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Hartford, CT 06103-3597
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Direct (860) 275-8345

Also admitted in Massachusetts

February 14, 2014

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

Re: **Request of Cellco Partnership d/b/a Verizon Wireless for an Order to Approve the Shared Use of an Existing Tower at 20 Barnabas Road, Newtown, Connecticut**

Dear Ms. Bachman:

Pursuant to Connecticut General Statutes ("C.G.S.") §16-50aa, as amended, Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby requests an order from the Connecticut Siting Council ("Council") to approve the shared use by Cellco of an existing telecommunications tower, owned by the Connecticut Light and Power Company ("CL&P"), at 20 Barnabas Road in Newtown, Connecticut (the "Property"). Cellco requests that the Council find that the proposed shared use of the CL&P tower satisfies the criteria of C.G.S § 16-50aa and issue an order approving the proposed shared use. A copy of this letter is being sent to Newtown's First Selectwoman E. Patricia Llodra. The Property is owned by CL&P.

Background

The existing CL&P facility consists of a 180-foot self-supporting lattice tower adjacent to an existing CL&P office building. The tower is currently being shared by T-Mobile at the 150-foot level, AT&T at the 136-foot level and Sprint at the 95-foot level. CL&P also maintains several dish and whip antennas at various heights near the top of the tower. Equipment associated with the wireless carriers' antennas is located on the ground to the east of the tower site.

Cellco is licensed by the Federal Communications Commission ("FCC") to provide wireless services throughout the State of Connecticut. Cellco and CL&P have agreed to the proposed shared use of the 20 Barnabas Road tower pursuant to mutually acceptable terms and conditions, and CL&P has authorized Cellco to apply for all necessary permits and approvals that may be required to share the existing tower. (*See* Owner's authorization letter included in Attachment 1).

Cellco proposes to install twelve (12) antennas at the 126-foot level on the tower. Cellco will also install six (6) remote radio heads (RRHs) behind its antennas. Equipment associated with Cellco's antennas and a natural gas-fired emergency generator will be located inside Cellco's 12' x 30' shelter located on the ground to the east of the CL&P building. Included in Attachment 2 are Cellco's Project Plans showing the location of all proposed site improvements.

C.G.S. § 16-50aa(c)(1) provides that, upon written request for approval of a proposed shared use, "if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the council shall issue an order approving such shared use." Cellco respectfully submits that the shared use of the tower satisfies these criteria.

A. Technical Feasibility. The existing tower is structurally capable of supporting Cellco's antennas and related equipment. The proposed shared use of this tower is, therefore, technically feasible. A Structural Analysis Report verifying the structural integrity of the tower, and its ability to support Cellco's antennas and related equipment is included in Attachment 3.

B. Legal Feasibility. Under C.G.S. § 16-50aa, the Council has been authorized to issue orders approving the shared use of an existing tower such as the CL&P tower in Newtown. This authority complements the Council's prior-existing authority under C.G.S. § 16-50p to issue orders approving the construction of new towers that are subject to the Council's jurisdiction. In addition, § 16-50x(a) directs the Council to "give such consideration to other state laws and municipal regulations as it shall deem appropriate" in ruling on requests for the shared use of existing tower facilities. Under the statutory authority vested in the Council, an order by the Council approving the requested shared use would permit the Applicant to obtain a building permit for the proposed installations.

C. Environmental Feasibility. The proposed shared use of the CL&P tower would have a minimal environmental effect, for the following reasons:

1. The proposed installation of twelve (12) antennas and related RRHs at the 126-foot level on the existing 180-foot tower would have an insignificant incremental visual impact on the area around the existing tower. Cellco would install its proposed shelter in a cleared area adjacent to other wireless carrier equipment and equipment associated with the CL&P building. Ground disturbance, for the installation of the concrete pad associated with the shelter, will be minimal and would not require the removal of any trees. Cellco's shared use of this tower would therefore, not cause any significant change or alteration in the physical or environmental characteristics of the Property.

2. Noise associated with the equipment shelter's air conditioning ("A/C") units was evaluated for compliance with State and/or local noise standards. According to the Noise Compliance Study included in Attachment 4, noise from the shelter's A/C units will not exceed State and/or local noise limits. Noise associated with Cellco's emergency back-up generator is exempt from State and local noise standards.

3. Operation of Cellco's antennas at this site would not exceed the RF emissions standards adopted by the Federal Communications Commission ("FCC"). Included in Attachment 5 of this filing is a worst-case Radio Frequency ("RF") emissions calculation that demonstrates that the existing CL&P, T-Mobile, AT&T and Sprint antennas together with the proposed Cellco antennas will operate well within the FCC guidelines for RF emissions.

4. Under ordinary operating conditions, the proposed installation would not require the use of any water or sanitary facilities and would not generate air emissions or discharges to water bodies or sanitary facilities. After construction is complete the proposed installations would not generate any increased traffic to the CL&P facility other than periodic (monthly) maintenance visits to the cell site.

The proposed shared use of the CL&P facility would, therefore, have a minimal environmental effect, and is environmentally feasible.

D. Economic Feasibility. As previously mentioned, CL&P and Cellco have entered into a lease for the shared use of the existing tower on mutually agreeable terms. The proposed tower sharing is, therefore, economically feasible. (*See* Attachment 1).

