Robinson+Cole

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Also admitted in Massachusetts

December 20, 2016

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

Re: **Notice of Exempt Modification – Facility Modification**
257 Norman Road, Jewett City (Griswold), Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the top of the existing 160-foot tower at 257 Norman Road in Jewett City (Town of Griswold), Connecticut (the "Property"). The tower is owned by SBA Communications ("SBA"). The Council approved Cellco's use of this tower in 1999. Cellco now intends to modify its facility by replacing six (6) of its antennas with three (3) model SBNHH-1D65B, 700/1900 MHz antennas and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) remote radio heads ("RRHs") and install six (6) new RRHs. Included in Attachment 1 are specifications for Cellco's replacement antennas and RRHs.

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 Kevin Skulczyck, First Selectman for the Town of Griswold. A copy of this letter is also being sent to Ernest R. Norman, the owner of the Property 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).

1. The proposed modifications will not result in an increase in the height of the existing structure. Cellco's new antennas and RRHs will be installed at a centerline height of 158 feet on the 160-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 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 for 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* Tower Structural Analysis Report included in Attachment 3).

A copy of the Town Assessor's Parcel Map and property owner information is included in Attachment 4.

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:
Kevin Skulczyck, Griswold First Selectman
Ernest R. Norman
SBA
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

SBNHH-1D65B

Multiband Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
Gain by Beam Tilt, average, dBi	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

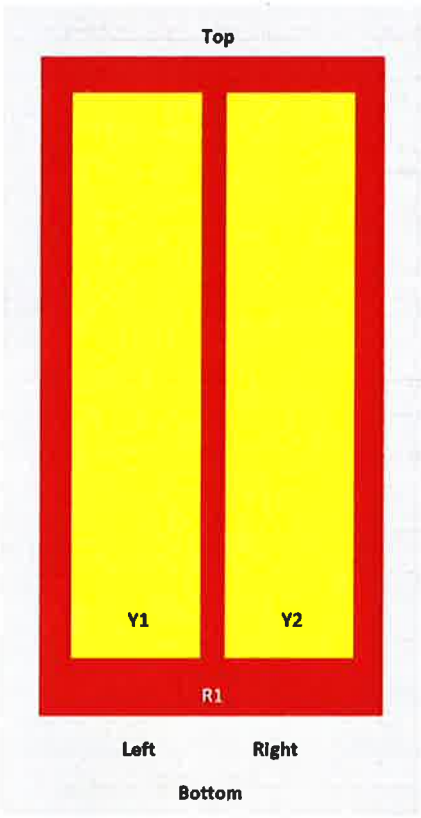
* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Array Layout

Product Specifications

SBNHH-1D65B

SBNHH 65



Array	Freq (MHz)	Conns	RET (AIRET)	AISG RET UID
R1	698-896	1-2	1	AIxxxxxxxxxxxxxxxx 1
Y1	1695-2360	3-4	2	AIxxxxxxxxxxxxxxxx 2
Y2	1695-2360	5-6		

View from the front of the antenna

(Sizes of colored boxes are not true depictions of array sizes)

General Specifications

Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female
Color	Light gray

Product Specifications

SBNHH-1D65B

Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	618.0 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Loading, lateral	197.0 N @ 150 km/h 44.3 lbf @ 150 km/h
Wind Loading, rear	728.0 N @ 150 km/h 163.7 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Depth	180.0 mm | 7.1 in
Net Weight, without mounting kit	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (1) | Low band (1)
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	1 female | 1 male

Packed Dimensions

Length	2025.0 mm | 79.7 in
Width	390.0 mm | 15.4 in
Depth	296.0 mm | 11.7 in
Shipping Weight	31.0 kg | 68.3 lb

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

Product Specifications

SBNHH-1D65B

BSAMNT-1 — Wide Profile Antenna 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

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.

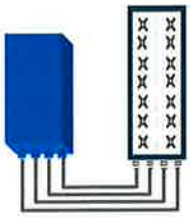
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

ALCATEL-LUCENT B25 RRH4X30

Alcatel-Lucent Band 25 Remote Radio Head 4x30W is the new 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 B25 RRH4x30 allows operators to have a compact radio solution to deploy LTE in the PCS band (1.9 GHz, 3GPP band 25), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B25 RRH4x30 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, LTE carriers from 3 MHz up to 20 MHz and up to 65 MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30 is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

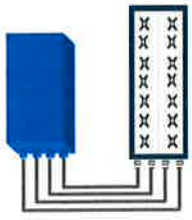
Its compactness and slim design makes the Alcatel-Lucent B25 RRH4x30 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 1.9 GHz band (PCS, 3GPP band 2 & 25)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- Ready for 3, 5, 10, 15 or 20MHz LTE carrier operation with 4Rx Diversity
- Ready to support up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- Convection-cooled (fan-less)
- Supports AISG 2.0 devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in PCS band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Full flexibility for multiple carriers operation over entire PCS spectrum
- Improves downlink spectral efficiency and cell edge throughput through MIMO4
- Increases LTE coverage thanks to 4-way Rx 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	3GPP bands 2 & 25 (PCS-G) DL: 1930 - 1995 MHz UL: 1850 - 1915 MHz
Instantaneous bandwidth - #carriers	65MHz – Up to 4 LTE carriers (in 40MHz occupied bandwidth)
LTE carrier bandwidth	3, 5, 10, 15 or 20 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure (3GPP band 2) RX Diversity scheme	2.0 dB typ. (<2.5 dB max) 2 or 4 way Rx diversity
Sizes (HxWxD)(w/ solar shield) in mm (in.) Volume (w/ solar shield) in L Weight (w/ solar shield) in kg (lb)	538 x 304 x 182 (21.2" x 12.0" x 7.2") 30 24 (53)
DC voltage range DC power consumption	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 580W typical @100% RF load
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 (> 14dB)
CPRI ports	2 CPRI ports (HW ready for Rate7 / 9.8 Gbps)
AISG interfaces	1 AISG2.0 output (RS485), +24V/2A DC power Integrated Smart Bias Tees (x2)
Misc. Interfaces	1 external alarms connector (4 alarms) 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

ALCATEL-LUCENT B66A RRH4X45

The Alcatel-Lucent B66a Remote Radio Head 4x45 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. Its operational range covers beyond that of B4 (AWS) and B10 (AWS+).

Supporting 2Tx/4Tx MIMO and 2-way/4-way Rx diversity, the Alcatel-Lucent B66a RRH4x45 allows operators to have a compact radio solution to deploy LTE in the 2100 band (3GPP band 4, 10, and 66), providing them with the means to achieve high capacity, high quality, high reliability, large instantaneous bandwidth, and high coverage with minimum site requirements.

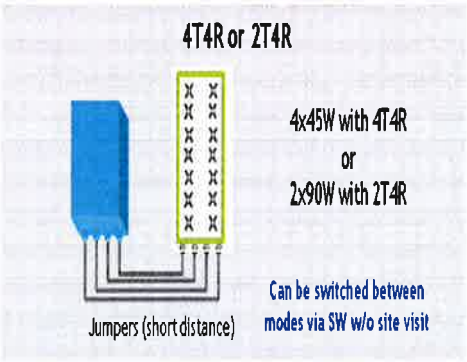
The Alcatel-Lucent B66a RRH4x45 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x90W or 4x45W RF output power. It also supports 4-way Rx diversity at the 70 MHz instantaneous bandwidth.

The Alcatel-Lucent B66a RRH4x45 is a compact (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 B66a RRH4x45 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 2110 - 2180 MHz band/DL, 1710-1780MHz/UL (3GPP band 4, 10, and 66a)
- LTE 2Tx or 4Tx MIMO (SW selectable)
- Configuration: 2T2R/2T4R/4T4R
- Output power: Up to 2x90W or 4x45W (SW configurable)
- 70MHz 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 AWS 1-3 band
- Selection of MIMO configuration (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through 4Tx MIMO
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall

TECHNICAL SPECIFICATIONS

Features & Performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R selectable by SW)
Frequency band	AWS 1-3, B4/B66a DL: 2110-2180 MHz / UL: 1710-1780 MHz
Instantaneous bandwidth - #carriers	70 MHz – 4 LTE MIMO carriers (in 70 MHz occupied bandwidth)
LTE carrier bandwidth	5, 10, 15, 20 MHz
RF output power	2x90W or 4x45W (selectable by SW)
Noise figure – RX Diversity scheme Receiver Sensivity (FRC A1-3)	2 dB typical (<2.5 dB max) – 2 or 4 way Rx diversity -104.5 dBm maximum
Sizes (HxWxD) in mm (in.) Volume in Liters Weight in kg (lb) (w/o mounting HW)	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield) 35.5 (with solar shield) 29.7 (without solar shield) 25.8kg (56.8lb) (with solar shield)
DC voltage range DC power consumption	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 750W typical @100% RF load (in 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions Wind load (@150km/h or 93mph)	-40°C (-40°F) /+55°C (+131°F) UL50E Type 4 Enclosure 250N (56lb) Frontal/150N (34lb) Lateral
Antenna ports	4 ports 4.3-10 female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate 7, 9.8 Gbps) SFP: SMDF (HW supports also SMSF and MMDF)
AISG interfaces	1 AISG 2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-487 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 / FCC Part 15 / GR-3178-CORE

ATTACHMENT 2

	General	Power	Density					
Site Name: Jewett City (Griswold)								
Tower Height: 160'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Fire Dept	4	300	160	33	0.0182	0.2000	0.91%	
*Fire Dept	2	200	160	458	0.0061	0.3053	0.20%	
*Fire Dept	1	200	160	152	0.0030	0.2000	0.15%	
*Fire Dept	1	100	60	76	0.0123	0.2000	0.62%	
*MetroPCS	3	444	128	2140	0.0322	1.0000	0.32%	
*VoiceStream	2	441	148	1930	0.0157	1.0000	0.16%	
*AT&T UMTS	2	1239	135	700	0.0536	0.4667	1.15%	
*AT&T UMTS	2	1876	135	1900	0.0811	1.0000	0.81%	
*AT&T GSM	2	414	135	850	0.0179	0.5667	0.32%	
*AT&T GSM	2	656	135	1900	0.0284	1.0000	0.28%	
*AT&T LTE	2	414	135	850	0.0179	0.5667	0.32%	
Verizon	**1**	**3046**	**158**	**0.0439**	**1970**	**1.0000**	**4.39%**	
Verizon	**9**	**225**	**158**	**0.0292**	**869**	**0.5793**	**5.03%**	
Verizon	**1**	**6907**	**158**	**0.0995**	**2145**	**1.0000**	**9.95%**	
Verizon	**1**	**1618**	**158**	**0.0233**	**698**	**0.4973**	**4.69%**	
								29.3%
* Source: Siting Council								

ATTACHMENT 3

ALLPRO
CONSULTING GROUP, INC.
9221 Lyndon B. Johnson Freeway, #204, Dallas, TX 75243 ★ PHONE 972-231-8893 ★ FAX 1-866-364-8375
www.allprocgi.com ★ e-mail: info@allprocgi.com

Tower Structural Analysis Report for SBA Network Services, Inc.

Existing 160' Self-Support Tower
SBA Site Name: Griswold 2, CT
SBA Site ID: CT10012-A-03
Carrier Name: Verizon
Carrier Site Name: 117858
App # 42607, v3

Site Location: 181 A Norman Road
Griswold, CT 06351

Latitude: 41.601097
Longitude: -71.954325

ACGI Job # 16-3553
(Refer to previous ACGI Job # 16-0261, dated 03/18/2016;
ACGI # 16-2850, dated 08/10/2016)

ANALYSIS RESULTS		
Tower Components	**96.0%**	**Pass**
Tower Foundation	**99.3%**	**Pass**
Net change in Tower stress ratio	+10.6 %	**Change from previous SA by Allpro Consulting Group, Inc., ACGI # 16-2850, dated 08/10/2016**

Prepared By:
Dejian Xu, EIT
Staff Engineer

10/12/2016
Approved By
Joji M. George, PE.
CT PE# 24444

TABLE OF CONTENTS

1. ANALYSIS SUMMARY

The existing 160' Self-support Tower located in Griswold, Connecticut was analyzed by Allpro Consulting Group, Inc. (ACGI) for the existing and the proposed Verizon antennas, radios and coaxes as authorized by SBA Communication Corp. Based on the results of the analysis, the existing tower with below mentioned proposed and existing loading is found to be **in code compliance** with *TIA-222-G, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and the* 2016 Connecticut State Building Code (IBC 2012).

2. SCOPE & SOURCE OF INFORMATION

The purpose of this structural analysis is to determine whether the existing structure is capable of supporting additional proposed loads.

SOURCE OF INFORMATION		
Tower Data:	Rohn Industries, Inc.	Original Tower Design by Rohn Industries, Inc., Rohn File No. 37696SP001, date April 6, 1999
	FDH Velocitel Inc.	Previous structural analysis by FDH Velocitel Inc., Project # 15BVKZ1400, dated July 10, 2015
	Allpro Consulting Group, Inc.	Previous structural analysis by Allpro Consulting Group, Inc., ACGI # 16-0261, dated 03/18/2016; ACGI # 16-2850, dated 08/10/2016.
Foundation Data:	FDH Velocitel Inc.	Dispersive Wave Propagation Testing and Rebar Investigation by FDH Velocitel, Inc., Project # 16BDGF1500, dated 03/03/2016
Geotechnical Report:	FDH Velocitel Inc.	Geotechnical Evaluation of Subsurface Conditions by FDH Velocitel Inc., Project # 16BDCN1600, dated 03/04/2016
Loading Data:	Allpro Consulting Group, Inc.	Existing loading as per previous structural analysis by Allpro Consulting Group, Inc., ACGI Job # 16-2850, dated 08/10/2016.
	SBA Communication Corp.	Proposed final loading for Verizon as per Application ID # 42607, v3 downloaded from SBA portal
Authorization:	SBA Communication Corp.	

3. ANALYSIS METHODS & DATA

The analysis was performed in accordance with Telecommunication Industry Association specification TIA-222-G-Addendum 2. The tower was modeled using TNX Tower, a 3-D finite element program. TNX Tower is a general-purpose modeling, analysis, and design program created specifically for communication towers using the EIA-222-C, EIA-222-D, TIA/EIA-222-F or TIA-222-G standards. The 3-D model included the tower, with existing appurtenances and all proposed loads.

SITE DATA	
SBA Site Name:	Griswold 2, CT
SBA Site Number:	CT10012-A-03
Carrier Site Name:	Verizon/117858
City, State:	Griswold, CT
County:	New London
Code Wind Load Requirement:	TIA-222-G (132 mph ultimate wind speed equal to 102 mph nominal wind speed) & 2016 Connecticut State Building Code (IBC 2012)
Wind Load Used:	TIA-222-G Code: • Nominal wind speed of 102 mph (3 second gust wind speed) • Structure Class II. • Exposure Category C. • Topographic Category 1. • Crest Height 0.00 ft. • A wind speed of 50 mph is used in combination with ice. • Nominal ice thickness of 0.75 in.
Seismic Check:	Spectral Response Acceleration at Short Period (Ss) is 0.169 g which less than 1.000 g. Therefore, no seismic check is required as per TIA-222-G section 2.7.3

TOWER DATA	
Tower Type:	3 Sided Self-support Tower
Height:	160'
Cross Section:	Triangular
Steel Strength:	Legs – 50 ksi, Braces – 36 ksi
Type of Foundation:	Individual concrete pad with square pedestal

TOWER HISTORY	
Tower Manufacturer / Model:	ROHN/ SSV TOWER
Date of Original Design:	04/06/1999
Previous Modifications:	N/A
Original Design Code Reqts:	TIA/EIA 222-F 1996, 90mph + 1/2" ice

4. CONCLUSIONS

RESULT SUMMARY		
MEMBER	*% Capacity*	*Pass/Fail*
Leg	**85.2 %**	**Pass**
Diagonal	**96.0 %**	**Pass**
Top Girt	**3.1 %**	**Pass**
Bolt Checks	**83.3 %**	**Pass**
Foundation (see attached MathCAD for details)	**Overturning: 25.1 %**	**Pass**
	Uplift: 99.3 %	**Pass**
	Bearing: 56.4 %	**Pass**
	Shear: 17.3 %	**Pass**
Tower Overall Rating = 99.3 % (Pass)		

As per the results of the analysis, the existing tower is in code compliance for the new and existing antenna loads.

Maximum tower member stress is **less than allowable,** making it in code compliance under the TIA-222-G code and 2016 Connecticut State Building Code (IBC 2012) requirements.

5. ASSUMPTIONS

This analysis was completed based on the following assumptions:

- Tower has been properly maintained
- Tower erection was in accordance to manufacturer drawings
- Leg flanges have been properly designed by manufacturer to not be a limiting reaction
- Welds have been properly designed and installed by manufacturer to not be a limiting reaction
- Foundation was constructed in accordance to manufacturer drawings
- Foundation does not have structural damage
- Bolts have been properly tightened according to manufacturer specifications
- Appurtenance, mount and transmission line sizes and weights are best estimates using the tnxTower database and manufacturer information

6. DISCLAIMER

Installation procedures and related loading are not within the scope of this analysis. A contractor experienced in similar work should perform all installation work. The engineering services provided by Allpro Consulting Group, Inc. (ACGI) are limited to the computer analysis and calculations of the structure with the proposed and existing loads. This analysis is considered void if the loading mentioned in this report is changed or is different as installed. It is assumed that the existing structure is properly maintained and is in good condition free of any defects. Scope of this analysis does not include existing connections, except as noted in this report.

ACGI does not make any warranties, expressed or implied in connection with this engineering analysis report and disclaims any liability arising from deficiencies or any existing conditions of the original structure. ACGI will not be responsible for consequential or incidental damages sustained by any parties as a result of any data or conclusions included in this Report. The maximum liability of ACGI pursuant to this report shall be limited to the consulting fee received for the preparation of the report.

7. APPURTENANCE LISTING

EXISTING LOAD DESCRIPTION					
ELEV (ft.)	***Qty.***	***Antenna Description***	***Mount Type & Qty.***	***TX. LINE (in)***	***TENANT***
169±	2	Decibel 20' x 2"Dipoles	Direct Mount (@ 160')	(2) 7/8 (1) 1/2	Quinebaug Comm 911
163±	1	Andrew DB201-C Omni			
158±	3	Commscope LNX-6514DS-A1M	(3) 15' T-Frames (1)Sabre Universal Pipe Mount	(12) 1-5/8 (2) 1-5/8 Hybrid Fiber	Verizon
	3	Commscope HBXX-6517DS-A2M			
	3	Commscope HBXX-6516DS-A2M			
	3	Antel BXA-70080/4CF-EDIN-0			
	3	Alcatel Lucent RRH 2x60-AWS			
	3	Alcatel Lucent RRH 2x60-700U			
	3	Alcatel Lucent RRH 2x60-PCS			
	2	RFS DB-T1-6Z-8AB-0Z			
149±	6	Powerwave 63SSFL	(3) 10.5' T-Frames (@148')	(6) 1-5/8	T-Mobile
148±	6	Dapa 59212			
135±	9	Powerwave 7770 Antennas	(3) 12' T-Frames (@137')	(12) 1-1/4 (Triple Stacked) (2) 3/4 DC Cables (1) 1/2 Fiber	AT&T
	1	CCI HPA-65R-BUU-H6 Antenna			
	2	CCI HPA-65R-BUU-H8 Antennas			
	6	Powerwave LGP21401 TMAs			
	3	Ericsson RRUS 11-700			
	3	Ericsson RRUS 12			
	3	Ericsson RRU-A2 Module			
	6	Powerwave LGP21903 Diplexers			
	1	Raycap DC6-48-60-18-8F			
128±	6	Kathrein 742 351	(3) 12' T-Frames	(12) 1-5/8 (1) 3/8	Metro PCS
82±	1	Yagi	Direct Mount	(1) 1/2	Quinebaug Comm 911
76±	1	GPS	(1) 3' Standoff	(1) 1/2	Verizon
68±	1	6' Trombone	Direct Mount	(1) 1/2	Quinebaug Comm 911

VERIZON FINAL LOAD DESCRIPTION					
ELEV (ft.)	***Qty.***	***Antenna Description***	***Mount Type & Qty.***	***TX. LINE (in)***	***TENANT***
158±	**6**	**Commscope SBNHH-1D65B Antennas**	(3) 15' T-Frames (1)Sabre Universal Pipe Mount	(12) 1-5/8 **(Double Stacked)** (2) 1-5/8 Hybrid Fiber	Verizon
	3	Antel BXA-70080-4CF-EDIN-0 Antennas			
	3	**Alcatel Lucent RH4x45-AWS RRH**			
	3	Alcatel Lucent RH 2x60-700U RRH			
	3	Alcatel-Lucent RH 2x60-PCS RRH			
	2	RFS DB-T1-6Z-8AB-0Z ODU			

Notes:

1. ACGI should be notified of any discrepancies found in the data listed in this report.
2. Notify Allpro Consulting Group, Inc. of any potential physical & other interference with existing antennas for a redesign.

