.27	52.0	0.00	0.390
50 mph Wind with 0" Ice	0.44	0.19	0.00	0.00	0.00	8.28	8.73	52.0	0.00	0.168

Monopole Mat Foundation Design

			Date: 9/4/2015
Customer Name:	Verizon	EIA/TIA Standard:	EIA-222-F
Site Name:	Groton North	Structure Height (Ft.):	150
Site Number:	CT13073-A-SBA	Engineer Name:	K. Wyant
Engr. Number:	17347	Engineer Login ID:	[illegible]

Foundation Info Obtained from: Drawings/Calculations

Structure Type: Monopole

Analysis or Design? Analysis

Base Reactions (Unfactored)

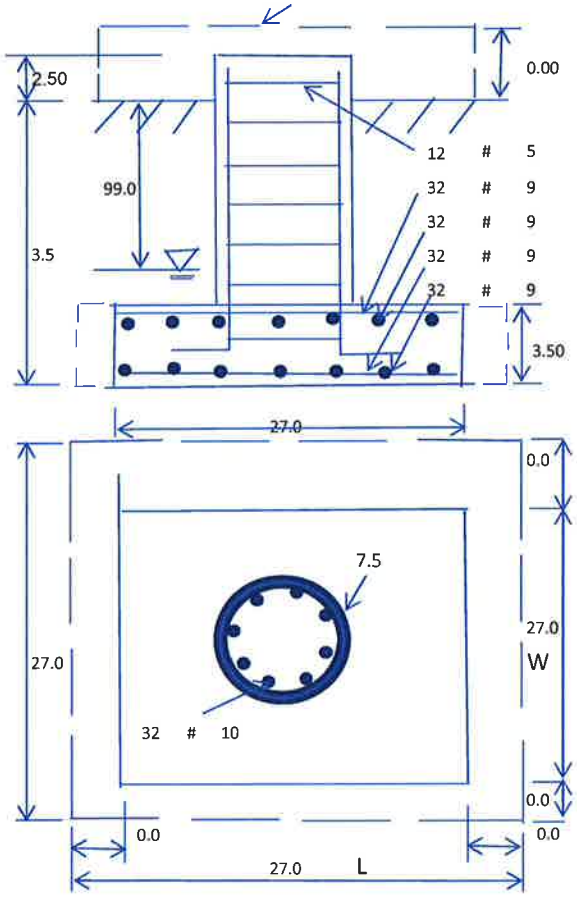
Axial Load (Kips):	48.5	Shear Force (Kips):	25.9
Uplift Force (Kips):	0.0	Moment (Kips-ft):	2762.5

Foundation Geometries:

		Mods required -Yes/No ?:	No
Diameter of Pier (ft.):	7.5	Depth of Base BG (ft.):	3.5
Pier Height A. G. (ft.):	2.50	Thickness of Pad (ft):	3.50
Length of Pad (ft.):	27	Width of Pad (ft.):	27
Final Length of pad (ft)	27.0	Final width of pad (ft):	27.0
Control Value for Cell D18:	0	Control Value for Cell F18:	0

Material Properties and Reabr Info:

Concrete Strength (psi):	4000	Steel Elastic Modulus:	29000	ksi
Vertical bar yield (ksi)	60	Tie steel yield (ksi):	60	
Vertical Rebar Size #:	10	Tie / Stirrup Size #:	5	
Qty. of Vertical Rebars:	32	Tie Spacing (in):	6.0	
Pad Rebar Yield (Ksi):	60	Pad Steel Rebar Size (#):	9	
Concrete Cover (in.):	3	Unit Weight of Concrete:	150.0	pcf
Rebar at the bottom of the concrete pad:				
Qty. of Rebar in Pad (L):	32	Qty. of Rebar in Pad (W):	32	
Rebar at the top of the concrete pad:				
Qty. of Rebar in Pad (L):	32	Qty. of Rebar in Pad (W):	32	



Soil Design Parameters:

Soil Unit Weight (pcf):	100.0	Soil Buoyant Weight:	50.0	Pcf		
Water Table B.G.S. (ft):	99.0	Unit Weight of Water:	62.4	pcf	Angle from Top of Pad:	30
Allowable Net Soil Bearing (psf):	20000	Allowable Skin Friction:	0	Psf	Angle from Bottm of Pad:	25
Consider Friction for O.T.M. (Y/N):	No	Consider Friction for bearing (Y/N):	No		Angle from Bottm of Pad:	25
Consider soil hori. force for O.T.M.:	No	Reduction factor on the maximum soil bearing pressure:	1.00			