E. Public Safety Concerns. As discussed above, the tower is structurally capable of supporting Cellco's full array of twelve (12) antennas, RRHs and related equipment. Cellco is not aware of any public safety concerns relative to the proposed sharing of the existing CL&P tower. In fact, the provision of new and improved wireless service through shared use of the existing tower is expected to enhance the safety and welfare of area residents and members of the general public traveling in and through the Town of Newtown.

Conclusion

For the reasons discussed above, the proposed shared use of the existing CL&P tower at 20 Barnabas Road in Newtown satisfies the criteria stated in C.G.S. § 16-50aa and advances the General Assembly's and the Council's goal of preventing the unnecessary proliferation of towers in Connecticut. The Applicant, therefore, respectfully requests that the Council issue an order approving the proposed shared use of the CL&P tower.

Thank you for your consideration of this matter.

Very truly yours,

Kenneth C. Baldwin

Enclosures
Copy to:
E. Patricia Llodra, First Selectwoman
Barbara Oakley, CFM, Northeast Utilities
Sandy M. Carter

ATTACHMENT 1

Northeast
Utilities System

107 Selden Street, Berlin, CT 06037

Northeast Utilities Service Company
P.O. Box 270
Hartford, CT 06141-0270
(860) 665-5000

January __, 2014

Cellco Partnership d/b/a Verizon Wireless
C/o James Smith
99 East River Drive, 9th Floor
East Hartford, CT 06108

Re: Connecticut Siting Council
New Britain, CT
20 Barnabus, Road, Newtown, CT

Dear Mr. Smith,

Authorization is hereby given to Cellco Partnership d/b/a Verizon Wireless and its employees and its duly authorized agents and independent contractors (hereinafter collectively referred to as "Verizon"), to apply for any and all local municipal, state and federal licenses, permits and approvals, including but not limited to Connecticut Siting Council, building permits, zoning variances, zoning special exceptions, site plan and subdivision approvals, driveway, wetlands and terrain alteration permits, which are or may be necessary or required for Verizon to construct, operate and maintain a wireless communications system, and/or antenna site on the following property over which The Connecticut Light & Power Company (CL&P) has property rights:

20 Barnabus Road
Newtown, Connecticut
Existing Tower Facility

The foregoing authorization is given subject to the following conditions:

1. This authorization shall be nonexclusive. Nothing herein shall prevent or restrict CL&P from authorizing any other person or entity to apply for any similar licenses, permits or approvals to construct, operate and maintain any other communication system or facility of any type on the property at any time.

2. This authorization shall not obligate CL&P to pay for or reimburse any costs or expenses or to provide any assistance of any kind in connection with any applications, or bind or obligate CL&P to agree or be responsible for any on-site or off-site improvements, development restrictions, impact fees or assessments, capital improvement charges, bonds or other security, or any other fee, assessment, charge or expense imposed or required as a condition of any license, permit or approval. Verizon shall be solely and fully responsible for all fees, charges costs and expenses of any kind in connection with any applications. CL&P agrees to reasonably cooperate with Verizon in signing such applications or other similar documents as may be required in order for Verizon to apply for any license, permit or approval.

3. This authorization shall not be deemed or construed to grant or transfer to Verizon any interest in the property, whatsoever, and shall not in any respect obligate or require CL&P to sell, lease or license the Property to Verizon or otherwise allow Verizon to use or occupy the property for any purpose, regardless of whether any licenses, permits and approvals applied for by Verizon for the property are granted. Verizon understands and acknowledges that any and all applications filed by Verizon for the property at 20 Barnabus Road, Newtown, Connecticut are done so at Verizon's sole risk and without any enforceable expectation that the property will be made available for Verizon's use.

4. Verizon shall be required to supply to CL&P, free of charge and contemporaneous with Verizon's filing of same, a complete copy of any and all applications, plans, reports and other public filings made by Verizon with any local, municipal, state or federal governmental or regulatory officer, agency board, bureau, commission or other person or body for any licenses, permits or approvals for the property, and to keep CL&P fully informed on a regular basis of the status of Verizon's applications.

5. This authorization shall automatically expire six (6) months after the date of this letter, unless extended in writing by mutual agreement of CL&P and Verizon.

Very truly yours,

Salvatore Giuliano, Manager
Corporate Property Management

AGREED TO on behalf of

_____

By: _____
Duly Authorized TIMOTHY PARKS NETWORK REAL ESTATE

Date: 1/24/14

Site Location: 20 Barnabus Road, Newtown, Connecticut

ATTACHMENT 2

Cellco Partnership

d.b.a. verizon wireless

WIRELESS COMMUNICATIONS FACILITY

NEWTOWN 2

20 BARNABAS ROAD

NEWTOWN, CT 06470

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT **TO:** 20 BARNABAS ROAD, NEWTOWN, CONNECTICUT

1. Head east on E River Dr toward Darlin St	0.3 mi
2. Turn left to stay on E River Dr	400 ft
3. Take the 1st left onto Connecticut Blvd	0.2 mi
4. Turn left to merge onto I-84	51.2 mi
5. Take exit 9 for CT-25 toward Brookfield	0.3 mi
6. Turn right onto CT-25 N/Newtown Rd	0.1 mi
7. Take the 1st right onto Barnabas Rd, Destination will be on the left	0.5 mi