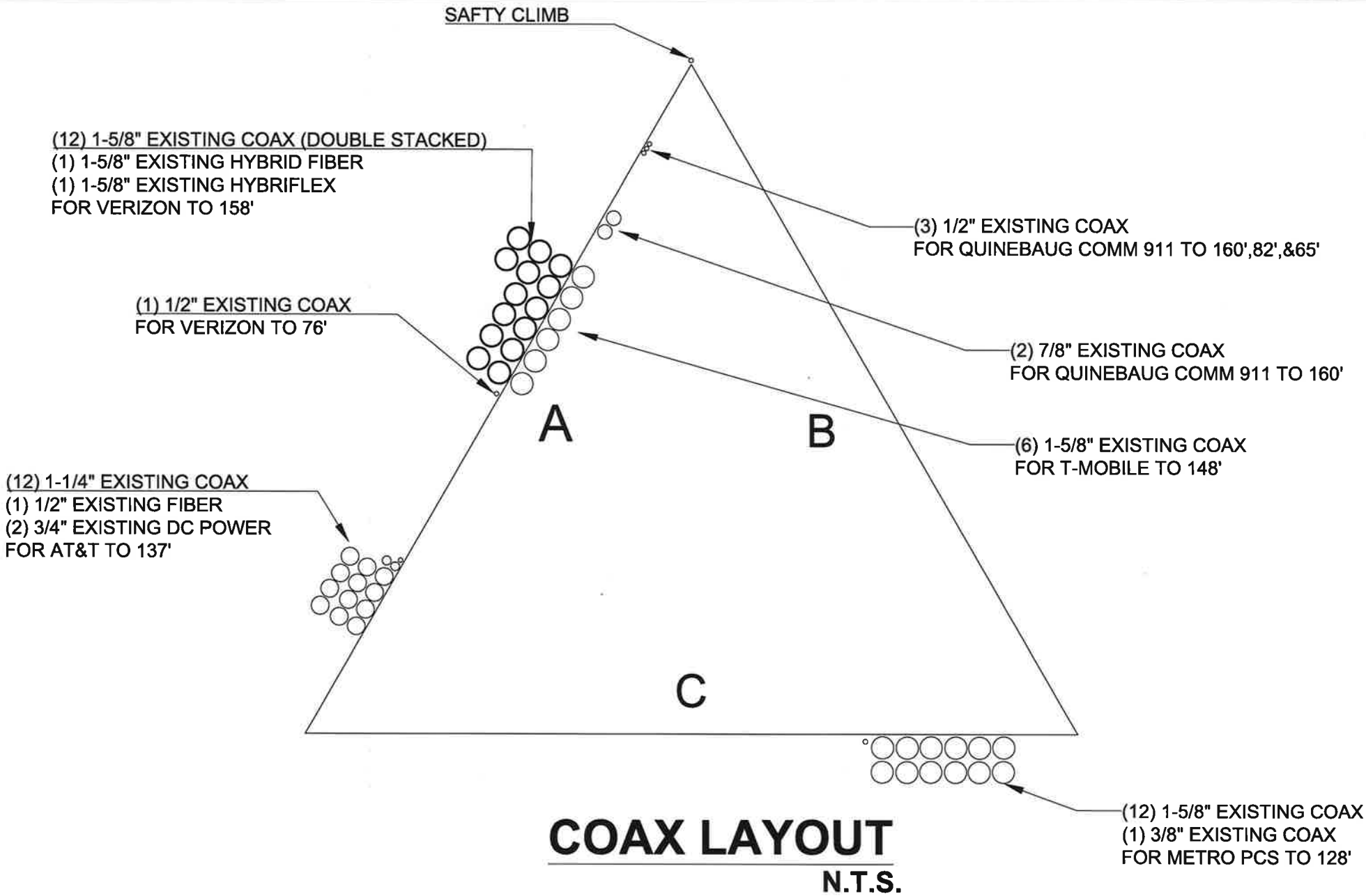
8. SUMMARY OF WORKING PERCENTAGE OF STRUCTURAL COMPONENTS

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	160 - 140	Leg	ROHN 2.5 STD	3	-22.54	63.56	35.5	Pass
T2	140 - 120	Leg	ROHN 3 STD	39	-59.49	82.51	72.1	Pass
T3	120 - 100	Leg	ROHN 3.5 EH	69	-95.98	125.72	76.3	Pass
T4	100 - 80	Leg	ROHN 4 EH	90	-130.51	159.90	81.6	Pass
T5	80 - 60	Leg	ROHN 5 EH	111	-164.11	239.38	68.6	Pass
T6	60 - 40	Leg	ROHN 6 EHS	132	-194.06	244.05	79.5	Pass
T7	40 - 20	Leg	ROHN 6 EH	147	-227.05	303.76	74.7	Pass
T8	20 - 0	Leg	ROHN 6 EH	162	-258.76	303.73	85.2	Pass
T1	160 - 140	Diagonal	L1 3/4x1 3/4x3/16	11	-3.55	8.79	40.4 60.3 (b)	Pass
T2	140 - 120	Diagonal	L2x2x3/16	48	-5.64	7.81	72.2 82.5 (b)	Pass
T3	120 - 100	Diagonal	L2 1/2x2 1/2x3/16	75	-6.22	9.55	65.1 79.0 (b)	Pass
T4	100 - 80	Diagonal	L2 1/2x2 1/2x3/16	96	-6.58	7.28	90.3	Pass
T5	80 - 60	Diagonal	L3x3x1/4	117	-7.24	13.05	55.4 61.8 (b)	Pass
T6	60 - 40	Diagonal	L3 1/2x3 1/2x1/4	138	-8.62	14.29	60.3 60.5 (b)	Pass
T7	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	153	-9.61	12.04	79.8	Pass
T8	20 - 0	Diagonal	L3 1/2x3 1/2x1/4	168	-9.73	10.13	96.0	Pass
T1	160 - 140	Top Girt	L1 3/4x1 3/4x3/16	4	-0.09	3.09	2.9	Pass
T2	140 - 120	Top Girt	L1 3/4x1 3/4x3/16	41	-0.10	3.09	3.1	Pass
							Summary	
						Leg (T8)	85.2	Pass
						Diagonal (T8)	96.0	Pass
						Top Girt (T2)	3.1	Pass
						Bolt Checks	83.3	Pass
						RATING =	**96.0**	**Pass**

APPENDIX

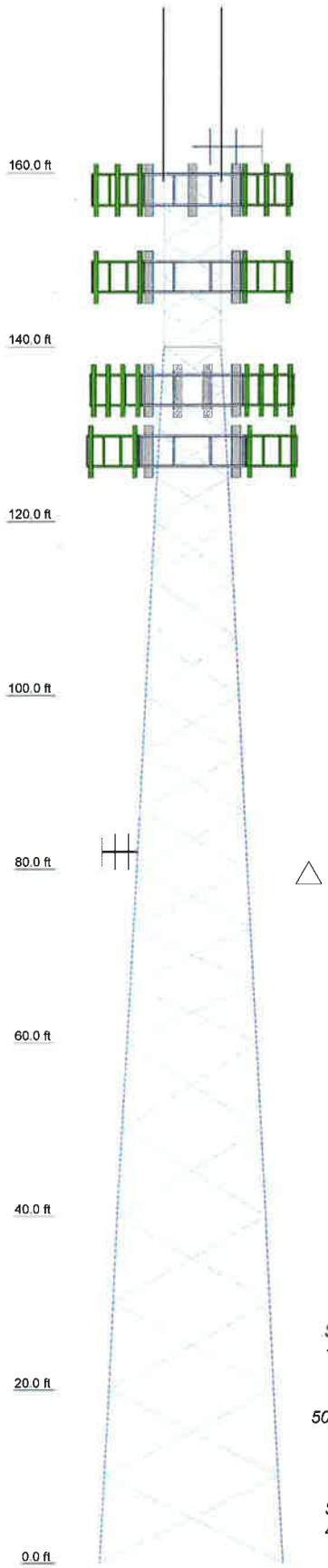
COAX LAYOUT



COAX LAYOUT

N.T.S.

TOWER ELEVATION DRAWING



Section	T1	T2	T3	T4	T5	T6	T7	T8
Legs	ROHN 2.5 STD	ROHN 3 STD	ROHN 3.5 EH	ROHN 4 EH	ROHN 5 EH	ROHN 6 EHS	ROHN 6 EH	ROHN 6 EH
Leg Grade	A572-50							
Diagonals	L1 3/4x1 3/4x3/16	L2x2x3/16	L2 1/2x2 1/2x3/16		L3x3x1/4		L3 1/2x3 1/2x1/4	
Diagonal Grade	A36						A572-50	
Top Girts	L1 3/4x1 3/4x3/16				N.A.			
Face Width (ft)	6.58		8.59	10.65	12.74	14.83	16.92	18.88
# Panels @ (ft)	5 @ 4	4 @ 5		9 @ 6.66667			6 @ 10	
Weight (K)	0.9	1.1	1.5	1.7	2.7	2.6	3.3	3.4
								17.4

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in New London County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 102 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 96%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 266 K
SHEAR: 30 K

UPLIFT: -233 K
SHEAR: 27 K

AXIAL 107 K
SHEAR 13 K *MOMENT 1231 kip-ft*

TORQUE 2 kip-ft
50 mph WIND - 0.7500 in ICE

AXIAL 39 K
SHEAR 49 K *MOMENT 4603 kip-ft*

TORQUE 5 kip-ft
REACTIONS - 102 mph WIND

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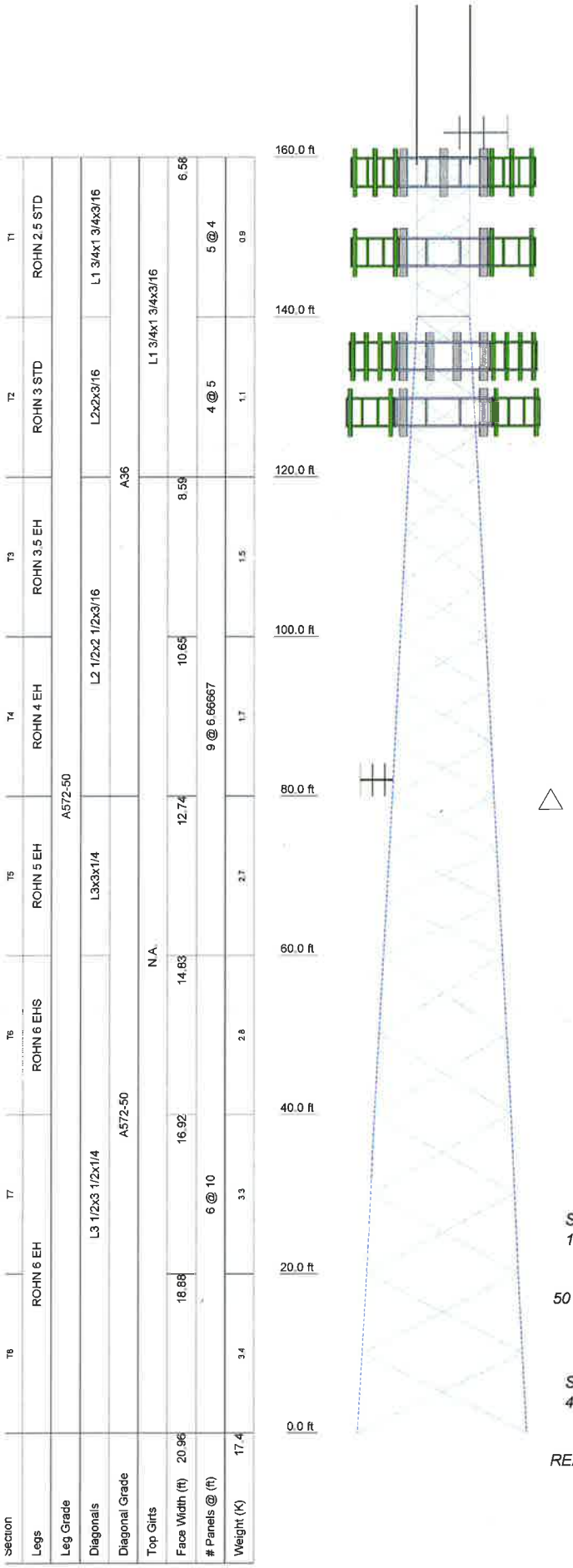
Dallas, TX 75243
Phone: 972-231-8893
FAX: 866-364-8375

Job: CT10012-A-03			
Project: 16-3553			
Client: SBA	Drawn by: Dejian Xu, EIT	App'd:	
Code: TIA-222-G	Date: 10/12/16	Scale: N	
Path:		Dwg No.	



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	160	10.5' T-Frame (T-Mobile)	148
Beacon	160	12' T-Frame (ATI)	137
Decibel 20' x 2" Dipoles (Quinebaug Comm 911)	160	12' T-Frame (ATI)	137
		12' T-Frame (ATI)	137
Decibel 20' x 2" Dipoles (Quinebaug Comm 911)	160	HPA-65R-BUU-H6 (ATI)	135
		HPA-65R-BUU-H8-K (ATI)	135
DB201 C (Quinebaug Comm 911)	160	HPA-65R-BUU-H8-K (ATI)	135
BXA-70080-4CF-EDIN-0 (Verizon)	158	(2) LGP 21401 TMA (ATI)	135
BXA-70080-4CF-EDIN-0 (Verizon)	158	(2) LGP 21401 TMA (ATI)	135
BXA-70080-4CF-EDIN-0 (Verizon)	158	(2) LGP 21401 TMA (ATI)	135
(2) SBNHH-1D65B (Verizon)	158	RRUS 11 (ATI)	135
(2) SBNHH-1D65B (Verizon)	158	RRUS 11 (ATI)	135
(2) SBNHH-1D65B (Verizon)	158	RRUS 11 (ATI)	135
B66A RRH4x45-4R (Verizon)	158	RRUS 12 AWS (ATI)	135
B66A RRH4x45-4R (Verizon)	158	RRUS 12 AWS (ATI)	135
B66A RRH4x45-4R (Verizon)	158	RRUS 12 AWS (ATI)	135
RRH2x60-700U (Verizon)	158	RRUS A2 (ATI)	135
RRH2x60-700U (Verizon)	158	RRUS A2 (ATI)	135
RRH2x60-700U (Verizon)	158	RRUS A2 (ATI)	135
RRH2x60-PCS (Verizon)	158	(2) LGP21903 Diplexer (ATI)	135
RRH2x60-PCS (Verizon)	158	(2) LGP21903 Diplexer (ATI)	135
RRH2x60-PCS (Verizon)	158	(2) LGP21903 Diplexer (ATI)	135
DB-T1-6Z-8AB-0Z (Verizon)	158	DC6-48-60-18-8F (ATT)	135
DB-T1-6Z-8AB-0Z (Verizon)	158	(3) 7770 (ATI)	135
15' T-Frames (Verizon)	158	(3) 7770 (ATT)	135
15' T-Frames (Verizon)	158	(3) 7770 (ATI)	135
15' T-Frames (Verizon)	158	(2) 742 351 (Metro PCS)	128
Sabre Universal Pipe Mount (Verizon)	158	(2) 742 351 (Metro PCS)	128
(2) 63SSFL (T-Mobile)	149	(2) 742 351 (Metro PCS)	128
(2) 63SSFL (T-Mobile)	149	12' T-Frame (Metro PCS)	128
(2) 63SSFL (T-Mobile)	149	12' T-Frame (Metro PCS)	128
(2) 59212 (T-Mobile)	148	12' T-Frame (Metro PCS)	128
(2) 59212 (T-Mobile)	148	Yagi (Quinebaug Comm 911)	82
(2) 59212 (T-Mobile)	148	GPS (Verizon)	76
10.5' T-Frame (T-Mobile)	148	6' Trombone (Quinebaug Comm 911)	68
10.5' T-Frame (T-Mobile)	148		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in New London County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 102 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 96%

UPLIFT: -233 K
SHEAR: 27 K

AXIAL
107 K

SHEAR
13 K

MOMENT
1231 kip-ft

TORQUE 2 kip-ft
50 mph WIND - 0.7500 in ICE

AXIAL
39 K

SHEAR
49 K

MOMENT
4603 kip-ft

TORQUE 5 kip-ft
REACTIONS - 102 mph WIND

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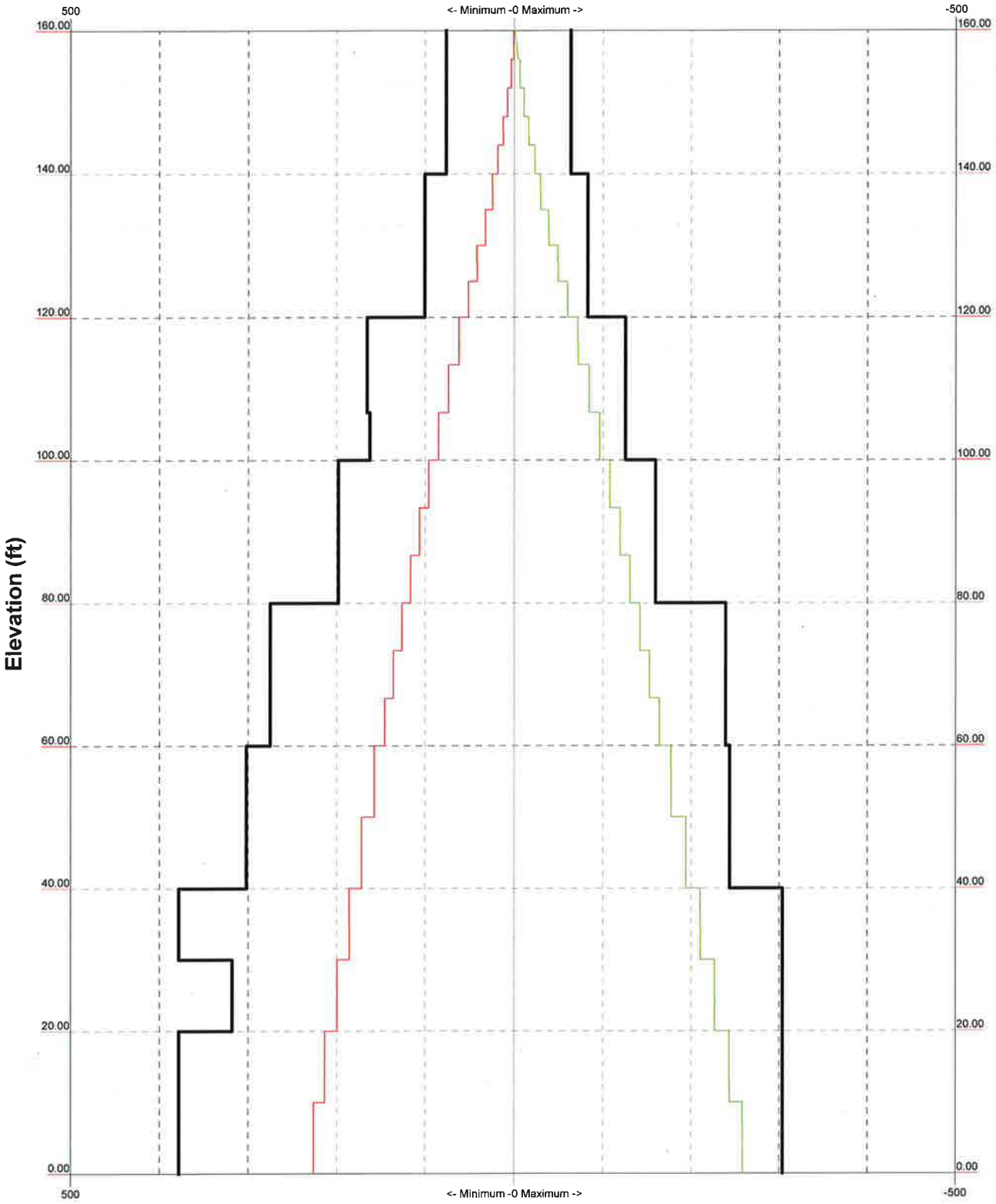
Job: *CT10012-A-03*			
Project: *16-3553*			
Client: SBA	Drawn by: Dejian Xu, EIT	App'd:	
Code: TIA-222-G	Date: 10/12/16	Scale: N	
Path:		Dwg No.	