Foundation Analysis and Design:

Total Dry Soil Volume (cu. Ft.):	0.07	Total Dry Soil Weight (Kips):	0.01
Total Buoyant Soil Volume (cu. Ft.):	0.00	Total Buoyant Soil Weight (Kips):	0.00
Total Effective Soil Weight (Kips):	0.01	Weight from the Concrete Block at Top (K):	0.00
Total Dry Concrete Volume (cu. Ft.):	2661.95	Total Dry Concrete Weight (Kips):	399.29
Total Buoyant Concrete Volume (cu. Ft.):	0.00	Total Buoyant Concrete Weight (Kips):	0.00
Total Effective Concrete Weight (Kips):	399.29	Total Vertical Load on Base (Kips):	447.80

Check Soil Capacities:

				Load/ Capacity Ratio	
Calculated Maxium Net Soil Pressure under the base (psf):	1720	<	Allowable Soil Bearing (psf): 20000	0.09	OK!
Allowable Foundation Overturning Resistance (SF=1.5, kips-ft.):	4030.2	>	Applied Momont (kips-ft): 2918	0.72	OK!
Factor of Safety Against Overturning (O. R. Moment/Design Moment):	2.07	OK!			

Check the capacities of Reinforceing Concrete:

Strength reduction factor (Flexure and axial tension):	0.90	Strength reduction factor (Shear):	0.75		
Strength reduction factor (Axial compresion):	0.65	Wind Load Factor on Concrete Design:	1.30		
				Load/ Capacity Ratio	
(1) Concrete Pier:					
Vertical Steel Rebar Area (sq. in./each):	1.27	Tie / Stirrup Area (sq. in./each):	0.31		
Calculated Moment Capacity (Mn,Kips-Ft):	7267.6 >	Design Factored Moment (Mu, Kips-Ft	2827.3	0.39	OK!
Calculated Shear Capacity (Kips):	1049.9 >	Design Factored Shear (Kips):	33.7	0.03	OK!
Calculated Tension Capacity (Tn, Kips):	2194.6 >	Design Factored Tension (Tu Kips):	0.0	0.00	OK!
Calculated Compression Capacity (Pn, Kips):	11175.7 >	Design Factored Axial Load (Pu Kips):	63.1	0.01	OK!
Moment & Axial Strength Combination:	0.39 OK!	Check Tie Spacing (Design/Required):		0.5	OK!
Pier Reinforcement Ratio:	0.006	Reinforcement Ratio is satisfied per ACI			
(2).Concrete Pad:					
One-Way Design Shear Capacity (L-Direction, Kips):	1173.8 >	One-Way Factored Shear (L-D. Kips):	226.3	0.19	OK!
One-Way Design Shear Capacity (W-Direction, Kips):	1173.8 >	One-Way Factored Shear (W-D., Kips):	226.3	0.19	OK!
One-Way Design Shear Capacity (Corner-Corner. Kips):	1333.9 >	One-Way Factored Shear (C-C, Kips):	375.3	0.28	OK!
Lower Steel Pad Reinforcement Ratio (L-Direct.):	0.0026 OK!	Lower Steel Pad Reinf. Ratio (W-Direc	0.0026		
Lower Steel Pad Moment Capacity (L-Direction. Kips-ft):	5373.5 >	Moment at Bottom (L-Direct. K-Ft):	571.7	0.11	OK!
Lower Steel Pad Moment Capacity (W-Direction. Kips-ft):	5373.5 >	Moment at Bottom (W-Direct. K-Ft):	571.7	0.11	OK!
Lower Steel Pad Moment Capacity (Corner-Corner,K-ft):	7555.9 >	Moment at Bottom (C-C Dir. K-Ft):	808.6	0.11	OK!
Upper Steel Pad Reinforcement Ratio (L-Direct.):	0.0026 OK!	Upper Steel Reinf. Ratio (W-Direct.):	0.0026		
Upper Steel Pad Moment Capacity (L-Direction. Kips-ft):	5373.5 >	Moment at the top (L-Dir Kips-Ft):	75.3	0.01	OK!
Upper Steel Pad Moment Capacity (W-Direction. Kips-ft):	5373.5 >	Moment at the top (W-Dir Kips-Ft):	75.3	0.01	OK!
Upper Steel Pad Moment Capacity (Corner-Corner. K-ft):	7555.9 >	Moment at the top (C-C Direc. K-Ft):	594.8	0.08	OK!