GENERAL NOTES

1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

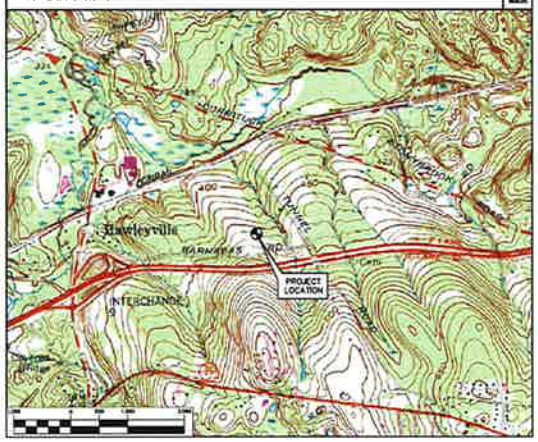
PROJECT SCOPE

1. THE EXISTING NEXTEL SHELTER IS PROPOSED TO BE REMOVED AND REPLACED WITH A ±12'x30' CELLCO PARTNERSHIP EQUIPMENT SHELTER HOUSING A NATURAL GAS FUELED EMERGENCY POWER BACKUP GENERATOR.

2. A TOTAL OF (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED ON AN EXISTING 180' TALL LATTICE TOWER AT A CENTERLINE ELEVATION OF 128' ABOVE TOWER BASE.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	NEWTOWN 2
SITE ADDRESS:	20 BARNABAS ROAD NEWTOWN, CT 06470
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON:	SANDY CARTER CELLCO PARTNERSHIP (860) 503-8219
TOWER COORDINATES:	LATITUDE 41°-25'-40.0" LONGITUDE 73°-20'-37.4" GROUND ELEVATION: 450'± A.M.S.L. COORDINATES & GROUND ELEVATION ARE BASED ON CONNECTICUT SITING COUNCIL DATABASE.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	0
C-1	COMPOUND PLAN AND ELEVATION	0

REV.	DATE	DRAWN BY	CHKD BY	DESCRIPTION
0	02/11/14	CLT	DAD	ISSUED FOR CSC - CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

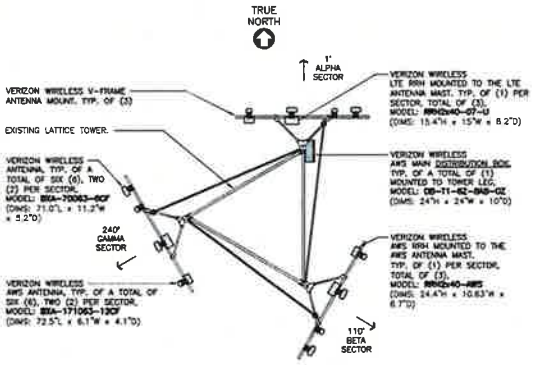
Cellco Partnership d.b.a. Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
NEWTOWN 2
20 BARNABAS ROAD
NEWTOWN, CT 06470