MISCELLANEOUS PLOTS

TIA-222-G - 102 mph/50 mph 0.7500 in Ice Exposure C

Leg Capacity ——— **Leg Compression (K)**



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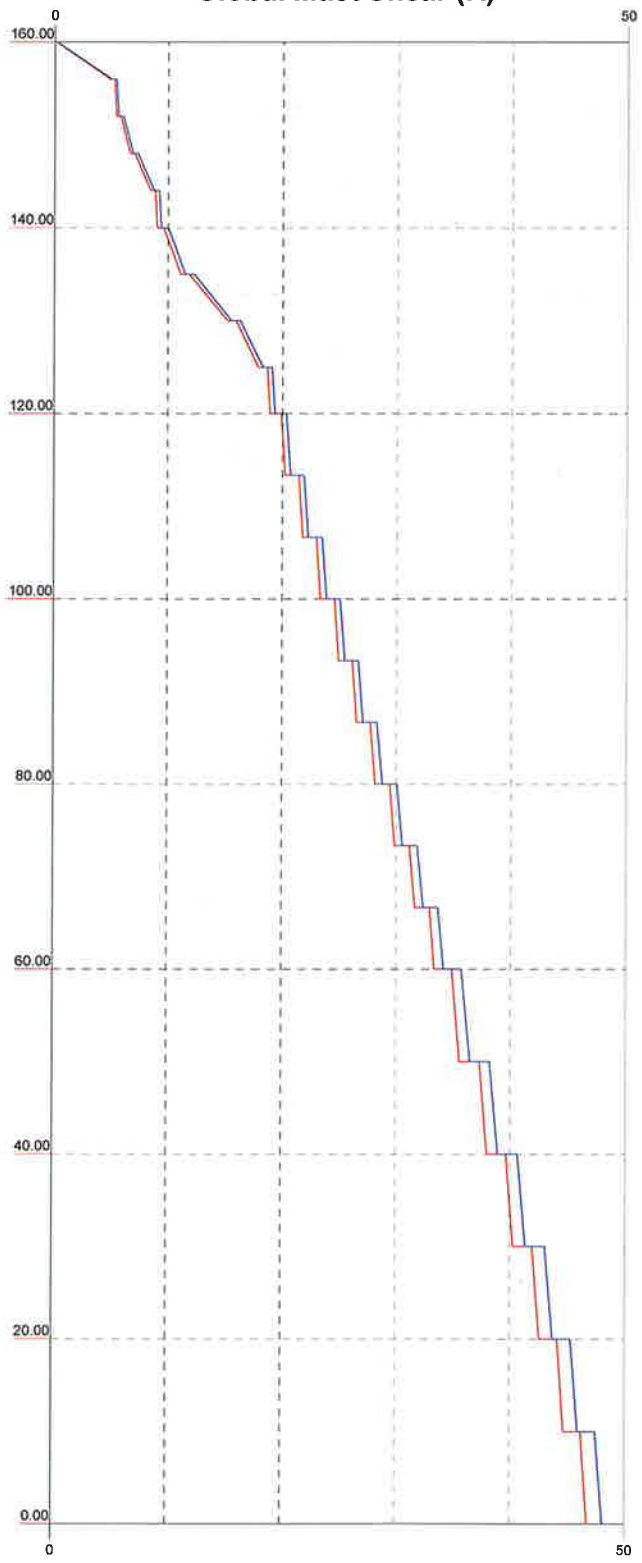
Code: TIA-222-G	Date: 10/12/16	Scale: N	
Path:		Dwg No.	

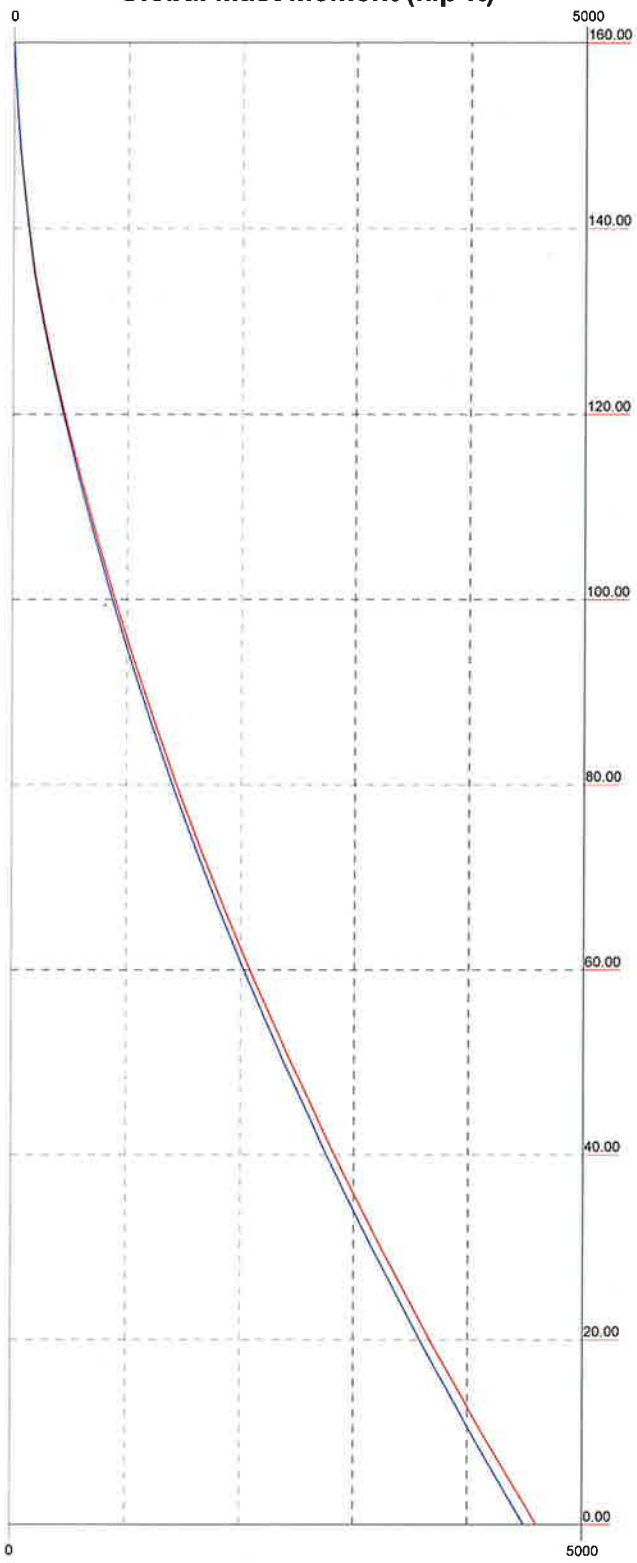
Vx Vz

Mx Mz

Global Mast Shear (K)



Global Mast Moment (kip-ft)



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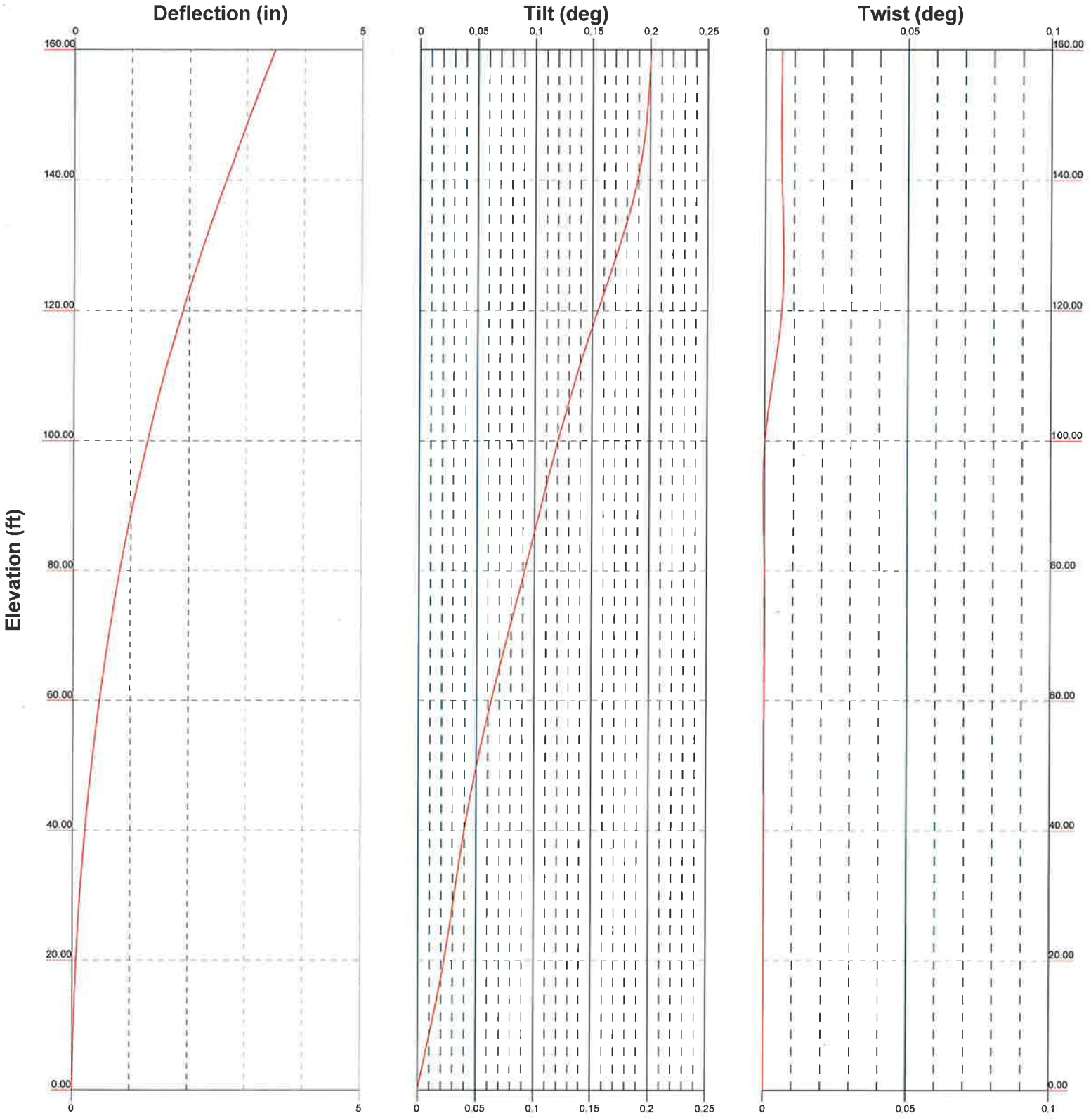
Project: ***16-3553***			
Client: SBA	Drawn by: Dejian Xu, EIT	App'd:	
Code: TIA-222-G	Date: 10/12/16	Scale: N	
Path:		Dwg No.	

TIA-222-G - Service - 60 mph

Maximum Values



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Job: *CT10012-A-03*			
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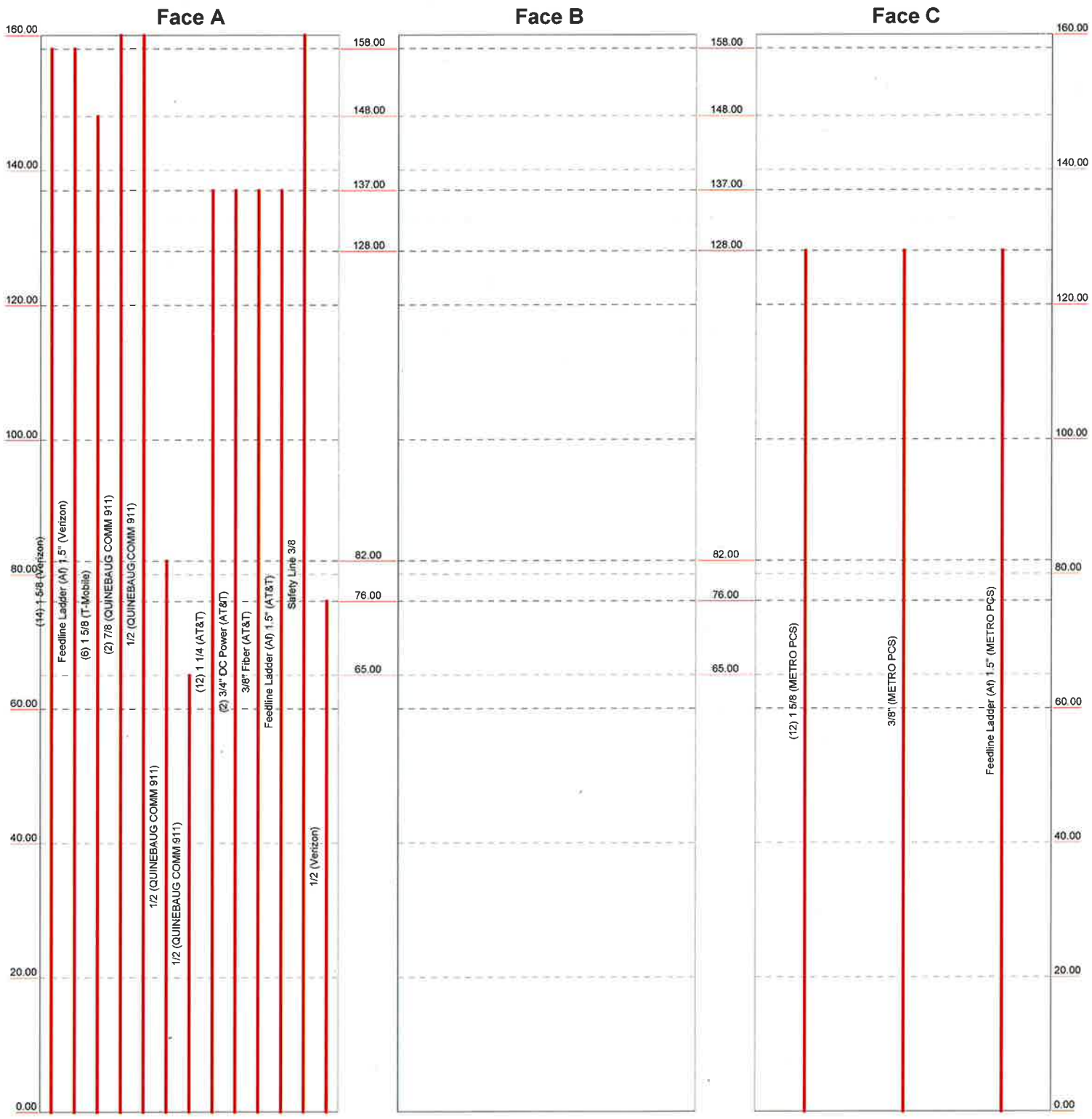
Client: SBA	Drawn by: Dejian Xu, EIT	App'd:	
Code: TIA-222-G	Date: 10/12/16	Scale: N	
Path:		Dwg No.	

0' - 160'

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



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Job: *CT10012-A-03*			
Project: *16-3553*			
Client: SBA	Drawn by: Dejian Xu, EIT	App'd:	
Code: TIA-222-G	Date: 10/12/16	Scale: N	
Path:		Dwg No.	

CALCULATION PRINTOUT

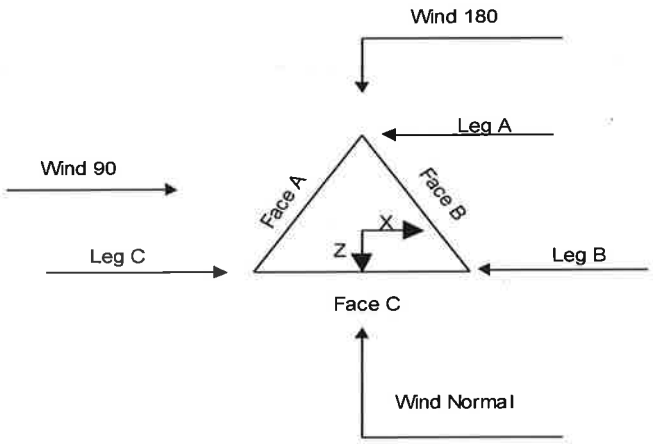
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 160.00 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 6.58 ft at the top and 20.96 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Tower is located in New London County, Connecticut.
ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
Basic wind speed of 102 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	160.00-140.00			6.58	1	20.00
T2	140.00-120.00			6.58	1	20.00
T3	120.00-100.00			8.59	1	20.00
T4	100.00-80.00			10.65	1	20.00
T5	80.00-60.00			12.74	1	20.00
T6	60.00-40.00			14.83	1	20.00
T7	40.00-20.00			16.92	1	20.00
T8	20.00-0.00			18.88	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	160.00-140.00	4.00	X Brace	No	No	0.0000	0.0000
T2	140.00-120.00	5.00	X Brace	No	No	0.0000	0.0000
T3	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T4	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T5	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T6	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T7	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000

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
T8	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 160.00-140.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T2 140.00-120.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T3 120.00-100.00	Pipe	ROHN 3.5 EH	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 100.00-80.00	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 80.00-60.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A572-50 (50 ksi)
T6 60.00-40.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)
T7 40.00-20.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)
T8 20.00-0.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A572-50 (50 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 160.00-140.00	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T2 140.00-120.00	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000
T2 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000
T3 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T4 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000
T5 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000
T6 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000
T7 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000
T8 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Single Diags X	K Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
T1 160.00-140.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T2 140.00-120.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T3 120.00-100.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T4 100.00-80.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T5 80.00-60.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T6 60.00-40.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T7 40.00-20.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
T8 20.00-0.00	Yes	Yes	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 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

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
T3 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 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 160.00-140.00	Flange	0.7500 A325N	4	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T2 140.00-120.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T3 120.00-100.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.0000 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T4 100.00-80.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T5 80.00-60.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T6 60.00-40.00	Flange	1.0000 A325N	6	0.7500 A325N	1	0.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T7 40.00-20.00	Flange	1.0000 A325N	6	0.7500 A325N	1	0.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T8 20.00-0.00	Flange	1.0000 A325N	8	0.7500 A325N	1	0.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0

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 klf
1 5/8 (Verizon)	A	No	Ar (CaAa)	158.00 - 0.00	0.0000	0.27	14	6	0.5000	1.9800		0.00
Feedline Ladder (Af) 1.5" (Verizon) **********	A	No	Af (CaAa)	158.00 - 0.00	0.0000	0.3	1	1	1.5000	1.5000		0.00
1 5/8 (T-Mobile) **********	A	No	Ar (CaAa)	148.00 - 0.00	-2.0000	0.27	6	6	0.5000	1.9800		0.00