DATE: 02/04/14
SCALE: AS NOTED
JOB NO. 13146.000

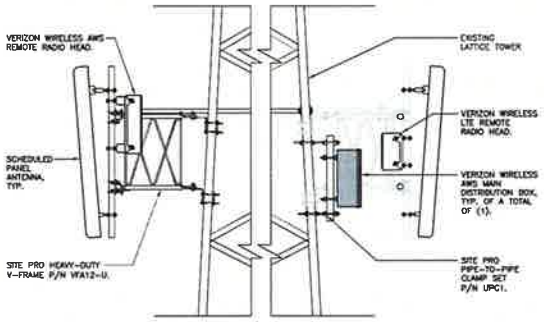
TITLE SHEET

T-1

Sheet No. 1 of 2

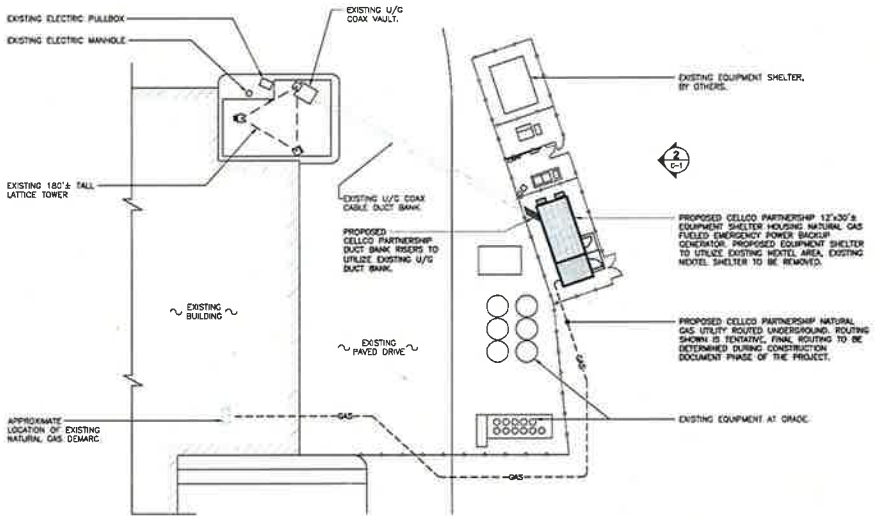


PLAN



ELEVATION

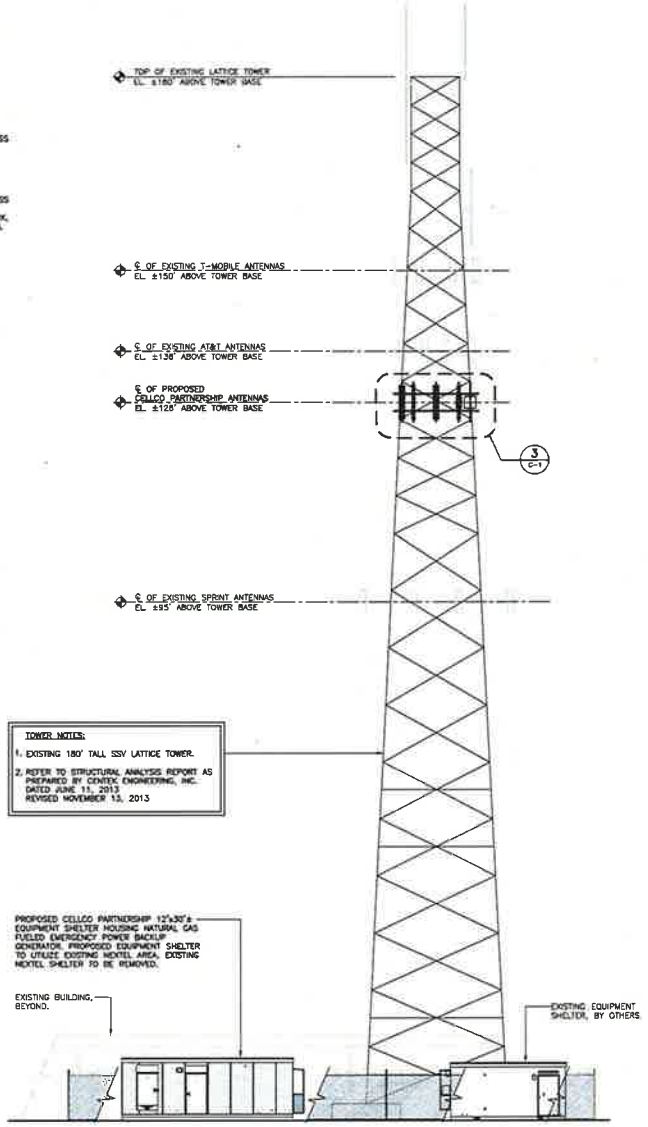
3 C-1 **ANTENNA MOUNTING CONFIGURATION**
NOT TO SCALE



1 C-1 **PARTIAL SITE PLAN**
SCALE: 1" = 20'

APPROXIMATE NORTH

GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.



2 C-1 **EAST ELEVATION**
SCALE: 1" = 10'

GRAPHIC SCALE
(IN FEET)
1 inch = 10 ft.

REV.	DATE	CUT	DRD	ISSUED FOR: DSC - CLIENT REVIEW
0	02/11/14			

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
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www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
NEWTOWN 2
20 BARNABAS ROAD
NEWTOWN, CT 06470

DATE: 02/04/14
SCALE: AS NOTED
JOB NO. 13146.000

COMPOUND PLAN AND ELEVATION

C-1
Sheet No. 2 of 3

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Existing ROHN SSV Lattice Tower

Proposed Antenna Installation

Verizon Site Ref: Newtown 2

20 Barnabas Road
Newtown, CT 06470

Centek Project No. 13118

~~Date: June 11, 2013~~
Rev 1: November 13, 2013

verizonwireless

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon on the existing Northeast Utilities self supporting lattice tower located in Newtown, Connecticut.

The host tower is a 180-ft three legged, tapered steel lattice tower originally designed and manufactured by UNR-ROHN. The tower geometry and structure member sizes were obtained from a tower mapping report prepared by CSB Communications LLC, dated August 22, 2006 and a previous structural analysis and reinforcement design report prepared by Centek Engineering, Inc., for AT&T, project no. 11009.CO6 (Rev. 2), dated November 29, 2011. Foundation information was obtained from the reinforcement design drawings noted in the aforementioned Centek report. Sub-grade information was obtained from a geo-technical soils study prepared by Clarence Welti and Assoc., dated October 19, 2011.

Antenna and appurtenance inventory were obtained from a combination of the aforementioned Centek Engineering, Inc. structural analysis and reinforcement design report, a subsequent structural analysis report prepared by Centek for Sprint, project no. 12047.CO6, dated March 28, 2013 and information provided by Northeast Utilities System.

The existing tower consists of nine (9) tapered steel pipe leg sections conforming to ASTM A572-50. Diagonal lateral support bracing consists of single angle steel sections conforming to ASTM A36. All tower connections are bolted. The width of the tower face is 8.56-ft at the top and 24.86-ft at the base.

Verizon Wireless proposes the installation of twelve (12) panel antennas, six (6) Remote Radio Heads, (RRH's) and one (1) surge arrestor mounted on three (3) 12-ft 6in. Heavy Duty V Frames. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing tower supports several communication antennas. The existing and proposed loads considered in the analysis consist of the following:

- NEU (Existing):
  Antenna: One (1) RFS PD220 Omni-directional whip antenna pipe mounted to the top of the existing tower with a RAD center elevation of ±191-ft above the tower base.
  Coax Cable: One (1) 7/8" ∅ coax cable running on the face of the existing tower as specified in Section 3 of this report.
- NEU (Existing):
  Antenna: One (1) 8-ft Omni-directional whip antenna mounted to the top of the existing tower with a RAD center elevation of ±189-ft above the tower base.
  Coax Cable: One (1) 1/2" ∅ coax cable running on the face of the existing tower as specified in Section 3 of this report.

- MUNICIPAL (EXISTING):
  Antenna: One (1) 10-ft 2 Bay dipole antenna mounted to the top of the existing tower with a RAD center elevation of ±188-ft above the tower base.
  Coax Cable: One (1) 1/2" ∅ coax cable running on the face of the existing tower as specified in Section 3 of this report.
- NEU (Existing):
  Antenna: One (1) 6-ft Microwave dish antenna mounted to the leg of the existing tower with a RAD center elevation of ±180-ft above the tower base.
  Coax Cable: One (1) EW63 elliptical coax cable running on the face of the existing tower as specified in Section 3 of this report.
- NEU (Existing):
  Antenna: One (1) 12-ft 2 Bay Dipole antenna mounted to the leg of the existing tower with a RAD center elevation of ±176-ft above the tower base.
  Coax Cable: One (1) 1/2" ∅ coax cable running on the face of the existing tower as specified in Section 3 of this report.
- NEU (Existing):
  Antenna: Two (2) Andrew DB586 Omni-directional whip antennas (one upright, one inverted) and one (1) TTA mounted to the leg of the existing tower on a 3-ft stand-off with a RAD center elevation of ±160-ft above the tower base.
  Coax Cable: Two (2) 7/8" ∅ coax cables running on the face of the existing tower as specified in Section 3 of this report.
- T-MOBILE (Existing):
  Antennas: Three (3) EMS RR-90-17-00DP panel antennas and six (6) TMA's mounted on three (3) 3-ft side arms with a RAD center elevation of ±149-ft above the tower base.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the leg of the existing tower as specified in Section 3 of this report.
- MUNICIPAL (Existing):
  Antenna: One (1) 10-ft 2 Bay Dipole antenna mounted on one (1) 3-ft side arm with a RAD center elevation of ±144-ft above the tower base.
  Coax Cable: One (1) 7/8" ∅ coax cable running on the face of the existing tower as specified in Section 3 of this report.
- AT&T (Existing):
  Antennas: Three (3) P65-16-XLH-RR panel antennas, three (3) Kathrein 800-10121 panel antennas and six (6) Powerwave LGP21401 TMA's mounted on three (3) SitePro1 10-ft Lightweight T-Arms with a RAD center elevation of 135-ft above the tower base.
  Radios: Six (6) Ericsson Remote Radio Units, Part No. RRUS-11 mounted to three (3) faces of the existing tower at a RAD center elevation of 135-ft above the tower base.
  Surge Arrestor: One (1) Raycap DC6-48-60-18-8F Surge Arrestor mounted to the leg of the existing tower with a RAD center elevation of 135-ft above the tower base.
  Coax Cables: Nine (9) 1-5/8" ∅ coax cables and one (1) 5/8" ∅ fiber optic cable and two (2) #8 DC control cables running within one (1) 3" ∅ flex conduit running on the leg of the existing tower as specified in Section 3 of this report.

- **NEU (Existing to Remove):**
  Antenna: One (1) 12-ft Folded Dipole antenna mounted to the leg of the existing tower with a RAD center elevation of ±117.5-ft above the tower base.
  Coax Cable: One (1) 1/2" Ø coax cable running on the face of the existing tower as specified in Section 3 of this report.
- **SPRINT/NEXTEL (Existing to Remove):**
  Antennas: Twelve (12) Andrew/Decibel DB844H90EX-Y panel antennas mounted on three (3) existing 12-ft frame mounts with RAD center elevation of ±106-ft above the tower base.
  Coax Cables: Twelve (12) 1-5/8" Ø coax cables running on the face of the existing tower as specified in Section 3 of this report.
- SPRINT (Existing):
  Antennas: One (1) GPS antenna mounted on one (1) 1-ft side arm with RAD center elevation of ±62-ft above the tower base.
  Coax Cables: One (1) 1/2" Ø coax cable running on the leg of the existing tower as specified in Section 3 of this report.
- *SPRINT (Reserved – Interim configuration):*
  Antennas: *Four (4) Andrew/Decibel DB980F90E-M, two (2) Andrew/Decibel DB950G65E-M panel antennaS, two (2) RFS APXVSPP18-C-A20 panel antennas, one (1) Powerwave P40-16-XLPP-RR-A panel antenna, three (3) 1900MHz 4X45W RRH's and three (3) 800MHz 2X50W RRH's mounted on three (3) existing 10-ft boom gates with a RAD center elevation of ±91-ft above the tower base.*
  Coax Cables: Six (6) 1-5/8" Ø coaxial cables and three (3) 1-1/4"Ø Hybriflex cables running on the leg of the existing tower as specified in Section 3 of this report.
- *SPRINT (Reserved – Final configuration):*
  Antennas: Two (2) RFS APXVSPP18-C-A20 panel antennas, one (1) Powerwave P40-16-XLPP-RR-A panel antenna, three (3) 1900MHz 4X45W RRH's and three (3) 800MHz 2X50W RRH's mounted on three (3) existing 10-ft boom gates with a RAD center elevation of ±91-ft above the tower base.
  Coax Cables: Three (3) 1-1/4"Ø Hybriflex cables running on the face of the existing tower as specified in Section 3 of this report.