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 klf
7/8 (QUINEBAUG COMM 911)	A	No	Ar (CaAa)	160.00 - 0.00	-2.0000	0.3	2	2	0.5000	1.1100		0.00
1/2 (QUINEBAUG COMM 911)	A	No	Ar (CaAa)	160.00 - 0.00	-2.0000	0.34	1	1	0.5000	0.5800		0.00
1/2 (QUINEBAUG COMM 911)	A	No	Ar (CaAa)	82.00 - 0.00	-2.0000	0.34	1	1	0.5000	0.5800		0.00
1/2 (QUINEBAUG COMM 911)	A	No	Ar (CaAa)	65.00 - 0.00	-2.0000	0.34	1	1	0.5000	0.5800		0.00
**********												
1 1/4 (AT&T)	A	No	Ar (CaAa)	137.00 - 0.00	0.0000	-0.35	12	4	0.5000	1.5500		0.00
3/4" DC Power (AT&T)	A	No	Ar (CaAa)	137.00 - 0.00	0.0000	-0.33	2	1	0.5000	0.8650		0.00
3/8" Fiber (AT&T)	A	No	Ar (CaAa)	137.00 - 0.00	0.0000	-0.32	1	1	0.4400	0.4400		0.00
Feedline Ladder (Af) 1.5" (AT&T)	A	No	Af (CaAa)	137.00 - 0.00	0.0000	-0.35	1	1	1.5000	1.5000		0.00
**********												
Safety Line 3/8	A	No	Ar (CaAa)	160.00 - 0.00	0.0000	0.5	1	1	0.3750	0.3750		0.00
**********												
1/2 (Verizon)	A	No	Ar (CaAa)	76.00 - 0.00	0.0000	0	1	1	0.5000	0.5800		0.00
**********												
1 5/8 (METRO PCS)	C	No	Ar (CaAa)	128.00 - 0.00	0.0000	-0.35	12	6	0.5000	1.9800		0.00
3/8" (METRO PCS)	C	No	Ar (CaAa)	128.00 - 0.00	0.0000	-0.32	1	1	0.4400	0.4400		0.00
Feedline Ladder (Af) 1.5" (METRO PCS)	C	No	Af (CaAa)	128.00 - 0.00	0.0000	-0.35	1	1	1.5000	1.5000		0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	160.00-140.00	A	0.000	0.000	70.250	0.000	0.42
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	140.00-120.00	A	0.000	0.000	130.109	0.000	0.74
		B	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C	0.000	0.000	21.360	0.000	0.13
T3	120.00-100.00	A	0.000	0.000	137.090	0.000	0.78
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	53.400	0.000	0.34
T4	100.00-80.00	A	0.000	0.000	137.206	0.000	0.78
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	53.400	0.000	0.34
T5	80.00-60.00	A	0.000	0.000	139.468	0.000	0.79
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	53.400	0.000	0.34
T6	60.00-40.00	A	0.000	0.000	140.570	0.000	0.80
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	53.400	0.000	0.34
T7	40.00-20.00	A	0.000	0.000	140.570	0.000	0.80
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	53.400	0.000	0.34
T8	20.00-0.00	A	0.000	0.000	140.570	0.000	0.80
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	53.400	0.000	0.34

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	160.00-140.00	A	1.745	0.000	0.000	111.222	0.000	1.94
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	140.00-120.00	A	1.720	0.000	0.000	207.214	0.000	3.56
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	27.351	0.000	0.54
T3	120.00-100.00	A	1.692	0.000	0.000	216.681	0.000	3.70
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	67.962	0.000	1.33
T4	100.00-80.00	A	1.658	0.000	0.000	215.642	0.000	3.65
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	67.471	0.000	1.31
T5	80.00-60.00	A	1.617	0.000	0.000	228.276	0.000	3.75
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	66.871	0.000	1.29
T6	60.00-40.00	A	1.564	0.000	0.000	231.989	0.000	3.72
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	66.091	0.000	1.26
T7	40.00-20.00	A	1.486	0.000	0.000	226.848	0.000	3.56
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	64.956	0.000	1.21
T8	20.00-0.00	A	1.331	0.000	0.000	216.651	0.000	3.25
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	62.707	0.000	1.13

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	160.00-140.00	-1.6852	-5.0595	-0.9328	-3.6984
T2	140.00-120.00	-2.2707	-2.0881	-2.0086	-1.5780
T3	120.00-100.00	-1.0429	-0.6405	-1.3080	-0.5719
T4	100.00-80.00	-1.1815	-0.7654	-1.5204	-0.7169
T5	80.00-60.00	-1.3203	-0.9940	-1.8747	-1.3558
T6	60.00-40.00	-1.4835	-1.2210	-2.2088	-1.8994
T7	40.00-20.00	-1.6243	-1.3577	-2.4259	-2.0893
T8	20.00-0.00	-1.7599	-1.4896	-2.6086	-2.2380

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	1 5/8	140.00 - 158.00	0.6000	0.6000
T1	3	Feedline Ladder (Af) 1.5"	140.00 - 158.00	0.6000	0.6000
T1	5	1 5/8	140.00 - 148.00	0.1000	0.1000
T1	7	7/8	140.00 - 160.00	0.6000	0.6000
T1	8	1/2	140.00 - 160.00	0.6000	0.6000
T1	17	Safety Line 3/8	140.00 - 160.00	0.6000	0.6000
T2	1	1 5/8	120.00 - 140.00	0.6000	0.6000
T2	3	Feedline Ladder (Af) 1.5"	120.00 - 140.00	0.6000	0.6000
T2	5	1 5/8	120.00 - 140.00	0.1000	0.1000
T2	7	7/8	120.00 - 140.00	0.6000	0.6000
T2	8	1/2	120.00 - 140.00	0.6000	0.6000
T2	12	1 1/4	120.00 - 137.00	0.6000	0.6000
T2	13	3/4" DC Power	120.00 - 137.00	0.6000	0.6000
T2	14	3/8" Fiber	120.00 - 137.00	0.6000	0.6000
T2	15	Feedline Ladder (Af) 1.5"	120.00 - 137.00	0.6000	0.6000
T2	17	Safety Line 3/8	120.00 - 140.00	0.6000	0.6000
T2	21	1 5/8	120.00 - 128.00	0.6000	0.6000
T2	22	3/8"	120.00 - 128.00	0.6000	0.6000
T2	23	Feedline Ladder (Af) 1.5"	120.00 - 128.00	0.6000	0.6000
T3	1	1 5/8	100.00 - 120.00	0.6000	0.6000
T3	3	Feedline Ladder (Af) 1.5"	100.00 - 120.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T3	5	1 5/8	100.00 - 120.00	0.1000	0.1000
T3	7	7/8	100.00 - 120.00	0.6000	0.6000
T3	8	1/2	100.00 - 120.00	0.6000	0.6000
T3	12	1 1/4	100.00 - 120.00	0.6000	0.6000
T3	13	3/4" DC Power	100.00 - 120.00	0.6000	0.6000
T3	14	3/8" Fiber	100.00 - 120.00	0.6000	0.6000
T3	15	Feedline Ladder (Af) 1.5"	100.00 - 120.00	0.6000	0.6000
T3	17	Safety Line 3/8	100.00 - 120.00	0.6000	0.6000
T3	21	1 5/8	100.00 - 120.00	0.6000	0.6000
T3	22	3/8"	100.00 - 120.00	0.6000	0.6000
T3	23	Feedline Ladder (Af) 1.5"	100.00 - 120.00	0.6000	0.6000
T4	1	1 5/8	80.00 - 100.00	0.6000	0.6000
T4	3	Feedline Ladder (Af) 1.5"	80.00 - 100.00	0.6000	0.6000
T4	5	1 5/8	80.00 - 100.00	0.1000	0.1000
T4	7	7/8	80.00 - 100.00	0.6000	0.6000
T4	8	1/2	80.00 - 100.00	0.6000	0.6000
T4	9	1/2	80.00 - 82.00	0.6000	0.6000
T4	12	1 1/4	80.00 - 100.00	0.6000	0.6000
T4	13	3/4" DC Power	80.00 - 100.00	0.6000	0.6000
T4	14	3/8" Fiber	80.00 - 100.00	0.6000	0.6000
T4	15	Feedline Ladder (Af) 1.5"	80.00 - 100.00	0.6000	0.6000
T4	17	Safety Line 3/8	80.00 - 100.00	0.6000	0.6000
T4	21	1 5/8	80.00 - 100.00	0.6000	0.6000
T4	22	3/8"	80.00 - 100.00	0.6000	0.6000
T4	23	Feedline Ladder (Af) 1.5"	80.00 - 100.00	0.6000	0.6000
T5	1	1 5/8	60.00 - 80.00	0.6000	0.6000
T5	3	Feedline Ladder (Af) 1.5"	60.00 - 80.00	0.6000	0.6000
T5	5	1 5/8	60.00 - 80.00	0.1000	0.1000
T5	7	7/8	60.00 - 80.00	0.6000	0.6000
T5	8	1/2	60.00 - 80.00	0.6000	0.6000
T5	9	1/2	60.00 - 80.00	0.6000	0.6000
T5	10	1/2	60.00 - 65.00	0.6000	0.6000
T5	12	1 1/4	60.00 - 80.00	0.6000	0.6000
T5	13	3/4" DC Power	60.00 - 80.00	0.6000	0.6000
T5	14	3/8" Fiber	60.00 - 80.00	0.6000	0.6000
T5	15	Feedline Ladder (Af) 1.5"	60.00 - 80.00	0.6000	0.6000
T5	17	Safety Line 3/8	60.00 - 80.00	0.6000	0.6000
T5	19	1/2	60.00 - 76.00	0.6000	0.6000
T5	21	1 5/8	60.00 - 80.00	0.6000	0.6000
T5	22	3/8"	60.00 - 80.00	0.6000	0.6000
T5	23	Feedline Ladder (Af) 1.5"	60.00 - 80.00	0.6000	0.6000
T6	1	1 5/8	40.00 - 60.00	0.6000	0.6000
T6	3	Feedline Ladder (Af) 1.5"	40.00 - 60.00	0.6000	0.6000
T6	5	1 5/8	40.00 - 60.00	0.1000	0.1000
T6	7	7/8	40.00 - 60.00	0.6000	0.6000
T6	8	1/2	40.00 - 60.00	0.6000	0.6000
T6	9	1/2	40.00 - 60.00	0.6000	0.6000
T6	10	1/2	40.00 - 60.00	0.6000	0.6000
T6	12	1 1/4	40.00 - 60.00	0.6000	0.6000
T6	13	3/4" DC Power	40.00 - 60.00	0.6000	0.6000
T6	14	3/8" Fiber	40.00 - 60.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T6	15	Feedline Ladder (Af) 1.5"	40.00 - 60.00	0.6000	0.6000
T6	17	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T6	19	1/2	40.00 - 60.00	0.6000	0.6000
T6	21	1 5/8	40.00 - 60.00	0.6000	0.6000
T6	22	3/8"	40.00 - 60.00	0.6000	0.6000
T6	23	Feedline Ladder (Af) 1.5"	40.00 - 60.00	0.6000	0.6000
T7	1	1 5/8	20.00 - 40.00	0.6000	0.6000
T7	3	Feedline Ladder (Af) 1.5"	20.00 - 40.00	0.6000	0.6000
T7	5	1 5/8	20.00 - 40.00	0.1000	0.1000
T7	7	7/8	20.00 - 40.00	0.6000	0.6000
T7	8	1/2	20.00 - 40.00	0.6000	0.6000
T7	9	1/2	20.00 - 40.00	0.6000	0.6000
T7	10	1/2	20.00 - 40.00	0.6000	0.6000
T7	12	1 1/4	20.00 - 40.00	0.6000	0.6000
T7	13	3/4" DC Power	20.00 - 40.00	0.6000	0.6000
T7	14	3/8" Fiber	20.00 - 40.00	0.6000	0.6000
T7	15	Feedline Ladder (Af) 1.5"	20.00 - 40.00	0.6000	0.6000
T7	17	Safety Line 3/8	20.00 - 40.00	0.6000	0.6000
T7	19	1/2	20.00 - 40.00	0.6000	0.6000
T7	21	1 5/8	20.00 - 40.00	0.6000	0.6000
T7	22	3/8"	20.00 - 40.00	0.6000	0.6000
T7	23	Feedline Ladder (Af) 1.5"	20.00 - 40.00	0.6000	0.6000
T8	1	1 5/8	0.00 - 20.00	0.6000	0.6000
T8	3	Feedline Ladder (Af) 1.5"	0.00 - 20.00	0.6000	0.6000
T8	5	1 5/8	0.00 - 20.00	0.1000	0.1000
T8	7	7/8	0.00 - 20.00	0.6000	0.6000
T8	8	1/2	0.00 - 20.00	0.6000	0.6000
T8	9	1/2	0.00 - 20.00	0.6000	0.6000
T8	10	1/2	0.00 - 20.00	0.6000	0.6000
T8	12	1 1/4	0.00 - 20.00	0.6000	0.6000
T8	13	3/4" DC Power	0.00 - 20.00	0.6000	0.6000
T8	14	3/8" Fiber	0.00 - 20.00	0.6000	0.6000
T8	15	Feedline Ladder (Af) 1.5"	0.00 - 20.00	0.6000	0.6000
T8	17	Safety Line 3/8	0.00 - 20.00	0.6000	0.6000
T8	19	1/2	0.00 - 20.00	0.6000	0.6000
T8	21	1 5/8	0.00 - 20.00	0.6000	0.6000
T8	22	3/8"	0.00 - 20.00	0.6000	0.6000
T8	23	Feedline Ladder (Af) 1.5"	0.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Lightning Rod	C	From Leg	0.00	0.00	0.0000	160.00	No Ice	0.25	0.25	0.03
			0.00	2.00			1/2" Ice	0.66	0.66	0.03
							1" Ice	0.97	0.97	0.04
Beacon	C	From Leg	0.00	0.00	0.0000	160.00	No Ice	2.00	2.00	0.02
			0.00	4.00			1/2" Ice	2.50	2.50	0.03
							1" Ice	3.00	3.00	0.04

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Decibel 20' x 2" Dipoles	C	From Leg	0.00	0.0000	160.00	No Ice	4.00	4.00	0.04
(Quinebaug Comm 911)			0.00			1/2" Ice	6.03	6.03	0.05
			9.00			1" Ice	8.05	8.05	0.07
Decibel 20' x 2" Dipoles	B	From Leg	0.00	0.0000	160.00	No Ice	4.00	4.00	0.04
(Quinebaug Comm 911)			0.00			1/2" Ice	6.03	6.03	0.05
			9.00			1" Ice	8.05	8.05	0.07
DB201 C	A	From Leg	0.00	0.0000	160.00	No Ice	2.00	2.00	0.03
(Quinebaug Comm 911)			0.00			1/2" Ice	2.83	2.83	0.04
			3.00			1" Ice	3.66	3.66	0.06
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BXA-70080-4CF-EDIN-0	A	From Leg	3.00	0.0000	158.00	No Ice	3.57	2.79	0.01
(Verizon)			0.00			1/2" Ice	3.87	3.10	0.04
			0.00			1" Ice	4.18	3.41	0.07
BXA-70080-4CF-EDIN-0	B	From Leg	3.00	0.0000	158.00	No Ice	3.57	2.79	0.01
(Verizon)			0.00			1/2" Ice	3.87	3.10	0.04
			0.00			1" Ice	4.18	3.41	0.07
BXA-70080-4CF-EDIN-0	C	From Leg	3.00	0.0000	158.00	No Ice	3.57	2.79	0.01
(Verizon)			0.00			1/2" Ice	3.87	3.10	0.04
			0.00			1" Ice	4.18	3.41	0.07
(2) SBNHH-1D65B	A	From Leg	3.00	0.0000	158.00	No Ice	8.05	5.34	0.05
(Verizon)			0.00			1/2" Ice	8.51	5.79	0.10
			0.00			1" Ice	8.97	6.26	0.16
(2) SBNHH-1D65B	B	From Leg	3.00	0.0000	158.00	No Ice	8.05	5.34	0.05
(Verizon)			0.00			1/2" Ice	8.51	5.79	0.10
			0.00			1" Ice	8.97	6.26	0.16
(2) SBNHH-1D65B	C	From Leg	3.00	0.0000	158.00	No Ice	8.05	5.34	0.05
(Verizon)			0.00			1/2" Ice	8.51	5.79	0.10
			0.00			1" Ice	8.97	6.26	0.16
B66A RRH4x45-4R	A	From Leg	3.00	0.0000	158.00	No Ice	2.54	1.61	0.04
(Verizon)			0.00			1/2" Ice	2.75	1.79	0.06
			0.00			1" Ice	2.97	1.98	0.08
B66A RRH4x45-4R	B	From Leg	3.00	0.0000	158.00	No Ice	2.54	1.61	0.04
(Verizon)			0.00			1/2" Ice	2.75	1.79	0.06
			0.00			1" Ice	2.97	1.98	0.08
B66A RRH4x45-4R	C	From Leg	3.00	0.0000	158.00	No Ice	2.54	1.61	0.04
(Verizon)			0.00			1/2" Ice	2.75	1.79	0.06
			0.00			1" Ice	2.97	1.98	0.08
RRH2x60-700U	A	From Leg	3.00	0.0000	158.00	No Ice	1.22	1.87	0.04
(Verizon)			0.00			1/2" Ice	1.36	2.05	0.06
			0.00			1" Ice	1.52	2.24	0.08
RRH2x60-700U	B	From Leg	3.00	0.0000	158.00	No Ice	1.22	1.87	0.04
(Verizon)			0.00			1/2" Ice	1.36	2.05	0.06
			0.00			1" Ice	1.52	2.24	0.08
RRH2x60-700U	C	From Leg	3.00	0.0000	158.00	No Ice	1.22	1.87	0.04
(Verizon)			0.00			1/2" Ice	1.36	2.05	0.06
			0.00			1" Ice	1.52	2.24	0.08
RRH2x60-PCS	A	From Leg	3.00	0.0000	158.00	No Ice	1.22	1.87	0.04
(Verizon)			0.00			1/2" Ice	1.36	2.05	0.06
			0.00			1" Ice	1.52	2.24	0.08
RRH2x60-PCS	B	From Leg	3.00	0.0000	158.00	No Ice	1.22	1.87	0.04
(Verizon)			0.00			1/2" Ice	1.36	2.05	0.06
			0.00			1" Ice	1.52	2.24	0.08
RRH2x60-PCS	C	From Leg	3.00	0.0000	158.00	No Ice	1.22	1.87	0.04
(Verizon)			0.00			1/2" Ice	1.36	2.05	0.06
			0.00			1" Ice	1.52	2.24	0.08
DB-T1-6Z-8AB-0Z	A	From Leg	3.00	0.0000	158.00	No Ice	5.60	2.33	0.04
(Verizon)			0.00			1/2" Ice	5.92	2.57	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	6.24	2.81	0.12
DB-T1-6Z-8AB-0Z (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice	5.60 5.92 6.24	2.33 2.57 2.81	0.04 0.08 0.12
15' T-Frames (Verizon)	A	From Leg	1.50 0.00 0.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice	14.03 18.11 22.18	7.50 10.09 12.67	0.64 0.92 1.21
15' T-Frames (Verizon)	B	From Leg	1.50 0.00 0.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice	14.03 18.11 22.18	7.50 10.09 12.67	0.64 0.92 1.21
15' T-Frames (Verizon)	C	From Leg	1.50 0.00 0.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice	14.03 18.11 22.18	7.50 10.09 12.67	0.64 0.92 1.21
Sabre Universal Pipe Mount (Verizon)	C	From Leg	2.00 0.00 0.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice	1.73 2.09 2.45	1.73 2.09 2.45	0.04 0.05 0.07
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(2) 59212 (T-Mobile)	A	From Leg	0.50 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	4.73 5.17 5.62	2.64 3.10 3.53	0.01 0.04 0.07
(2) 59212 (T-Mobile)	B	From Leg	0.50 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	4.73 5.17 5.62	2.64 3.10 3.53	0.01 0.04 0.07
(2) 59212 (T-Mobile)	C	From Leg	0.50 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	4.73 5.17 5.62	2.64 3.10 3.53	0.01 0.04 0.07
(2) 63SSFL (T-Mobile)	A	From Leg	0.50 0.00 0.00	0.0000	149.00	No Ice 1/2" Ice 1" Ice	4.59 5.14 5.70	2.15 2.48 2.81	0.03 0.04 0.07
(2) 63SSFL (T-Mobile)	B	From Leg	0.50 0.00 0.00	0.0000	149.00	No Ice 1/2" Ice 1" Ice	4.59 5.14 5.70	2.15 2.48 2.81	0.03 0.04 0.07
(2) 63SSFL (T-Mobile)	C	From Leg	0.50 0.00 0.00	0.0000	149.00	No Ice 1/2" Ice 1" Ice	4.59 5.14 5.70	2.15 2.48 2.81	0.03 0.04 0.07
10.5' T-Frame (T-Mobile)	A	From Leg	0.00 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	6.04 8.20 10.37	1.68 2.08 2.49	0.20 0.30 0.40
10.5' T-Frame (T-Mobile)	B	From Leg	0.00 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	6.04 8.20 10.37	1.68 2.08 2.49	0.20 0.30 0.40
10.5' T-Frame (T-Mobile)	C	From Leg	0.00 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	6.04 8.20 10.37	1.68 2.08 2.49	0.20 0.30 0.40
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(3) 7770 (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	5.51 5.87 6.23	2.93 3.27 3.63	0.04 0.07 0.11
(3) 7770 (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	5.51 5.87 6.23	2.93 3.27 3.63	0.04 0.07 0.11
(3) 7770 (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	5.51 5.87 6.23	2.93 3.27 3.63	0.04 0.07 0.11
HPA-65R-BUU-H6 (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	9.49 9.96 10.43	5.49 5.94 6.41	0.04 0.10 0.16

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
HPA-65R-BUU-H8-K (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	13.30 13.99 14.70	7.52 8.09 8.67	0.07 0.14 0.22
HPA-65R-BUU-H8-K (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	13.30 13.99 14.70	7.52 8.09 8.67	0.07 0.14 0.22
(2) LGP 21401 TMA (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	0.82 0.94 1.06	0.35 0.44 0.54	0.01 0.02 0.02
(2) LGP 21401 TMA (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	0.82 0.94 1.06	0.35 0.44 0.54	0.01 0.02 0.02
(2) LGP 21401 TMA (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	0.82 0.94 1.06	0.35 0.44 0.54	0.01 0.02 0.02
RRUS 11 (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.10
RRUS 11 (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.10
RRUS 11 (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.10
RRUS 12 AWS (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	1.29 1.43 1.60	3.15 3.36 3.59	0.06 0.08 0.11
RRUS 12 AWS (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	1.29 1.43 1.60	3.15 3.36 3.59	0.06 0.08 0.11
RRUS 12 AWS (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	1.29 1.43 1.60	3.15 3.36 3.59	0.06 0.08 0.11
RRUS A2 (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.07 2.25 2.43	0.50 0.61 0.72	0.02 0.03 0.05
RRUS A2 (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.07 2.25 2.43	0.50 0.61 0.72	0.02 0.03 0.05
RRUS A2 (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.07 2.25 2.43	0.50 0.61 0.72	0.02 0.03 0.05
(2) LGP21903 Diplexer (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	0.23 0.29 0.36	0.16 0.21 0.28	0.01 0.01 0.01
(2) LGP21903 Diplexer (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	0.23 0.29 0.36	0.16 0.21 0.28	0.01 0.01 0.01
(2) LGP21903 Diplexer (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	0.23 0.29 0.36	0.16 0.21 0.28	0.01 0.01 0.01
DC6-48-60-18-8F (AT&T)	A	From Leg	0.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice 1" Ice	2.20 2.40 2.60	3.70 3.94 4.19	0.03 0.06 0.10
12' T-Frame (AT&T)	A	From Leg	1.50 0.00 0.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice	13.46 17.79 22.12	6.72 8.03 9.34	0.26 0.36 0.46

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
12' T-Frame	B	From Leg	1.50	0.0000	137.00	No Ice	13.46	6.72	0.26
(AT&T)			0.00			1/2" Ice	17.79	8.03	0.36
			0.00			1" Ice	22.12	9.34	0.46
12' T-Frame	C	From Leg	1.50	0.0000	137.00	No Ice	13.46	6.72	0.26
(AT&T)			0.00			1/2" Ice	17.79	8.03	0.36
			0.00			1" Ice	22.12	9.34	0.46
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(2) 742 351	A	From Leg	3.00	0.0000	128.00	No Ice	5.39	1.73	0.04
(Metro PCS)			0.00			1/2" Ice	5.73	2.04	0.06
			0.00			1" Ice	6.08	2.36	0.09
(2) 742 351	B	From Leg	3.00	0.0000	128.00	No Ice	5.39	1.73	0.04
(Metro PCS)			0.00			1/2" Ice	5.73	2.04	0.06
			0.00			1" Ice	6.08	2.36	0.09
(2) 742 351	C	From Leg	3.00	0.0000	128.00	No Ice	5.39	1.73	0.04
(Metro PCS)			0.00			1/2" Ice	5.73	2.04	0.06
			0.00			1" Ice	6.08	2.36	0.09
12' T-Frame	A	From Leg	1.50	0.0000	128.00	No Ice	10.00	6.46	0.26
(Metro PCS)			0.00			1/2" Ice	12.50	7.92	0.36
			0.00			1" Ice	15.00	9.38	0.46
12' T-Frame	B	From Leg	1.50	0.0000	128.00	No Ice	10.00	6.46	0.26
(Metro PCS)			0.00			1/2" Ice	12.50	7.92	0.36
			0.00			1" Ice	15.00	9.38	0.46
12' T-Frame	C	From Leg	1.50	0.0000	128.00	No Ice	10.00	6.46	0.26
(Metro PCS)			0.00			1/2" Ice	12.50	7.92	0.36
			0.00			1" Ice	15.00	9.38	0.46
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Yagi	C	From Leg	0.00	0.0000	82.00	No Ice	2.08	2.08	0.03
(Quinebaug Comm 911)			0.00			1/2" Ice	3.78	3.78	0.05
			0.00			1" Ice	5.51	5.51	0.09
**********									
GPS	A	From Leg	3.00	0.0000	76.00	No Ice	0.16	0.16	0.00
(Verizon)			0.00			1/2" Ice	0.21	0.21	0.00
			0.00			1" Ice	0.28	0.28	0.01
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6' Trombone	B	From Leg	0.00	0.0000	68.00	No Ice	2.00	2.00	0.04
(Quinebaug Comm 911)			0.00			1/2" Ice	2.83	2.83	0.06
			0.00			1" Ice	3.66	3.66	0.07
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Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice

Comb. No.	Description
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	3.485	39	0.2020	0.0057
T2	140 - 120	2.640	39	0.1886	0.0052
T3	120 - 100	1.887	39	0.1541	0.0036
T4	100 - 80	1.281	39	0.1219	0.0025
T5	80 - 60	0.807	39	0.0902	0.0016
T6	60 - 40	0.459	39	0.0651	0.0010
T7	40 - 20	0.218	39	0.0408	0.0007
T8	20 - 0	0.067	39	0.0207	0.0003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	Lightning Rod	39	3.485	0.2020	0.0057	195445
158.00	BXA-70080-4CF-EDIN-0	39	3.399	0.2012	0.0057	195445
149.00	(2) 63SSFL	39	3.014	0.1969	0.0055	88839
148.00	(2) 59212	39	2.972	0.1962	0.0055	81435
137.00	12' T-Frame	39	2.519	0.1845	0.0050	44426
135.00	(3) 7770	39	2.440	0.1814	0.0049	41839
128.00	(2) 742 351	39	2.172	0.1690	0.0043	34830
82.00	Yagi	39	0.849	0.0931	0.0016	36872
76.00	GPS	39	0.728	0.0847	0.0014	38024
68.00	6' Trombone	39	0.584	0.0747	0.0012	41206

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	15.986	2	0.9229	0.0264
T2	140 - 120	12.120	2	0.8629	0.0240
T3	120 - 100	8.671	2	0.7064	0.0169
T4	100 - 80	5.890	2	0.5595	0.0116
T5	80 - 60	3.712	2	0.4141	0.0072
T6	60 - 40	2.113	2	0.2989	0.0048
T7	40 - 20	1.003	2	0.1875	0.0031
T8	20 - 0	0.308	11	0.0952	0.0016

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	Lightning Rod	2	15.986	0.9229	0.0264	43751
158.00	BXA-70080-4CF-EDIN-0	2	15.592	0.9195	0.0263	43751
149.00	(2) 63SSFL	2	13.832	0.9001	0.0256	19887
148.00	(2) 59212	2	13.638	0.8972	0.0255	18229
137.00	12' T-Frame	2	11.567	0.8442	0.0232	9897
135.00	(3) 7770	2	11.204	0.8301	0.0225	9297
128.00	(2) 742 351	2	9.978	0.7740	0.0199	7683
82.00	Yagi	2	3.904	0.4275	0.0075	8035
76.00	GPS	2	3.348	0.3889	0.0065	8282
68.00	6' Trombone	2	2.688	0.3429	0.0055	8974

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325N	0.7500	4	4.67	29.82	0.157 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	3.50	5.81	0.603 ✓	1	Member Block Shear
		Top Girt	A325N	0.6250	1	0.09	5.81	0.015 ✓	1	Member Block Shear
T2	140	Leg	A325N	0.8750	4	12.87	40.59	0.317 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	5.64	6.83	0.825 ✓	1	Member Block Shear
		Top Girt	A325N	0.6250	1	0.09	5.81	0.015 ✓	1	Member Block Shear
T3	120	Leg	A325N	0.8750	4	21.32	40.59	0.525 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	6.19	7.83	0.790 ✓	1	Member Bearing
T4	100	Leg	A325N	1.0000	4	29.14	53.01	0.550 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	6.52	7.83	0.833 ✓	1	Member Bearing
T5	80	Leg	A325N	1.0000	6	24.32	53.01	0.459 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	7.23	11.70	0.618 ✓	1	Member Bearing
T6	60	Leg	A325N	1.0000	6	28.63	53.01	0.540 ✓	1	Bolt Tension
		Diagonal	A325N	0.7500	1	8.56	14.14	0.605 ✓	1	Member Bearing
T7	40	Leg	A325N	1.0000	6	33.32	53.01	0.628 ✓	1	Bolt Tension
		Diagonal	A325N	0.7500	1	9.46	14.14	0.669 ✓	1	Member Bearing
T8	20	Leg	A325N	1.0000	8	28.31	53.01	0.534 ✓	1	Bolt Tension
		Diagonal	A325N	0.7500	1	9.57	14.14	0.677 ✓	1	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	ROHN 2.5 STD	20.00	4.00	50.7 K=1.00	1.7040	-22.54	63.56	0.355 [1] ✓
T2	140 - 120	ROHN 3 STD	20.03	5.01	51.7 K=1.00	2.2285	-59.49	82.51	0.721 [1] ✓
T3	120 - 100	ROHN 3.5 EH	20.04	6.68	61.3 K=1.00	3.6784	-95.98	125.72	0.763 [1] ✓
T4	100 - 80	ROHN 4 EH	20.04	6.68	54.3 K=1.00	4.4074	-130.51	159.90	0.816 [1] ✓
T5	80 - 60	ROHN 5 EH	20.04	6.68	43.6 K=1.00	6.1120	-164.11	239.38	0.686 [1] ✓
T6	60 - 40	ROHN 6 EHS	20.04	10.02	54.0 K=1.00	6.7133	-194.06	244.05	0.795 [1] ✓
T7	40 - 20	ROHN 6 EH	20.03	10.02	54.8	8.4049	-227.05	303.76	0.747 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T8	20 - 0	ROHN 6 EH	20.04	10.02	K=1.00 54.8 K=1.00	8.4049	-258.76	303.73	✔ 0.852 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L1 3/4x1 3/4x3/16	7.70	3.59	125.4 K=1.00	0.6211	-3.55	8.79	0.404 [1] ✔
T2	140 - 120	L2x2x3/16	9.72	4.72	143.8 K=1.00	0.7148	-5.64	7.81	0.722 [1] ✔
T3	120 - 100	L2 1/2x2 1/2x3/16	12.28	6.02	146.1 K=1.00	0.9023	-6.22	9.55	0.651 [1] ✔
T4	100 - 80	L2 1/2x2 1/2x3/16	14.07	6.90	167.3 K=1.00	0.9023	-6.58	7.28	0.903 [1] ✔
T5	80 - 60	L3x3x1/4	15.94	7.79	157.9 K=1.00	1.4400	-7.24	13.05	0.554 [1] ✔
T6	60 - 40	L3 1/2x3 1/2x1/4	19.21	9.45	163.4 K=1.00	1.6900	-8.62	14.29	0.603 [1] ✔
T7	40 - 20	L3 1/2x3 1/2x1/4	20.93	10.30	178.0 K=1.00	1.6900	-9.61	12.04	0.798 [1] ✔
T8	20 - 0	L3 1/2x3 1/2x1/4	22.76	11.23	194.1 K=1.00	1.6900	-9.73	10.13	0.960 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L1 3/4x1 3/4x3/16	6.58	6.10	213.2 K=1.00	0.6211	-0.09	3.09	0.029 [1] ✔
T2	140 - 120	KL/R > 200 (C) - 4 L1 3/4x1 3/4x3/16 KL/R > 200 (C) - 41	6.58	6.10	213.2 K=1.00	0.6211	-0.10	3.09	0.031 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	ROHN 2.5 STD	20.00	4.00	50.7	1.7040	18.67	76.68	0.243 [1] ✔
T2	140 - 120	ROHN 3 STD	20.03	5.01	51.7	2.2285	51.47	100.28	0.513 [1] ✔
T3	120 - 100	ROHN 3.5 EH	20.04	6.68	61.3	3.6784	85.29	165.53	0.515 [1] ✔
T4	100 - 80	ROHN 4 EH	20.04	6.68	54.3	4.4074	116.56	198.34	0.588 [1] ✔
T5	80 - 60	ROHN 5 EH	20.04	6.68	43.6	6.1120	145.93	275.04	0.531 [1] ✔
T6	60 - 40	ROHN 6 EHS	20.04	10.02	54.0	6.7133	171.77	302.10	0.569 [1] ✔
T7	40 - 20	ROHN 6 EH	20.03	10.02	54.8	8.4049	199.90	378.22	0.529 [1] ✔
T8	20 - 0	ROHN 6 EH	20.04	10.02	54.8	8.4049	226.46	378.22	0.599 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L1 3/4x1 3/4x3/16	7.70	3.59	82.9	0.3604	3.50	15.68	0.224 [1] ✔
T2	140 - 120	L2x2x3/16	9.72	4.72	94.1	0.4307	5.64	18.73	0.301 [1] ✔
T3	120 - 100	L2 1/2x2 1/2x3/16	12.28	6.02	94.7	0.5713	6.19	24.85	0.249 [1] ✔
T4	100 - 80	L2 1/2x2 1/2x3/16	14.07	6.90	108.3	0.5713	6.52	24.85	0.262 [1] ✔
T5	80 - 60	L3x3x1/4	15.94	7.79	102.0	0.9394	7.23	45.79	0.158 [1] ✔
T6	60 - 40	L3 1/2x3 1/2x1/4	19.21	9.45	105.5	1.1034	8.56	53.79	0.159 [1] ✔
T7	40 - 20	L3 1/2x3 1/2x1/4	20.93	10.30	114.8	1.1034	9.46	53.79	0.176 [1] ✔
T8	20 - 0	L3 1/2x3 1/2x1/4	22.76	11.23	125.1	1.1034	9.57	53.79	0.178 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L1 3/4x1 3/4x3/16	6.58	6.10	141.7	0.3604	0.09	15.68	0.006 [1] ✔
T2	140 - 120	L1 3/4x1 3/4x3/16	6.58	6.10	141.7	0.3604	0.09	15.68	0.006 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	160 - 140	Leg	ROHN 2.5 STD	3	-22.54	63.56	35.5	Pass
T2	140 - 120	Leg	ROHN 3 STD	39	-59.49	82.51	72.1	Pass
T3	120 - 100	Leg	ROHN 3.5 EH	69	-95.98	125.72	76.3	Pass
T4	100 - 80	Leg	ROHN 4 EH	90	-130.51	159.90	81.6	Pass
T5	80 - 60	Leg	ROHN 5 EH	111	-164.11	239.38	68.6	Pass
T6	60 - 40	Leg	ROHN 6 EHS	132	-194.06	244.05	79.5	Pass
T7	40 - 20	Leg	ROHN 6 EH	147	-227.05	303.76	74.7	Pass
T8	20 - 0	Leg	ROHN 6 EH	162	-258.76	303.73	85.2	Pass
T1	160 - 140	Diagonal	L1 3/4x1 3/4x3/16	11	-3.55	8.79	40.4 60.3 (b)	Pass
T2	140 - 120	Diagonal	L2x2x3/16	48	-5.64	7.81	72.2 82.5 (b)	Pass
T3	120 - 100	Diagonal	L2 1/2x2 1/2x3/16	75	-6.22	9.55	65.1 79.0 (b)	Pass
T4	100 - 80	Diagonal	L2 1/2x2 1/2x3/16	96	-6.58	7.28	90.3	Pass
T5	80 - 60	Diagonal	L3x3x1/4	117	-7.24	13.05	55.4 61.8 (b)	Pass
T6	60 - 40	Diagonal	L3 1/2x3 1/2x1/4	138	-8.62	14.29	60.3 60.5 (b)	Pass
T7	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	153	-9.61	12.04	79.8	Pass
T8	20 - 0	Diagonal	L3 1/2x3 1/2x1/4	168	-9.73	10.13	96.0	Pass
T1	160 - 140	Top Girt	L1 3/4x1 3/4x3/16	4	-0.09	3.09	2.9	Pass
T2	140 - 120	Top Girt	L1 3/4x1 3/4x3/16	41	-0.10	3.09	3.1	Pass
							Summary	
						Leg (T8)	85.2	Pass
						Diagonal (T8)	96.0	Pass
						Top Girt (T2)	3.1	Pass
						Bolt Checks	83.3	Pass
						RATING =	**96.0**	**Pass**

tnxTower	Job	Page
	CT10012-A-03	21 of 21
Allpro Consulting Group, Inc. 9221 Lyndon B. Johnson Fwy, Suite# 204 Dallas, TX 75243 Phone: 972-231-8893 FAX: 866-364-8375	Project 16-3553	Date 17:59:44 10/12/16
Tower/CT10012-A-03_Ground 2,CT_Verizon_SBA_08102016.eri	Client SBA	Designed by Dejian Xu, EIT

MATHCAD CALCULATION PRINTOUT

Existing 160 ft Self Supporting Tower Foundation Check

Customer Name: SBA Communications Corp
Customer Site Number: CT10012-A-03
Customer Site Name: Griswold 2, CT

Carrier Name: Verizon
Carrier Site ID/Name: 117858
Site Location: 181 A Norman Road,
Griswold, CT 06351

Latitude: 41.601097
Longitude:-71.954325

ACGI Job # 16-3553

Ref. ACGI # 16-0261, dated 03/18/2016
ACGI # 16-2850, dated 08/10/2016

By:

Allpro Consulting Group, Inc.
9221 Lyndon B. Johnson Freeway, #204
Dallas, TX 75243
Phone: 972-231-8893
Fax: 866-364-8375

INPUT DATA

-Foundation Reactions- G Code (factered)

(As per TNX Output)

Down load; $Pv := 266 \cdot kips$ Shear; $S := 30 \cdot kips$

Uplift load; $P_{up} := 233 \cdot kips$ Moment; $M := 0 \cdot ft\_K$

MATERIAL & SOIL PARAMETERS

Conforming to the design requirements as in ACI 318

Unit wt. of concrete, $\gamma_c := 0.150kcf$

Concrete compressive strength, $f_c := 3000 \cdot psi$

Rebar yield strength, $f_y := 60000 \cdot psi$

Soil data as per Geotechnical report by FDH Engineering Inc. FDH Project No. 16BDCN1600 dated 03/04/2016.