> *Note 1: All existing SPRINT equipment shall be removed upon the successful completion of the testing of the proposed equipment. The removal the existing SPRINT equipment shall be completed within a time frame acceptable to NEU.*

- **VERIZON (Proposed):**
  Antennas: Six (6) Antel BXA-70063-6CF panel antennas, six (6) Antel BXA-171063-12CF panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads, three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads mounted to three (3) 12ft-6in. Heavy Duty V-Frames (Site PRO1 P/NVFA12 with a RAD center elevation of 123-ft above the tower base.
- **VERIZON (Proposed):**
  Misc Equipment: One (1) RFS DB-T1-6Z-8AB-0Z main distribution box flush mounted to the leg of the existing tower with a RAD center elevation of 123-ft above the tower base.
  Coax Cables: Two (2) 1-5/8" Ø Hybriflex fiber lines running on the East face of the existing tower adjacent to the existing municipal cables, as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- **All coax cables routed as specified in Section 3 of this report.**
- **All calculations were performed using the interim configuration for Sprint's antenna loading.**
- **All reinforcements included within the structural reinforcement and modification design documents prepared by Centek Engineering, Inc., for AT&T; Centek Job No. 11009.CO6 and Bulletin #3 dated January 8, 2013 must be completed prior to Verizon's antenna installation.**

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower legs, and the model assumes that the leg members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for 85mph basic wind speed (fastest mile) with no ice and 85mph with ½ inch accumulative ice to determine stresses in members as per guidelines of Northeast Utilities Substation Standard (NU SUB-090), TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice tower structure and its components.

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	NU SUB-090; v = 85 mph (fastest mile)	*[Northeast Utilities Substation Standard 090]*
	Newtown; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	NU–SUB-090 wind speed controls	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design.	*[Northeast Utilities Substation Standard 090]*
	Load Case 2; 85 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. This load case typically controls the design of lattice towers.	*[Northeast Utilities Substation Standard 090]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

The tower deflection was evaluated with a wind velocity of 85 mph concurrent with 0.5" ice to determine twist (rotation) and sway (deflection) in accordance with NU SUB-90 requirements.

- Calculated stresses **with the proposed reinforcements outlined in section 4 of this report** were found to be within allowable limits. In Load Case 2, per tnxTower "Section Capacity Table", this tower was found to be at **87.5%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T10)	3'-0"- 23'-0"	77.8%	**PASS**
Diagonal (T6)	63'-0"- 83'-0"	87.5%	**PASS**
Diagonal (T2)	143'-0"- 163'-0"	86.3%	**PASS**
Diagonal (T3) (Bolt to Member Bearing)	123'-0"- 143'-0"	74.9%	**PASS**
Diagonal (T7) (Bolt Shear)	43'-0"- 63'-0"	84.4%	**PASS**
Secondary Horizontal (T10)	3'-0"- 23'-0"	82.5%	**PASS**

- The tower combined deflection is **0.5370 degrees**.

Deflection Criteria	Proposed (degrees)	Allowable (degrees)	Result
Sway (Tilt)	0.5370	0.5	**n/a**
Twist	0.0280	0.5	**n/a**
Combined	0.5377	0.5	**PASS** (2)

Note 2: *Under the proposed Load Case 2 above the tower marginally exceeds NU-SUB-90 limitation of 0.5 degrees. Tower deflection is subject to NEU approval.*

Foundation and Anchors

The existing foundation system consists of three (3) 2-ft 6in square reinforced concrete piers on three (3) 10-ft square x 2-ft deep reinforced concrete pads concentrically bearing on the existing sub grade, with subsequent mass concrete reinforcement located at grade. The existing foundation geometry was obtained from the aforementioned foundation reinforcement design documents prepared by Centek for AT&T. The sub-grade conditions used in the analysis of the existing foundation were obtained from a geo-technical soil study prepared by Clarence Welti and Assoc., dated October 19, 2011. The tower legs are connected to the foundation with (6) 1.00"Ø, ASTM A-449 (Fu = 120ksi) anchor bolts per leg.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

- The tower reactions developed from the governing Load Case 2 were used in the verification of the foundation and anchor bolts:

Load Effect	Proposed Tower Reactions
Leg Shear	31 kips
Leg Compression	246 kips
Leg Tension	191 kips
Base Moment	4873 ft-kips
Base Shear	54 kips

- The anchor bolts were found to be within allowable limits.