For Leg A With smallest computed thickness, consider this as worst case

Unit wt. of soil, $\gamma_s := 0.130 \cdot kcf$ Average Soil Weight

Ultimate Bearing Capacity, $Br_{ult} := 20ksf$ (as per geotechnical report)

Internal angle of friction for soil, $\phi := 40 \cdot deg$

Cohesion of soil, $c_u := 0 \cdot ksf$

Coefficient of Friction $C_f := 0.45$

PRELIMINARY DIMENSIONS

Type of pedestal Pe.t=0 for circular,=1 for rectangular/square $Pe_t := 1$

Footing Dimensions, LxB $L := 6 \cdot ft$ $B := L$ Thickness of footing, $T_f := 2.3 \cdot ft$

Depth of footing, $D_f := 11.8ft$ Extension above the grade, $Ex_g := 1 \cdot ft$

Pedestal diameter/size $Ped_{size} := 3 \cdot ft$

Depth of soil neglected: $L_{neg} := 1 \cdot ft$

CALCULATIONS

Determine footing size

$P_{ave} := 6.16ksf$ average passive pressure on footing. As per Geotechnical Report Figure 2

Calculate safety against overturning and location of resultant on the base

$Area_{ped} := if\left(Pe_t = 1, Ped_{size}^2, \frac{\pi}{4} \cdot Ped_{size}^2\right)$ $Area_{ped} = 9\,ft^2$

Resisting Moments

$N := 1..5$

Component	Down load value, kips	Lever arm, ft
$Component_N :=$	$PDL_N :=$	$LEV_N :=$
"Soil Weight"	$[L \cdot B \cdot (D_f - T_f) - Area_{ped} \cdot (D_f - T_f)] \cdot \gamma_s$	$\frac{L}{2}$
"Soil Wedge Weight"	$(D_f - T_f) \cdot \frac{1}{2} \cdot [(D_f - T_f) \cdot \tan(\phi)] \cdot B \cdot \gamma_s$	$L + (D_f - T_f) \cdot \frac{\tan(\phi)}{3}$
"Concrete Weight"	$L \cdot B \cdot T_f \cdot \gamma_c + Area_{ped} \cdot \gamma_c \cdot (D_f + Ex_g - T_f)$	$\frac{L}{2}$
"Passive Pressure"	$T_f \cdot B \cdot P_{ave}$	$\frac{T_f}{3}$
"Vertical load"	Pv	$\frac{L}{2}$

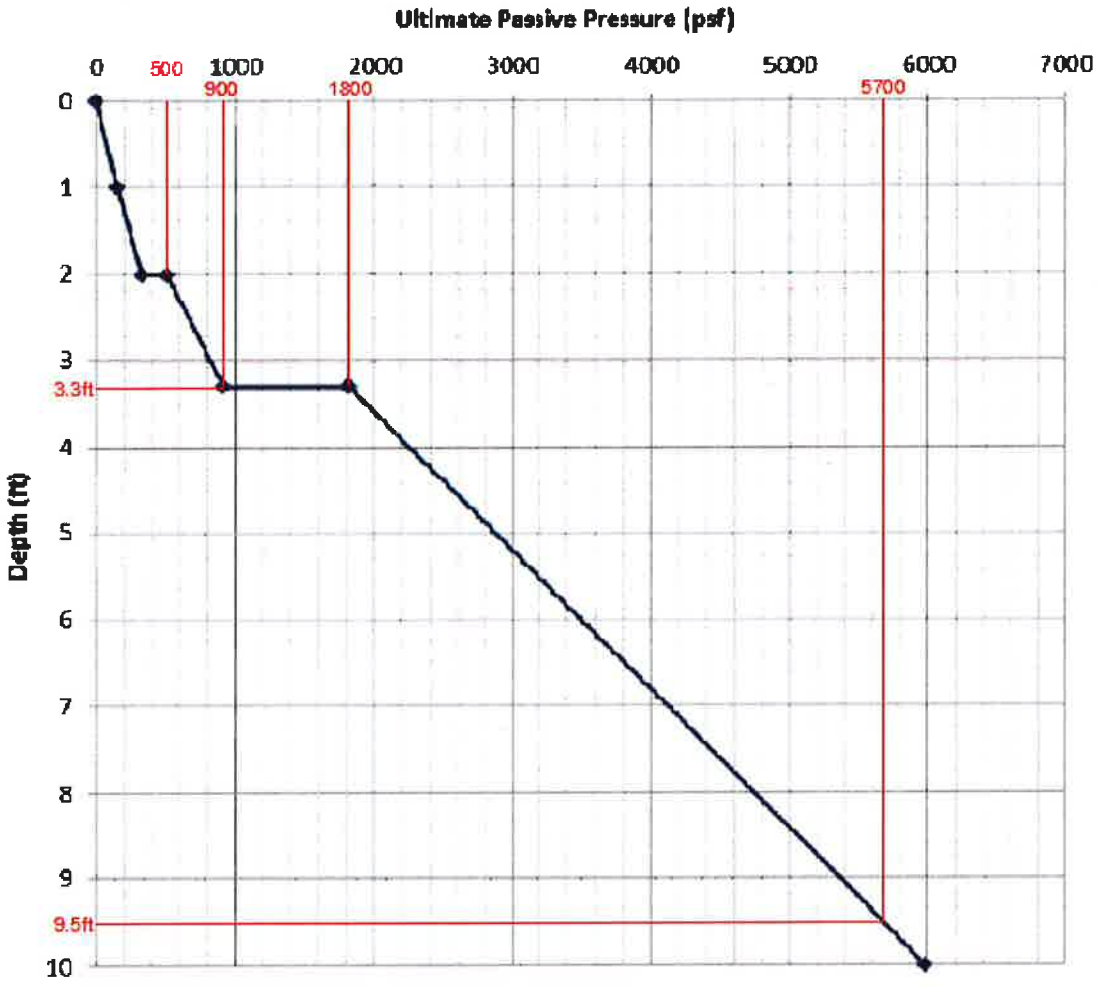
$RM_N := PDL_N \cdot LEV_N$

$TRM := \sum_N RM_N$ $TRM = 1298.675 \cdot ft \cdot kips$

$TWT := PDL_1 + PDL_2 + PDL_3 + PDL_5$ $TWT = 355.474 \cdot kips$ Total down load

Net soil weight removed $S_{w1} := L \cdot B \cdot D_f \cdot \gamma_s$ $S_{w1} = 55.224 \cdot kips$

FIGURE 2: ULTIMATE PASSIVE RESISTANCE vs. DEPTH



2ft-3.3ft passive pressure on pedestal

As per Geotechnical Report Figure 2

resisting force $F_{pr1} := \frac{(0.5ksf + 0.9ksf)\cdot(3.3ft - 2ft)\cdot Ped_{size}}{2} = 2.73\cdot kips$

resisting moment arm $L_{pr1} := T_f + 9.5ft - \frac{(2ft + 3.3ft)}{2} = 9.15\,ft$

$M_{pr1} := F_{pr1}\cdot L_{pr1} = 24.98\cdot kips\cdot ft$

3.3ft-9.5ft passive pressure on pedestal

resisting force $F_{pr2} := \frac{(5.7ksf + 1.8ksf)\cdot(9.5ft - 3.3ft)\cdot Ped_{size}}{2} = 69.75\cdot kips$

resisting moment arm $L_{pr2} := T_f + 9.5ft - \frac{(9.5ft + 3.3ft)}{2} = 5.4\,ft$

$M_{pr2} := F_{pr2}\cdot L_{pr2} = 376.65\cdot kips\cdot ft$

$M_{pr} := M_{pr1} + M_{pr2} = 401.63\cdot kips\cdot ft$

Total resisting moment $M_r := TRM + M_{pr} = 1700.304 \cdot kip \cdot ft$

Overturning Moments

component	value, kips	lever arm, ft	Overturning Moment ft-kips
1) Moment on foundation	-	-	$M = 0 \cdot ft\_K$
2) Moment due to horizontal shear	$S = 30 \cdot kips$	$L_{hs} := D_f + Ex_g$	$O_{hs} := L_{hs} \cdot S$ $L_{hs} = 12.8\,ft$ $O_{hs} = 384 \cdot ft\_K$
Total Overturning Moment=	$M_o := M + O_{hs}$		$M_o = 384 \cdot ft\_K$

Check Safety Factor against Overturning

$SF := \frac{0.9M_r}{M_o}$ $SF = 3.985$ > 1.0 OK!

$TWT_1 := TWT - PDL_2$ (exclude soil wedge weight for bearing check)

$M_{o\_red} := M_o - 0.75\left(M_{pr} + RM_4\right) = 33.898 \cdot kip \cdot ft$ (exclude overturning moment resist from lateral force)

Calculate eccentricity, ec $ec := \frac{M_{o\_red}}{TWT_1}$ $ec = 0.104 \cdot ft$ $\phi_{bearing} := 0.75$

Check location of eccentricity and determine pressure distribution under the footing

$L_{loc} := \frac{L}{6}$ $L_{loc} = 1\,ft$ For net bearing calcs $T_{w1} := S_{w1}$ $T_{w1} = 55.224 \cdot kips$

$P_{max1} := if\left[ec \le L_{loc}, \frac{TWT_1}{L \cdot B} \cdot \left[1 + \left(6 \cdot \frac{ec}{L}\right)\right], 4 \cdot \frac{TWT_1}{3 \cdot B \cdot (L - 2 \cdot ec)}\right]$ $P_{max1} = 9.996 \cdot ksf$ Gross soil pressure

$P_{max2} := \left(\frac{T_{w1}}{L \cdot B}\right)$ $P_{max2} = 1.534 \cdot ksf$ In-situ soil pressure $P_{net} := P_{max1} - P_{max2}$ $P_{max} := P_{net}$

Net soil pressure, $P_{net} = 8.462 \cdot ksf$ < $\phi_{bearing} Br_{ult} = 15 \cdot ksf$ $\frac{P_{net}}{\phi_{bearing} Br_{ult}} = 56.41 \cdot \%$ OK!

$P_{min} := if\left[ec \le L_{loc}, \frac{TWT}{L \cdot B} \cdot \left[1 - \left(6 \cdot \frac{ec}{L}\right)\right], 0 \cdot ksf\right]$ $P_{min} = 8.847 \cdot ksf$

Check for horizontal shear

$P_{tw} := \left(PDL_1 + PDL_3 + PDL_5\right) \cdot C_f$ $P_{shr} := 0.75\left(PDL_4 + P_{tw}\right)$

$P_{shr} = 173.761 \cdot kips$ > $S = 30 \cdot kips$ **OK!**

Check for uplift

Number of soil layers $NSL := 4$ $j := 1 .. NSL$

Neglected soil height $L_{ngl} := 3.3 \cdot ft$ $k := 1 .. NSL$

$\alpha := 0.4$ Estimated cohesion $i := 1 .. NSL$

Height $H_{soil_i} :=$	PHI $\phi_{soil_i} :=$	Soil Dens $\gamma_{soil_i} :=$
1·ft	0·deg	105·pcf
1·ft	30·deg	115·pcf
7.5·ft	40·deg	135·pcf
2.3ft	40·deg	135pcf

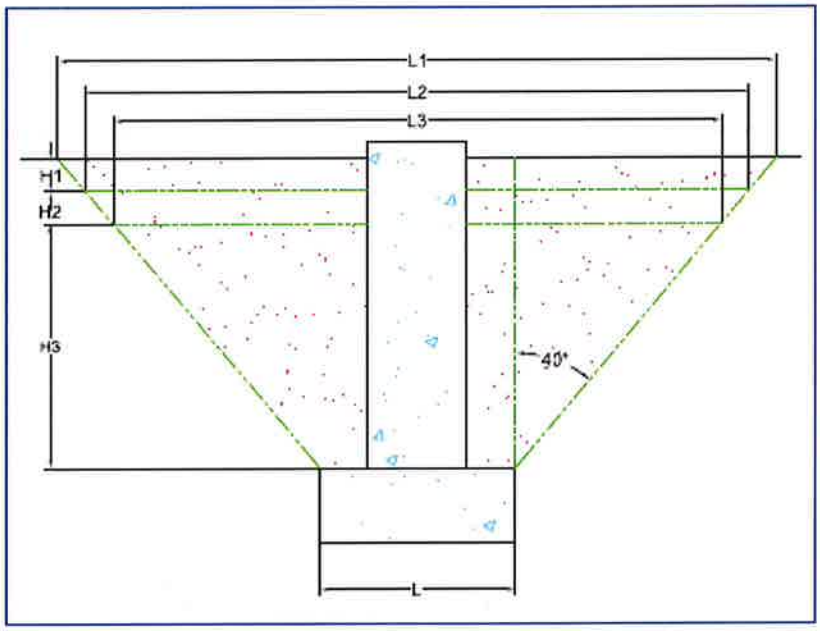
$K_s := 1$ For ϕ=40

$\sigma 1_{v_4} := \gamma_{s_1} \cdot H_1 + \gamma_{s_2} \cdot H_2 + \gamma_{s_3} \cdot H_3 + \gamma_{s_4} \cdot \frac{H_4}{2}$ $SK4 := K_s \cdot \sigma 1_{v_4} \cdot \tan(\phi_4 \cdot 0.8)$ $SK4 = 0.867 \cdot ksf$

Skin friction around Pad

$SKFUN_4 := 4 \cdot L \cdot H_4 \cdot (SK4)$

Soil & Soil Wedge Weight



$L_3 := L + 2 \cdot H_3 \cdot \tan(\phi_3) = 18.586\,ft$

$L_2 := L_3 + 2 \cdot H_2 \cdot \tan(\phi_2) = 19.741\,ft$

$L_1 := L_2 + 2 \cdot H_1 \cdot \tan(\phi_1) = 19.741\,ft$

For Layer 0-1ft

$V_{soil1} := \frac{1}{6} \cdot H_1 \cdot \left[L_2^2 + (L_2 + L_1)^2 + L_1^2 \right]$

$W_{soil1} := \gamma_{s_1} \cdot (V_{soil1} - Area_{ped} \cdot H_1)$

For Layer 1ft-2ft

$V_{soil2} := \frac{1}{6} \cdot H_2 \cdot \left[L_2^2 + (L_2 + L_3)^2 + L_3^2 \right]$

$W_{soil2} := \gamma_{s_2} \cdot (V_{soil2} - Area_{ped} \cdot H_2)$

For Layer 2ft-9.5ft

$V_{soil3} := \frac{1}{6} \cdot H_3 \cdot \left[L^2 + (L + L_3)^2 + L_3^2 \right]$

$W_{soil3} := \gamma_{s_3} \cdot (V_{soil3} - Area_{ped} \cdot H_3)$

Total uplift resisting force

$TWT1 := W_{soil1} + W_{soil2} + W_{soil3} + PDL_3$ PDL3 is concrete weight

$P_{ucap} := 0.75(SKFUN_4 + TWT1)$ $P_{ucap} = 234.687 \cdot kips$ > $P_{up} = 233 \cdot kips$ $\frac{P_{up}}{P_{ucap}} = 99.281 \cdot \%$

Concrete Design Calculations

General Input parameters

Concrete Cover, $cc := 3.0 \cdot in$

Reduction factors as per respective ACI sections

$\phi_{shear} := 0.85$ as per ACI 9.3.2.3

$\phi_{compr} := 0.75$ as per ACI 9.3.2.2

$\phi_{axten} := 0.9$ as per ACI 9.3.2.2 a

Reinforced concrete load factor as per EIA 3.1.13 $RC_{fac} := 1.0$

(Loads already factored under TIA/EIA-222-G Code)

Single shear in footing

Allowable shear stress in concrete for wide beam shear criteria=

$\nu_{wide} := 2 \cdot \phi_{shear} \cdot \sqrt{f_c \cdot psi}$ $\nu_{wide} = 93.113 \cdot psi$

Effective depth of steel= $d := T_f - cc$ $d = 24.6 \cdot in$

$L_{eff} := if(ec \le L_{loc}, L, L - 2 \cdot ec)$ $L_{eff} = 6\ ft$

Factor load $P_{maxf} := P_{max} \cdot RC_{fac}$ $P_{minf} := P_{min} \cdot RC_{fac}$

shear on the face of concrete=

$$Shear_{wide} := \left(\frac{L - Ped_{size}}{2} - d\right) \cdot B \cdot \left[\frac{P_{maxf} + \left[P_{maxf} - \frac{P_{maxf} - P_{minf}}{L_{eff}} \cdot \left(\frac{L - Ped_{size}}{2} - d\right)\right]}{2}\right]$$ $Shear_{wide} = -27.865 \cdot kips$

Area of concrete in shear= $A_{shear} := B \cdot d$ $A_{shear} = 1771.2 \cdot in^2$

Shear stress acting on concrete face= $\nu_{act1} := \frac{Shear_{wide}}{A_{shear}}$ $\nu_{act1} = -15.732 \cdot psi <$ $\nu_{wide} = 93.113 \cdot psi$ O.K!

Punching or two way shear in footing

Calculate allowable shear stress in concrete for punching/two way shear

$\beta := \frac{L}{B}$ $\beta = 1$ $\nu_{punch} := if\left[\left(2 + \frac{4}{\beta}\right)\cdot\phi_{shear}\cdot\sqrt{f_c\cdot psi} \le 4\cdot\phi_{shear}\cdot\sqrt{f_c\cdot psi}, \left(2 + \frac{4}{\beta}\right)\cdot\phi_{shear}\cdot\sqrt{f_c\cdot psi}, 4\cdot\phi_{shear}\cdot\sqrt{f_c\cdot psi}\right]$

$\nu_{punch} = 186.226\cdot psi$

$Area_{col} := if\left[Pe_t = 0, \frac{\pi}{4}\cdot\left(Ped_{size} + d\right)^2, \left(Ped_{size} + d\right)^2\right]$

$P_{avg} := \frac{P_{maxf} + P_{minf}}{2}$

Factor vertical load $Pvf := RC_{fac}\cdot Pv$

$Peri_{col} := if\left[Pe_t = 0, 2\cdot\pi\cdot\frac{Ped_{size} + d}{2}, 4\cdot\left(Ped_{size} + d\right)\right]$

Shear stress acting on the concrete face=

$\nu_{act} := \frac{Pvf - Area_{col}\cdot P_{avg}}{Peri_{col}\cdot d}$ $\nu_{act} = 7.595\cdot psi$ < $\nu_{punch} = 186.226\cdot psi$ O.K!

Design pedestal steel

Effective diameter/size= $D_{eff} := Ped_{size} - cc\cdot 2$ $D_{eff} = 30\cdot in$ $h := Ped_{size}$ $h = 36\cdot in$

$D_{pier} := Ped_{size}$

Effective pier diameter $D_{eff} := D_{pier} - cc\cdot 2$ $D_{eff} = 2.5\,ft$

-Minimum required area of steel per ACI-

$Area_{stlmin} := 0.005\cdot\frac{\pi}{4}\cdot D_{pier}^2$ -(ACI 10.8.4) & (ACI 10.9.1)

$Area_{stlmin} = 5.089\cdot in^2$

-Rebar details-

Selected rebar size $d_{bar} := 8$

-Rebar details-

$No := (0\ 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10\ 11\ 12\ 13\ 14\ 15\ 16\ 17\ 18)^T$

$d_b := (0\ 0\ 0\ 0.375\ 0.5\ 0.625\ 0.75\ 0.875\ 1.00\ 1.125\ 1.25\ 1.41\ 0\ 0\ 1.693\ 0\ 0\ 0\ 2.257)^T\cdot in$

$A_b := (0\ 0\ 0\ 0.11\ 0.20\ 0.31\ 0.44\ 0.60\ 0.79\ 1.00\ 1.27\ 1.56\ 0\ 0\ 2.25\ 0\ 0\ 0\ 4.00)^T\cdot in^2$

$B := d_{bar}$ $d_{b_B} = 1\cdot in$ Bar area= $Area_{abar} := A_{b_B}$ $Area_{abar} = 0.79\cdot in^2$

-Number of vertical rebars required-

$NRB := ceil\left(\frac{Area_{stlmin}}{Area_{abar}}\right)$ $NRB = 7$ $Area_{stluse} := Area_{abar}\cdot NRB$ $Area_{stluse} = 5.53\cdot in^2$

Rebar used $NRB := 12$ $Area_{stluse1} := Area_{abar}\cdot NRB = 9.48\cdot in^2$ OK!