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	73.2%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[4]	Proposed Loading (FS)[3]	Result
(Existing Conditions)	Overturning	2.00	2.68	**PASS**

Note 3: FS denotes Factor of Safety

Conclusion

This analysis shows that the subject tower **with the proposed reinforcement detailed in section 4 of this report is adequate** to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by Northeast Utilities and Verizon. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Jason R. Mead
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

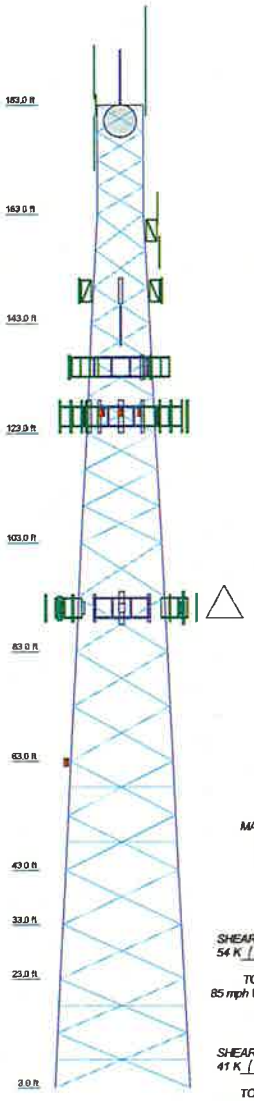
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly RISA Tower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Sec. Horizontals	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	P2.5x.203		L3.3/4x3.3/4x3/16		L2 1/2x2 1/2x3/16		8.5@		
T2	P2.5x.276		L2x2x1/8					4 @ 5	
T3	P3x.216		L2 1/2x2 1/2x3/16				10 @		
T4	P4x.337		L2 1/2x2 1/2x5/16				12.5@		
T5	P5x.258	A572-50	A	A36	N.A.		14.7@	9 @ 6.66667	
T6	P5x.375		L3 1/2x3 1/2x1/4				16.7@		
T7			L3 1/2x3 1/2x3/8			L3 1/2x3 1/2x1/4	18.7@		
T8	P8x.432		L4x4x3/8			N.A.	20.8@	10 @ 10	
T9							21.6@		
T10			L4x4x1/2			L4x4x1/2	22.8@		



MAX. CORNER REACTIONS AT BASE:
DOWN: 246 K
UPLIFT: -191 K
SHEAR: 31 K

AXIAL 58 K
SHEAR 54 K *MOMENT 4873 kip-ft*
TORQUE 8 kip-ft
85 mph WIND - 0.5000 in ICE

AXIAL 38 K
SHEAR 41 K *MOMENT 3738 kip-ft*
TORQUE 12 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PD220 (NU)	191	BXA-70063/6CF (VZW - proposed)	128
2' Dia 8' Omni (NU)	188	BXA-70063/6CF (VZW - proposed)	126
10' 2 Bay Dipole (Municipal)	186	BXA-70063/6CF (VZW - proposed)	125
3'x2.5" Pipe Mount (NU)	183	BXA-70063/6CF (VZW - proposed)	125
4'x4" Pipe Mount (NU)	183	BXA-70063/6CF (VZW - proposed)	125
6'x4" Pipe Mount (NU Dish)	180	BXA-70063/6CF (VZW - proposed)	125
6 FT DISH (NU)	180	BXA-171063-12CF (VZW - proposed)	125
12' Dipole (NU)	176	BXA-171063-12CF (VZW - proposed)	125
DB586-Y (NEU)	164	BXA-171063-12CF (VZW - proposed)	125
3' Standoff (NEU)	160	BXA-171063-12CF (VZW - proposed)	125
TMA (NEU)	160	BXA-171063-12CF (VZW - proposed)	125
DB586-Y (NEU)	156	BXA-171063-12CF (VZW - proposed)	125
3' Standoff (T-Mobile)	149	RRH2x40-07-U (VZW - proposed)	129
RR90-17-00DP w/Mount Pipe (T-Mobile)	149	RRH2x40-07-U (VZW - proposed)	129
(2) TMA 10"x5"x3" (T-Mobile)	149	RRH2x40-07-U (VZW - proposed)	129
3' Standoff (T-Mobile)	149	RRH2x40-AWS (VZW - proposed)	126
RR90-17-00DP w/Mount Pipe (T-Mobile)	149	RRH2x40-AWS (VZW - proposed)	129
(2) TMA 10"x5"x3" (T-Mobile)	149	RRH2x40-AWS (VZW - proposed)	129
3' Standoff (T-Mobile)	149	DO-T1-6Z-8AB-0Z (VZW - proposed)	126
(2) TMA 10"x5"x3" (T-Mobile)	149	Site Pro Heavy Duty V-Frame (VZW - proposed)	129
RR90-17-00DP w/Mount Pipe (T-Mobile)	149	Site Pro Heavy Duty V-Frame (VZW - proposed)	129
10' 2 Bay Dipole (Municipal)	144	Site Pro Heavy Duty V-Frame (VZW - proposed)	126
3' Standoff (Municipal)	139	(2) DB980F90E-M w/Mount Pipe (Sprint)	91
(2) LPG21401 TMA (ATT)	135	APXV18P18-C-A20 w/ Mount (Sprint - reserved)	91
P65-15-XL w/ mount pipe (ATT)	135	APXV18P18-C-A20 w/ Mount (Sprint - reserved)	91
P65-15-XL w/ mount pipe (ATT)	135	P60-16-XLPP-RR-A w/ Mount (Sprint - reserved)	91
P65-15-XL w/ mount pipe (ATT)	135	FD-RRH 4x45 1900 (Sprint - reserved)	91
(2) RRH (ATT)	135	FD-RRH 4x45 1900 (Sprint - reserved)	91
(2) RRH (ATT)	135	FD-RRH 4x45 1900 (Sprint - reserved)	91
(2) RRH (ATT)	135	FD-RRH 2x50 800 (Sprint - reserved)	91
DC6-48-60-18-8F Surge Arrestor (ATT)	135	FD-RRH 2x50 800 (Sprint - reserved)	91
1015" Site Pro T-Arm (ATT)	135	FD-RRH 2x50 800 (Sprint - reserved)	91
1015" Site Pro T-Arm (ATT)	135	(2) DB1900GB9E-M w/Mount Pipe (Sprint)	91
1015" Site Pro T-Arm (ATT)	135	10' Frame (Sprint)	91
800 10121 (ATT)	135	(2) DB980F90E-M w/Mount Pipe (Sprint)	91
(2) LPG21401 TMA (ATT)	135	10' Frame (Sprint)	91
(2) LPG21401 TMA (ATT)	135	10' Frame (Sprint)	91
800 10121 (ATT)	135	GPS (Sprint)	62
800 10121 (ATT)	135	1' Standoff (Sprint)	62