$Mn := 4889.09154 \cdot in \cdot kips$

$0.9 \cdot Mn = 366.682 \cdot kips \cdot ft$ > $M_{o\_red} = 33.898 \cdot kips \cdot ft$ **OK**

Use (NRB = 12) $d_{bar} = 8$ vertical bars

Vertical bar spacing $S_{bar} := D_{eff} \cdot \frac{\pi}{NRB} - d_{b_B}$ $S_{bar} = 6.854 \cdot in$

Check pedestal in compression

Allowable compressive load on column ACI 10.15= $P_{comp} := \phi_{compr} \cdot 0.85 \cdot f_c \cdot Area_{ped}$

$P_{comp} = 2478.6 \cdot kips$ > $Pv = 266 \cdot kips$ **O.K!**

SPREAD FOOTING CHECK SUMMARY

Safety Factor against Overturning	SF = 3.985	> 1.0	O.K!	$\frac{1.0}{SF} = 25.094 \cdot \%$
Uplift	$P_{ucap} = 234.687 \cdot kips$	> $P_{up} = 233 \cdot kips$	OK!	$\frac{P_{up}}{P_{ucap}} = 99.281 \cdot \%$
Net soil pressure,	$P_{net} = 8.462 \cdot ksf$	< $\phi_{bearing} Br_{ult} = 15 \cdot ksf$	OK!	$\frac{P_{net}}{\phi_{bearing} Br_{ult}} = 56.41 \cdot \%$
Check for horizontal shear	$P_{shr} = 173.761 \cdot kips$	> $S = 30 \cdot kips$	OK!	$\frac{S}{P_{shr}} = 17.265 \cdot \%$

Check pedestal in compression

Allowable compressive load on column ACI 10.15= $P_{comp} = 2478.6 \cdot kips$ > $Pv = 266 \cdot kips$

$\frac{Pv}{P_{comp}} = 10.732 \cdot \%$

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================================================================================

                  LPILE Plus for Windows, Version 5.0 (5.0.47)

                Analysis of Individual Piles and Drilled Shafts
               Subjected to Lateral Loading Using the p-y Method

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                              All Rights Reserved

================================================================================

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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:      P:\2016\Structural\16-3553 CT10012-A-03 Griswold 2, CT Structural
Analysis (SBA)\L-Pile\
Name of input data file:     CT10012-A-03 Foundation.lpd
Name of output file:         CT10012-A-03 Foundation.lpo
Name of plot output file:    CT10012-A-03 Foundation.lpp
Name of runtime file:        CT10012-A-03 Foundation.lpr


--------------------------------------------------------------------------------
                           Time and Date of Analysis
--------------------------------------------------------------------------------

               Date:  October 10, 2016     Time:   8:45:34


--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

16-3553 CT10012-A-01 Griswold 2


--------------------------------------------------------------------------------
                                 Program Options
--------------------------------------------------------------------------------

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 2:
- Computation of Ultimate Bending Moment of Cross Section (Section Design)



--------------------------------------------------------------------------------
   Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
--------------------------------------------------------------------------------
```

Number of sections = 1

Pile Section No. 1

The sectional shape is a circular drilled shaft (bored pile).

Outside Diameter = 36.0000 in

Material Properties:

Compressive Strength of Concrete	=	3.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2
Number of Reinforcing Bars	=	12
Area of Single Bar	=	0.79000 in**2
Number of Rows of Reinforcing Bars	=	7
Area of Steel	=	9.480 in**2
Area of Shaft	=	1017.876 in**2
Percentage of Steel Reinforcement	=	0.931 percent
Cover Thickness (edge to bar center)	=	4.000 in

Unfactored Axial Squash Load Capacity = 3140.21 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	0.790	14.000
2	1.580	12.124
3	1.580	7.000
4	1.580	0.000
5	1.580	-7.000
6	1.580	-12.124
7	0.790	-14.000

Axial Thrust Force = -233000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
354664.19131	2.837314E+11	0.00000125	1.341105E-12	0.00000107	0.00000	1159.99996
700285.14474	2.801141E+11	0.00000250	2.682209E-12	0.00000107	0.00000	2319.99992
1036863.	2.764968E+11	0.00000375	4.023314E-12	0.00000107	0.00000	3479.99988
1036863.	2.073726E+11	0.00000500	5.364418E-12	0.00000107	0.00000	4639.99984
1036863.	1.658981E+11	0.00000625	6.705523E-12	0.00000107	0.00000	5799.99981
1036863.	1.382484E+11	0.00000750	8.046627E-12	0.00000107	0.00000	6959.99977
1036863.	1.184986E+11	0.00000875	9.387732E-12	0.00000107	0.00000	8119.99973
1036863.	1.036863E+11	0.00001000	1.072884E-11	0.00000107	0.00000	9279.99969
1036863.	9.216559E+10	0.00001125	1.206994E-11	0.00000107	0.00000	10439.99965
1036863.	8.294903E+10	0.00001250	1.341105E-11	0.00000107	0.00000	11599.99961
1036863.	7.540821E+10	0.00001375	1.475215E-11	0.00000107	0.00000	12759.99957
1036863.	6.912419E+10	0.00001500	1.609325E-11	0.00000107	0.00000	13919.99953
1036863.	6.380695E+10	0.00001625	1.743436E-11	0.00000107	0.00000	15079.99949

1036863.	5.924931E+10	0.00001750	1.877546E-11	0.00000107	0.00000	16239.99946
1036863.	5.529935E+10	0.00001875	2.011657E-11	0.00000107	0.00000	17399.99942
1036863.	5.184314E+10	0.00002000	2.145767E-11	0.00000107	0.00000	18559.99938
1036863.	4.879355E+10	0.00002125	2.279878E-11	0.00000107	0.00000	19719.99934
1036863.	4.608279E+10	0.00002250	2.413988E-11	0.00000107	0.00000	20879.99930
1036863.	4.365738E+10	0.00002375	2.548099E-11	0.00000107	0.00000	22039.99926
1036863.	4.147451E+10	0.00002500	2.682209E-11	0.00000107	0.00000	23199.99922
1036863.	3.949954E+10	0.00002625	2.816319E-11	0.00000107	0.00000	24359.99918
1036863.	3.770410E+10	0.00002750	2.950430E-11	0.00000107	0.00000	25519.99914
1036863.	3.606480E+10	0.00002875	3.084540E-11	0.00000107	0.00000	26679.99911
1036863.	3.456210E+10	0.00003000	3.218651E-11	0.00000107	0.00000	27839.99907
1036863.	3.317961E+10	0.00003125	3.352761E-11	0.00000107	0.00000	28999.99903
1036863.	3.190347E+10	0.00003250	3.486872E-11	0.00000107	0.00000	30159.99899
1036863.	3.072186E+10	0.00003375	3.620982E-11	0.00000107	0.00000	31319.99895
1036863.	2.962465E+10	0.00003500	3.755093E-11	0.00000107	0.00000	32479.99891
1036863.	2.860311E+10	0.00003625	3.889203E-11	0.00000107	0.00000	33639.99887
1036863.	2.764968E+10	0.00003750	4.023314E-11	0.00000107	0.00000	34799.99883
1044009.	2.694216E+10	0.00003875	4.157424E-11	0.00000107	0.00000	35959.99879
1077686.	2.694216E+10	0.00004000	4.291534E-11	0.00000107	0.00000	37119.99876
1111364.	2.694216E+10	0.00004125	4.425645E-11	0.00000107	0.00000	38279.99872
1145042.	2.694216E+10	0.00004250	4.559755E-11	0.00000107	0.00000	39439.99868
1178720.	2.694216E+10	0.00004375	4.693866E-11	0.00000107	0.00000	40599.99864
1212397.	2.694216E+10	0.00004500	4.827976E-11	0.00000107	0.00000	41759.99860
1246075.	2.694216E+10	0.00004625	4.962087E-11	0.00000107	0.00000	42919.99856
1279753.	2.694216E+10	0.00004750	0.00000748	0.15748966	0.00000	43863.05800
1316776.	2.701079E+10	0.00004875	0.00002998	0.61498868	48.13201303	44370.55975
1402816.	2.737201E+10	0.00005125	0.00007293	1.42296660	178.03375	45445.11589
1505178.	2.800332E+10	0.00005375	0.00011208	2.08513105	293.23518	46629.80198
1620428.	2.880760E+10	0.00005625	0.00014806	2.63224590	396.43077	47906.14888
1744398.	2.969188E+10	0.00005875	0.00018178	3.09406435	490.77616	49248.48786
1868955.	3.051356E+10	0.00006125	0.00021529	3.51492655	582.45662	50596.61171
2005902.	3.146514E+10	0.00006375	0.00024540	3.84938300	662.83798	52043.45319
2137583.	3.226541E+10	0.00006625	0.00027688	4.17925394	745.17073	53450.60838
2281290.	3.318240E+10	0.00006875	0.00030482	4.43372905	816.50237	54960.25270
2418429.	3.394286E+10	0.00007125	0.00033460	4.69610703	891.06160	56416.66885
2564265.	3.476969E+10	0.00007375	0.00036159	4.90294182	957.05854	57953.83318
2705424.	3.548097E+10	0.00007625	0.00038997	5.11441791	1025.09839	59450.74340
2829565.	3.593098E+10	0.00007875	0.00041690	5.29394138	1088.17653	60000.00000
2949821.	3.630549E+10	0.00008125	0.00044038	5.42004597	1141.87687	60000.00000
3066391.	3.661363E+10	0.00008375	0.00046536	5.55656612	1198.02080	60000.00000
3142664.	3.643668E+10	0.00008625	0.00048658	5.64154279	1244.55677	60000.00000
3207011.	3.613534E+10	0.00008875	0.00050673	5.70965803	1287.90463	60000.00000
3271167.	3.584841E+10	0.00009125	0.00052694	5.77469194	1330.64997	60000.00000
3335131.	3.557473E+10	0.00009375	0.00054721	5.83689988	1372.78782	60000.00000
3398899.	3.531323E+10	0.00009625	0.00056754	5.89651144	1414.31322	60000.00000
3462470.	3.506298E+10	0.00009875	0.00058793	5.95373476	1455.22142	60000.00000
3521825.	3.478346E+10	0.00010125	0.00060750	5.99999964	1493.71087	60000.00000
3592673.	3.462817E+10	0.00010375	0.00062518	6.02580249	1527.74305	60000.00000
3656303.	3.441226E+10	0.00010625	0.00064512	6.07171333	1565.65593	60000.00000
3719746.	3.420456E+10	0.00010875	0.00066512	6.11602342	1602.95890	60000.00000
3759368.	3.379207E+10	0.00011125	0.00068236	6.13360155	1634.35434	60000.00000
3785538.	3.327945E+10	0.00011375	0.00069805	6.13673007	1662.33210	60000.00000
3811635.	3.278825E+10	0.00011625	0.00071377	6.13995731	1689.92536	60000.00000
3837657.	3.231711E+10	0.00011875	0.00072951	6.14327681	1717.13173	60000.00000
3863604.	3.186478E+10	0.00012125	0.00074529	6.14668429	1743.94912	60000.00000
3889476.	3.143011E+10	0.00012375	0.00076108	6.15017760	1770.37584	60000.00000
3915271.	3.101205E+10	0.00012625	0.00077691	6.15375245	1796.40963	60000.00000
3940991.	3.060964E+10	0.00012875	0.00079277	6.15740883	1822.04909	60000.00000
3966634.	3.022197E+10	0.00013125	0.00080865	6.16114247	1847.29179	60000.00000
3992198.	2.984821E+10	0.00013375	0.00082456	6.16494906	1872.13522	60000.00000

4017684.	2.948759E+10	0.00013625	0.00084050	6.16883075	1896.57822	60000.00000
4043092.	2.913940E+10	0.00013875	0.00085647	6.17278326	1920.61814	60000.00000
4068420.	2.880297E+10	0.00014125	0.00087247	6.17680442	1944.25273	60000.00000
4093667.	2.847768E+10	0.00014375	0.00088850	6.18089211	1967.47968	60000.00000
4118834.	2.816297E+10	0.00014625	0.00090456	6.18504846	1990.29755	60000.00000
4143921.	2.785829E+10	0.00014875	0.00092065	6.18927133	2012.70389	60000.00000
4193846.	2.727705E+10	0.00015375	0.00095293	6.19790375	2056.27105	60000.00000
4243439.	2.673033E+10	0.00015875	0.00098533	6.20678723	2098.16369	60000.00000
4292693.	2.621492E+10	0.00016375	0.00101786	6.21591103	2138.36162	60000.00000
4341603.	2.572802E+10	0.00016875	0.00105051	6.22527301	2176.84553	60000.00000
4390165.	2.526714E+10	0.00017375	0.00108331	6.23487103	2213.59520	60000.00000
4419026.	2.472182E+10	0.00017875	0.00111211	6.22157800	2244.09710	60000.00000
4432871.	2.412447E+10	0.00018375	0.00113782	6.19221103	2269.93750	60000.00000
4446568.	2.355798E+10	0.00018875	0.00116359	6.16474092	2294.70195	60000.00000
4460119.	2.301997E+10	0.00019375	0.00118944	6.13902819	2318.38270	60000.00000
4473516.	2.250826E+10	0.00019875	0.00121534	6.11493981	2340.97033	60000.00000
4486765.	2.202093E+10	0.00020375	0.00124132	6.09236634	2362.45725	60000.00000
4499858.	2.155620E+10	0.00020875	0.00126736	6.07119834	2382.83368	60000.00000
4512795.	2.111249E+10	0.00021375	0.00129347	6.05134356	2402.09097	60000.00000
4525576.	2.068835E+10	0.00021875	0.00131966	6.03271616	2420.21985	60000.00000
4538196.	2.028244E+10	0.00022375	0.00134591	6.01523674	2437.21069	60000.00000
4538196.	1.983911E+10	0.00022875	0.00137250	5.99999964	2453.21752	60000.00000
4538196.	1.941474E+10	0.00023375	0.00140250	5.99999964	2469.91412	60000.00000
4564316.	1.911755E+10	0.00023875	0.00143250	5.99999964	2485.03102	60000.00000
4588733.	1.882557E+10	0.00024375	0.00146217	5.99863064	2498.41884	60000.00000
4600402.	1.849408E+10	0.00024875	0.00148854	5.98409092	2508.95980	60000.00000
4611907.	1.817500E+10	0.00025375	0.00151501	5.97047174	2518.32818	60000.00000
4623244.	1.786761E+10	0.00025875	0.00154156	5.95772159	2526.51128	60000.00000
4634416.	1.757125E+10	0.00026375	0.00156821	5.94580400	2533.49700	60000.00000
4645413.	1.728526E+10	0.00026875	0.00159494	5.93467176	2539.27179	60000.00000
4656239.	1.700909E+10	0.00027375	0.00162178	5.92429483	2543.82267	60000.00000
4666890.	1.674221E+10	0.00027875	0.00164870	5.91463673	2547.13566	60000.00000
4677361.	1.648409E+10	0.00028375	0.00167573	5.90566528	2549.19651	60000.00000
4687651.	1.623429E+10	0.00028875	0.00170286	5.89735258	2549.99062	60000.00000
4697518.	1.599155E+10	0.00029375	0.00173009	5.88967502	2546.03362	60000.00000
4707245.	1.575647E+10	0.00029875	0.00175743	5.88260257	2541.50190	60000.00000
4716875.	1.552881E+10	0.00030375	0.00178487	5.87611806	2538.68753	60000.00000
4726403.	1.530819E+10	0.00030875	0.00181242	5.87019789	2543.00647	60000.00000
4735829.	1.509428E+10	0.00031375	0.00184009	5.86482489	2546.30536	60000.00000
4745147.	1.488673E+10	0.00031875	0.00186787	5.85997760	2548.56909	60000.00000
4754358.	1.468527E+10	0.00032375	0.00189576	5.85564315	2549.78232	60000.00000
4763414.	1.448947E+10	0.00032875	0.00192382	5.85192239	2548.49326	60000.00000
4772300.	1.429903E+10	0.00033375	0.00195205	5.84882605	2544.33153	60000.00000
4781104.	1.411396E+10	0.00033875	0.00198037	5.84610951	2540.15266	60000.00000
4789829.	1.393405E+10	0.00034375	0.00200879	5.84376633	2535.95604	60000.00000
4798467.	1.375904E+10	0.00034875	0.00203732	5.84178150	2539.24690	60000.00000
4815490.	1.342297E+10	0.00035875	0.00209469	5.83886540	2546.16672	60000.00000
4832160.	1.310416E+10	0.00036875	0.00215250	5.83729899	2549.61208	60000.00000
4848322.	1.280085E+10	0.00037875	0.00221091	5.83737409	2545.89094	60000.00000
4864088.	1.251212E+10	0.00038875	0.00226980	5.83872378	2538.19086	60000.00000
4879594.	1.223723E+10	0.00039875	0.00232907	5.84093606	2534.15350	60000.00000
4883818.	1.194818E+10	0.00040875	0.00237890	5.81994617	2540.50285	60000.00000
4884601.	1.166472E+10	0.00041875	0.00242593	5.79325926	2544.84617	60000.00000
4885321.	1.139433E+10	0.00042875	0.00247312	5.76820099	2547.88725	60000.00000
4885975.	1.113612E+10	0.00043875	0.00252047	5.74466836	2549.60110	60000.00000
4886534.	1.088921E+10	0.00044875	0.00256807	5.72271073	2548.88846	60000.00000
4886951.	1.065275E+10	0.00045875	0.00261599	5.70243108	2544.16585	60000.00000
4887337.	1.042632E+10	0.00046875	0.00266402	5.68323934	2539.42492	60000.00000
4887693.	1.020928E+10	0.00047875	0.00271215	5.66507113	2534.66537	60000.00000
4888013.	1.000105E+10	0.00048875	0.00276039	5.64786422	2529.88715	60000.00000

4888300.	9.801103E+09	0.00049875	0.00280874	5.63156712	2525.95905	60000.00000
4888553.	9.608950E+09	0.00050875	0.00285721	5.61613047	2532.07424	60000.00000
4888772.	9.424138E+09	0.00051875	0.00290578	5.60150921	2537.31897	60000.00000
4888954.	9.246249E+09	0.00052875	0.00295448	5.58766043	2541.67916	60000.00000
4889101.	9.074898E+09	0.00053875	0.00300329	5.57454765	2545.14062	60000.00000
4889212.	8.909726E+09	0.00054875	0.00305222	5.56213439	2547.68833	60000.00000
4889284.	8.750396E+09	0.00055875	0.00310128	5.55038631	2549.30682	60000.00000
4889316.	8.596599E+09	0.00056875	0.00315046	5.53927338	2549.98023	60000.00000
4889316.	8.448061E+09	0.00057875	0.00319998	5.52912390	2546.84252	60000.00000
4889316.	8.304570E+09	0.00058875	0.00324962	5.51953018	2542.87079	60000.00000
4889316.	8.165872E+09	0.00059875	0.00329933	5.51036775	2538.88743	60000.00000
4889316.	8.031730E+09	0.00060875	0.00334911	5.50161946	2534.89199	60000.00000
4889316.	7.901924E+09	0.00061875	0.00339896	5.49326384	2530.88462	60000.00000
4889316.	7.776247E+09	0.00062875	0.00344887	5.48528373	2526.86515	60000.00000
4889316.	7.654506E+09	0.00063875	0.00349886	5.47766411	2522.83328	60000.00000
4889316.	7.536517E+09	0.00064875	0.00354892	5.47039211	2518.78859	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 4889.09154 in-kip

Axial Thrust Force = 266000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
343325.98851	2.746608E+11	0.00000125	0.00010101	80.80929387	307.09696	2784.33690
686575.41870	2.746302E+11	0.00000250	0.00012370	49.48083937	372.52553	3297.36085
1029703.	2.745875E+11	0.00000375	0.00014647	39.05792749	437.19961	3812.54961
1372545.	2.745089E+11	0.00000500	0.00016930	33.86095226	501.10310	4329.83808
1714130.	2.742608E+11	0.00000625	0.00019219	30.75111759	564.17033	4848.64006
2055563.	2.740751E+11	0.00000750	0.00021517	28.68965113	626.49289	5369.99912
2391920.	2.733623E+11	0.00000875	0.00023810	27.21161878	687.69099	5889.94827
2727166.	2.727166E+11	0.00001000	0.00026110	26.11025655	748.08937	6411.97440
3057764.	2.718013E+11	0.00001125	0.00028405	25.24858725	807.34408	6932.35159
3057764.	2.446212E+11	0.00001250	0.00028538	22.83002222	809.82611	6825.88305
3057764.	2.223829E+11	0.00001375	0.00030251	22.00101149	853.16653	7177.90333
3057764.	2.038510E+11	0.00001500	0.00031918	21.27861321	894.75957	7516.19675
3057764.	1.881701E+11	0.00001625	0.00033553	20.64802587	935.04943	7845.38219
3057764.	1.747294E+11	0.00001750	0.00035161	20.09193313	974.16754	8166.65606
3090610.	1.648325E+11	0.00001875	0.00036746	19.59804618	1012.25857	8481.43761
3189878.	1.594939E+11	0.00002000	0.00038315	19.15758026	1049.48186	8791.39655
3282843.	1.544867E+11	0.00002125	0.00039836	18.74640191	1085.10639	9087.47017
3376385.	1.500616E+11	0.00002250	0.00041367	18.38524354	1120.53285	9386.37141
3465547.	1.459178E+11	0.00002375	0.00042862	18.04702985	1154.69188	9674.89181
3554934.	1.421974E+11	0.00002500	0.00044363	17.74535429	1188.59412	10334.61814
3640716.	1.386939E+11	0.00002625	0.00045833	17.46007240	1221.34329	11068.51989
3727355.	1.355402E+11	0.00002750	0.00047316	17.20594919	1254.01631	11798.25552
3810162.	1.325274E+11	0.00002875	0.00048761	16.96025026	1285.41087	12539.39135
3895277.	1.298426E+11	0.00003000	0.00050240	16.74651039	1317.17506	13270.53596
3975496.	1.272159E+11	0.00003125	0.00051660	16.53114188	1347.26972	14018.65267
4055522.	1.247853E+11	0.00003250	0.00053082	16.33294165	1377.03426	14766.20249
4138094.	1.226102E+11	0.00003375	0.00054547	16.16202271	1407.32256	15501.42027
4215905.	1.204544E+11	0.00003500	0.00055946	15.98458493	1435.85060	16255.64630
4293531.	1.184422E+11	0.00003625	0.00057347	15.81990588	1464.05686	17009.32395
4370971.	1.165592E+11	0.00003750	0.00058750	15.66671312	1491.94012	17762.44948
4450762.	1.148584E+11	0.00003875	0.00060199	15.53522265	1520.37747	18502.29355
4526343.	1.131586E+11	0.00004000	0.00061580	15.39507616	1547.09475	19261.71166

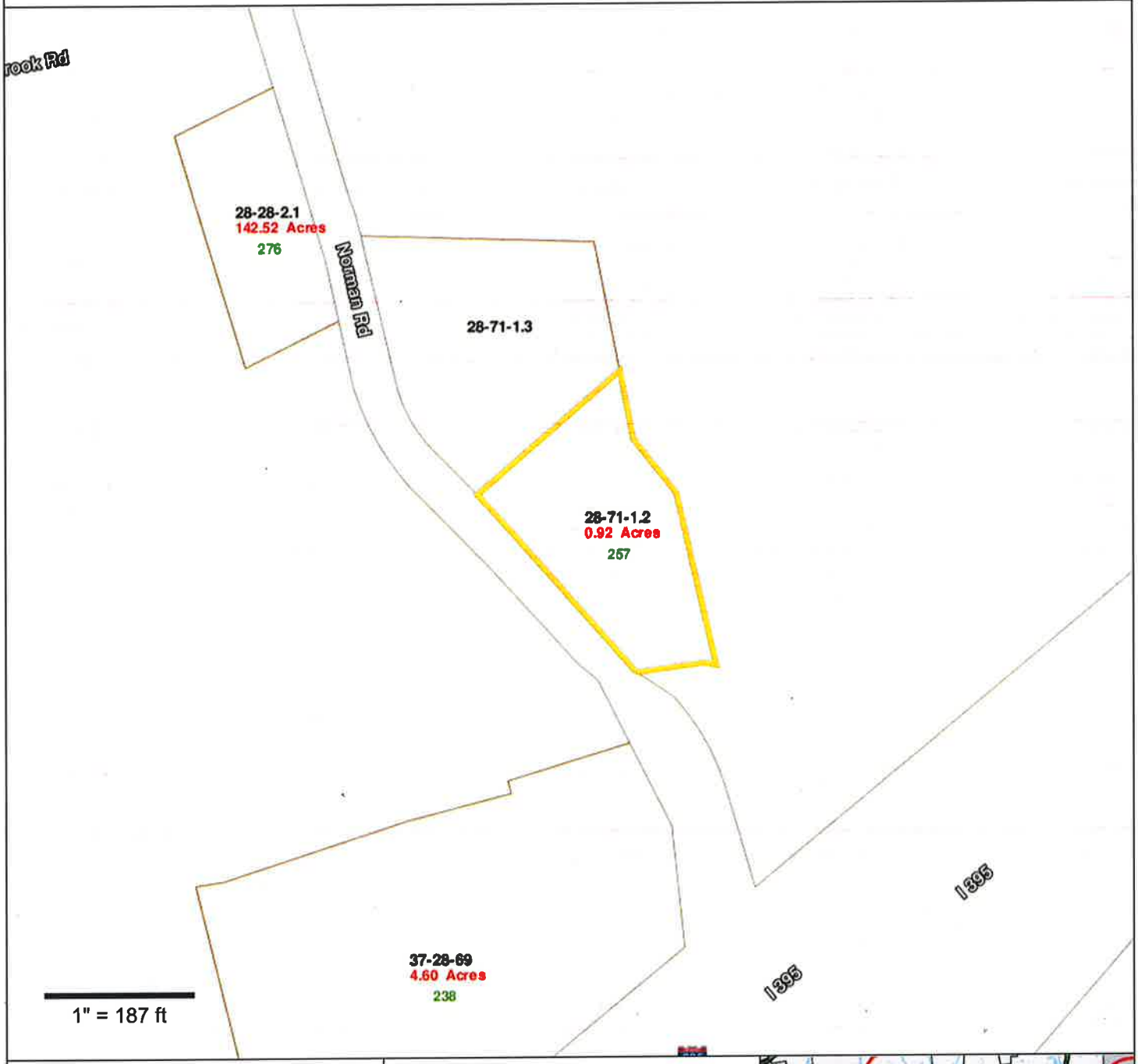
4601747.	1.115575E+11	0.00004125	0.00062963	15.26387322	1573.49699	20020.59166
4676971.	1.100464E+11	0.00004250	0.00064349	15.14082634	1599.58286	20778.93153
4752013.	1.086174E+11	0.00004375	0.00065735	15.02523816	1625.35104	21536.72909
4829393.	1.073198E+11	0.00004500	0.00067176	14.92805851	1651.77363	22278.88365
4902913.	1.060089E+11	0.00004625	0.00068543	14.82014573	1676.45086	23042.47954
4976260.	1.047634E+11	0.00004750	0.00069912	14.71830118	1700.81791	23805.54013
5049433.	1.035781E+11	0.00004875	0.00071283	14.62206137	1724.87365	24568.06074
5195252.	1.013708E+11	0.00005125	0.00074029	14.44476306	1772.04605	26091.47090
5342566.	9.939658E+10	0.00005375	0.00076840	14.29589617	1818.91256	27596.27184
5485265.	9.751582E+10	0.00005625	0.00079559	14.14386857	1862.81642	29127.81440
5627278.	9.578345E+10	0.00005875	0.00082286	14.00607383	1905.48127	30657.15171
5768597.	9.418117E+10	0.00006125	0.00085020	13.88078678	1946.89702	32184.25249
5912288.	9.274178E+10	0.00006375	0.00087865	13.78271878	1988.57726	33679.19866
6051038.	9.133642E+10	0.00006625	0.00090577	13.67202938	2026.87471	35212.61356
6189104.	9.002333E+10	0.00006875	0.00093298	13.57055390	2063.92941	36743.70816
6326476.	8.879265E+10	0.00007125	0.00096026	13.47733748	2099.73041	38272.45143
6463146.	8.763588E+10	0.00007375	0.00098763	13.39155614	2134.26668	39798.80930
6599105.	8.654564E+10	0.00007625	0.00101508	13.31249535	2167.52697	41322.74466
6734342.	8.551545E+10	0.00007875	0.00104261	13.23953068	2199.49974	42844.22180
6871758.	8.457548E+10	0.00008125	0.00107170	13.19012010	2231.80273	44320.77951
7004880.	8.364036E+10	0.00008375	0.00109911	13.12374079	2260.77767	45845.71455
7137283.	8.275111E+10	0.00008625	0.00112662	13.06226027	2288.46109	47368.02150
7268955.	8.190372E+10	0.00008875	0.00115422	13.00527942	2314.84009	48887.66209
7399886.	8.109464E+10	0.00009125	0.00118191	12.95244849	2339.90193	50404.58319
7530062.	8.032067E+10	0.00009375	0.00120970	12.90344989	2363.63303	51918.74560
7659474.	7.957895E+10	0.00009625	0.00123758	12.85800254	2386.01971	53430.10040
7788110.	7.886694E+10	0.00009875	0.00126557	12.81585753	2407.04819	54938.58800
7915957.	7.818230E+10	0.00010125	0.00129365	12.77678525	2426.70380	56444.16430
8043003.	7.752292E+10	0.00010375	0.00132184	12.74058187	2444.97176	57946.77430
8169234.	7.688691E+10	0.00010625	0.00135013	12.70706499	2461.83693	59446.35601
8278855.	7.612740E+10	0.00010875	0.00137769	12.66840470	2476.83973	60000.00000
8378502.	7.531237E+10	0.00011125	0.00140486	12.62795913	2490.25549	60000.00000
8472073.	7.447976E+10	0.00011375	0.00143325	12.59999979	2502.83672	60000.00000
8578469.	7.379328E+10	0.00011625	0.00146182	12.57478917	2513.99949	60000.00000
8657605.	7.290615E+10	0.00011875	0.00148789	12.52956283	2522.84982	60000.00000
8709310.	7.182936E+10	0.00012125	0.00151231	12.47264206	2529.99771	60000.00000
8760569.	7.079248E+10	0.00012375	0.00153681	12.41865242	2536.07393	60000.00000
8811380.	6.979311E+10	0.00012625	0.00156139	12.36743510	2541.06804	60000.00000
8861732.	6.882899E+10	0.00012875	0.00158605	12.31883347	2544.96897	60000.00000
8911621.	6.789807E+10	0.00013125	0.00161079	12.27271020	2547.76562	60000.00000
8961042.	6.699844E+10	0.00013375	0.00163562	12.22893870	2549.44656	60000.00000
9009979.	6.612829E+10	0.00013625	0.00166053	12.18739450	2549.94686	60000.00000
9058181.	6.528418E+10	0.00013875	0.00168553	12.14797032	2546.64964	60000.00000
9105968.	6.446703E+10	0.00014125	0.00171062	12.11056316	2548.74947	60000.00000
9153337.	6.367539E+10	0.00014375	0.00173579	12.07508075	2549.83735	60000.00000
9200173.	6.290716E+10	0.00014625	0.00176107	12.04153812	2548.22920	60000.00000
9246486.	6.216125E+10	0.00014875	0.00178646	12.00983870	2546.94889	60000.00000
9341801.	6.075968E+10	0.00015375	0.00184128	11.97582400	2549.92654	60000.00000
9424876.	5.936929E+10	0.00015875	0.00189148	11.91484988	2546.35240	60000.00000
9458458.	5.776158E+10	0.00016375	0.00193680	11.82775962	2549.32063	60000.00000
9491250.	5.624445E+10	0.00016875	0.00198237	11.74739850	2548.48379	60000.00000
9523124.	5.480934E+10	0.00017375	0.00202825	11.67338240	2546.47262	60000.00000
9554440.	5.345142E+10	0.00017875	0.00207434	11.60468566	2549.25711	60000.00000
9585121.	5.216392E+10	0.00018375	0.00212066	11.54100144	2549.09148	60000.00000
9614944.	5.094010E+10	0.00018875	0.00216727	11.48224604	2544.53677	60000.00000
9644319.	4.977713E+10	0.00019375	0.00221407	11.42747748	2548.06099	60000.00000
9695108.	4.878042E+10	0.00019875	0.00226575	11.40000093	2549.91271	60000.00000
9706681.	4.764015E+10	0.00020375	0.00231435	11.35879362	2546.03148	60000.00000
9733405.	4.662709E+10	0.00020875	0.00236083	11.30936158	2544.86766	60000.00000
9759818.	4.565997E+10	0.00021375	0.00240747	11.26299798	2547.98577	60000.00000

9785910.	4.473559E+10	0.00021875	0.00245427	11.21950758	2549.67756	60000.00000
9811561.	4.385055E+10	0.00022375	0.00250128	11.17892039	2548.36803	60000.00000
9836720.	4.300205E+10	0.00022875	0.00254853	11.14113557	2543.50026	60000.00000
9861643.	4.218885E+10	0.00023375	0.00259592	11.10554802	2544.48532	60000.00000
9886325.	4.140869E+10	0.00023875	0.00264345	11.07203329	2547.54163	60000.00000
9910762.	4.065954E+10	0.00024375	0.00269112	11.04047763	2549.38683	60000.00000
9934943.	3.993947E+10	0.00024875	0.00273893	11.01077807	2549.96465	60000.00000
9958588.	3.924567E+10	0.00025375	0.00278702	10.98332512	2545.47640	60000.00000
9982060.	3.857801E+10	0.00025875	0.00283522	10.95736992	2540.96832	60000.00000
10005354.	3.793499E+10	0.00026375	0.00288354	10.93283522	2543.62889	60000.00000
10028467.	3.731523E+10	0.00026875	0.00293197	10.90965235	2546.72774	60000.00000
10051398.	3.671744E+10	0.00027375	0.00298052	10.88775694	2548.81189	60000.00000
10074140.	3.614041E+10	0.00027875	0.00302920	10.86708677	2549.86517	60000.00000
10096553.	3.558257E+10	0.00028375	0.00307807	10.84782636	2547.96683	60000.00000
10118091.	3.504101E+10	0.00028875	0.00312694	10.82921612	2543.86837	60000.00000
10118091.	3.444456E+10	0.00029375	0.00317250	10.79999936	2540.34907	60000.00000
10125541.	3.389302E+10	0.00029875	0.00322650	10.79999936	2541.08874	60000.00000
10140790.	3.338532E+10	0.00030375	0.00327307	10.77555048	2544.13601	60000.00000
10143215.	3.285252E+10	0.00030875	0.00331667	10.74226534	2546.19493	60000.00000
10144361.	3.233262E+10	0.00031375	0.00336124	10.71311295	2547.89839	60000.00000
10145454.	3.182887E+10	0.00031875	0.00340588	10.68509996	2549.10417	60000.00000
10146499.	3.134054E+10	0.00032375	0.00345059	10.65818346	2549.80560	60000.00000
10147471.	3.086683E+10	0.00032875	0.00349539	10.63237846	2549.62026	60000.00000
10148277.	3.040682E+10	0.00033375	0.00354041	10.60795748	2546.72406	60000.00000
10149055.	2.996031E+10	0.00033875	0.00358547	10.58440125	2543.81930	60000.00000
10149807.	2.952671E+10	0.00034375	0.00363058	10.56167328	2540.90592	60000.00000
10150530.	2.910546E+10	0.00034875	0.00367573	10.53973925	2537.98385	60000.00000
10151892.	2.829796E+10	0.00035875	0.00376620	10.49813068	2537.52280	60000.00000
10153137.	2.753393E+10	0.00036875	0.00385688	10.45933735	2542.87508	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 10060.49769 in-kip

The analysis ended normally.

ATTACHMENT 4



Property Information

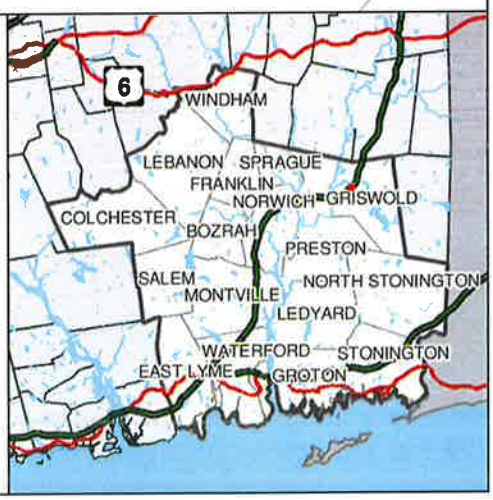
Property ID	58-28-71-1.2
Location	257 NORMAN RD
Owner	NORMAN ERNEST R

SCCOG Southeastern Connecticut Council of Governments Geographic Information System

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

The Town makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Parcels updated October 1, 2013



Town of Griswold, CT
Tax Assessor

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Owner and Parcel Information

Owner Name	NORMAN ERNEST R	**Today's Date**	December 19, 2016
Mailing Address	257 NORMAN RD GRISWOLD, CT 06351	**Parcel ID**	6250 (Account #: N0299500)
		Subdivison	
Location Address	257 NORMAN RD	**Census Tract**	7091
Map / Block / Lot	28 / 71 / 1.2	**Acreage**	0.92
Use Class / Description	1010 SINGLE FAMILY	**Parcel Map**	
Assessing Neighborhood	0050A	**Utilities**	Well,Septic

Current Appraised Value Information

Building Value	XF Value	OB Value	Land Value	Special Land Value	Total Appraised Value	Net Appraised Value	Current Assessment
$ 221,600	$ 0	$ 0	$ 53,000		$ 274,600	$ 274,600	$ 192,220

Assessment History

Year	Building	OB/Misc	Land	Total Assessment
Current	$ 155,120	0	$ 37,100	$ 192,220
2016	$ 155,120	0	$ 37,100	$ 192,220
2015	$ 165,270	0	$ 38,780	$ 204,050

Land Information

Use	Class	Zoning	Area	Value
SINGLE FAMILY	R	R60	0.92 AC	$ 53,000

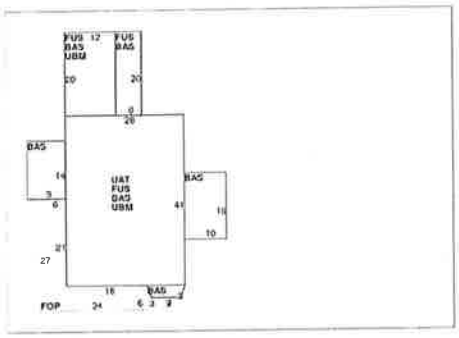
Residential Building Information

Style	Year Built	Eff Year Built	Living Area	Stories	Grade	Exterior Wall	Interior Wall
Antique	1796	1977	3,326	2 Stories	Good +	Clapboard	Plastered and Drywall/Sheet
Roof Cover	**Roof Structure**	**Floor Type**	**Heat Type**	**Heat Fuel**	**AC**	**Bedrooms/Full Baths/Half Baths/Total Rooms**	
Asph/F Gls/Cmp	Gable	Hardwood and Carpet	Oil	Steam	None	5 / 2 / 0 / 14	

Building Sub Areas

Code	Description	Living Area	Gross Area	Effective Area
BAS	First Floor	1,818	1,818	
FOP	Porch, Open	0	270	
FUS	Upper Story, Finished	1,508	1,508	
UAT	Attic, Unfinished	0	1,148	
UBM	Basement, Unfinished	0	1,388	
	Totals	**3,326**	**6,132**	**3,871**

Building Sketch Enlarge



Building Photo Enlarge

Out Buildings / Extra Features

Description	Sub Description	Area	Year Built	Value
	No Out Building/Misc Information available for this parcel.			

Sale Information

Sale Date	Sale Price	Deed Book/Page	Sale Qualification	Reason	Vacant or Improved	Owner
08/02/2006		294/ 148	Unqualified	Probate Certificate	Improved	NORMAN ERNEST R
01/10/1991		00138/0279	Unqualified			NORMAN ETHEL
00/00/0000			Unqualified			NORMAN GEORGE E
00/00/0000			Unqualified			NORMAN GEORGE E

Permit Information

Permit ID	Issue Date	Type	Description	Amount	Inspection Date	% Complete	Date Complete	Comments
203-16	11/05/2015	MN	MAINTENANCE	$ 15,000		100		REPLACE EXISITING ANTENNA PANELS AND ADD REMOTE RADIO HEADS ON EXITING CELL TOWER
58-15	09/10/2014	MN	MAINTENANCE	$ 2,150		100	12/01/2015	290-16 CC LINER FOR A BOILER FLU
39-15	08/14/2014	MN	MAINTENANCE	$ 15,000		0		CELL TOWER

235-06	02/28/2005	RN	RE-ROOF	$ 8,000		100	10/04/2006	FINAL INSP
360-01	03/07/2002		ROOFING		08/21/2002	100	08/21/2002	COMPCO
127-97	11/12/1997		REROOF		01/12/1998	100	01/12/1998	127-97 CO

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