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	L3X3X3/16 Reinf w/L2.5X2.5X3/16		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

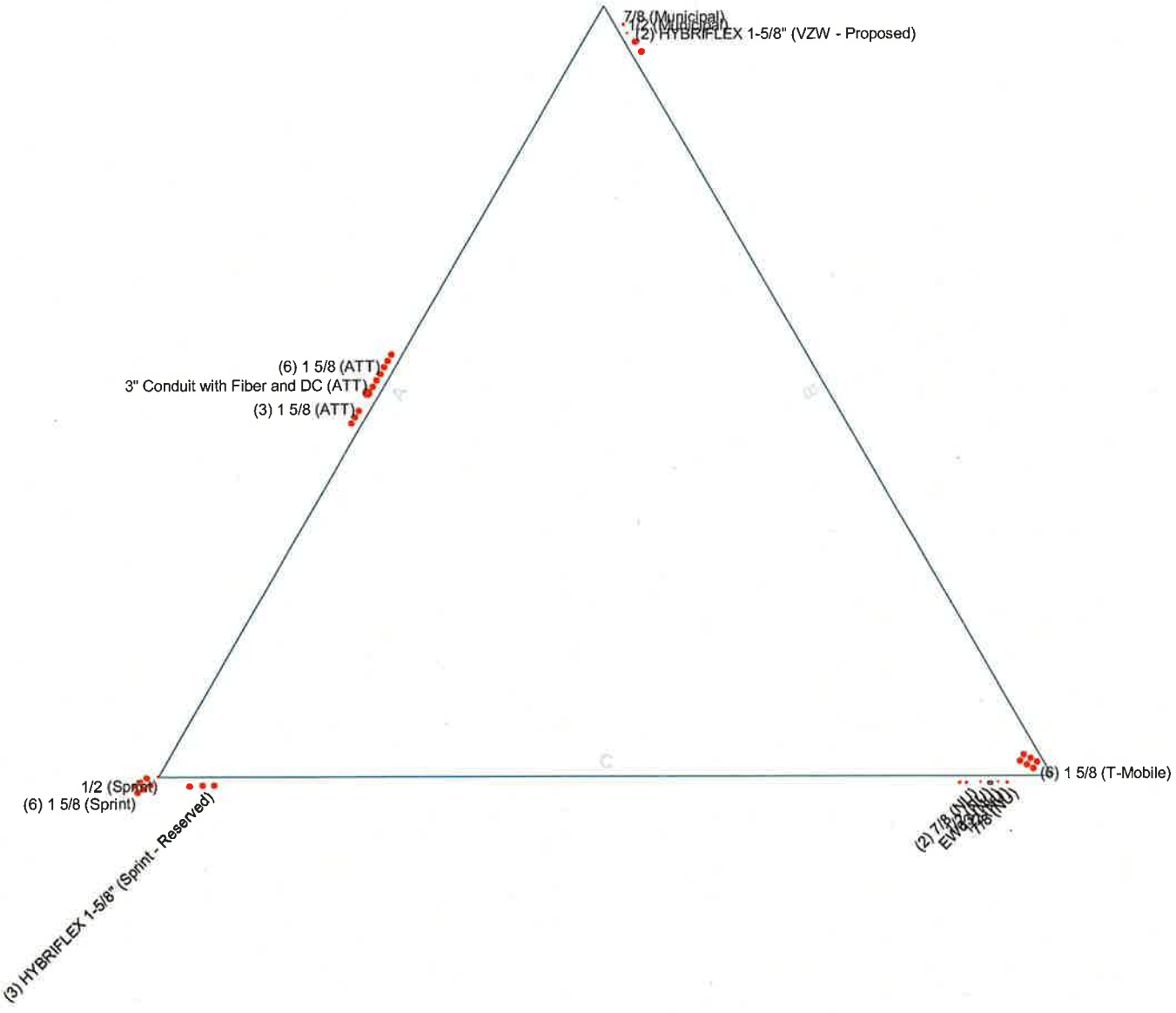
1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 85 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 85 mph wind.
4. Analysis per NU-SUB-090 Standard
5. TOWER RATING: 87.5%

Centek Engineering Inc.
63-2 N. Branford Road
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	13118 – 180-ft Rohn SSV - Newtown 2 - Rev – 1
Project:	20 Barnabas Rd, Newtown, CT
Client: Verizon Wireless	Drawn by: jmm / Appvd:
Code: TIA/EIA-222-F	Date: 11/13/13 / Scale: NTS
Path:	Dwg No.: E-1

Feedline Plan

Round Flat App In Face App Out Face



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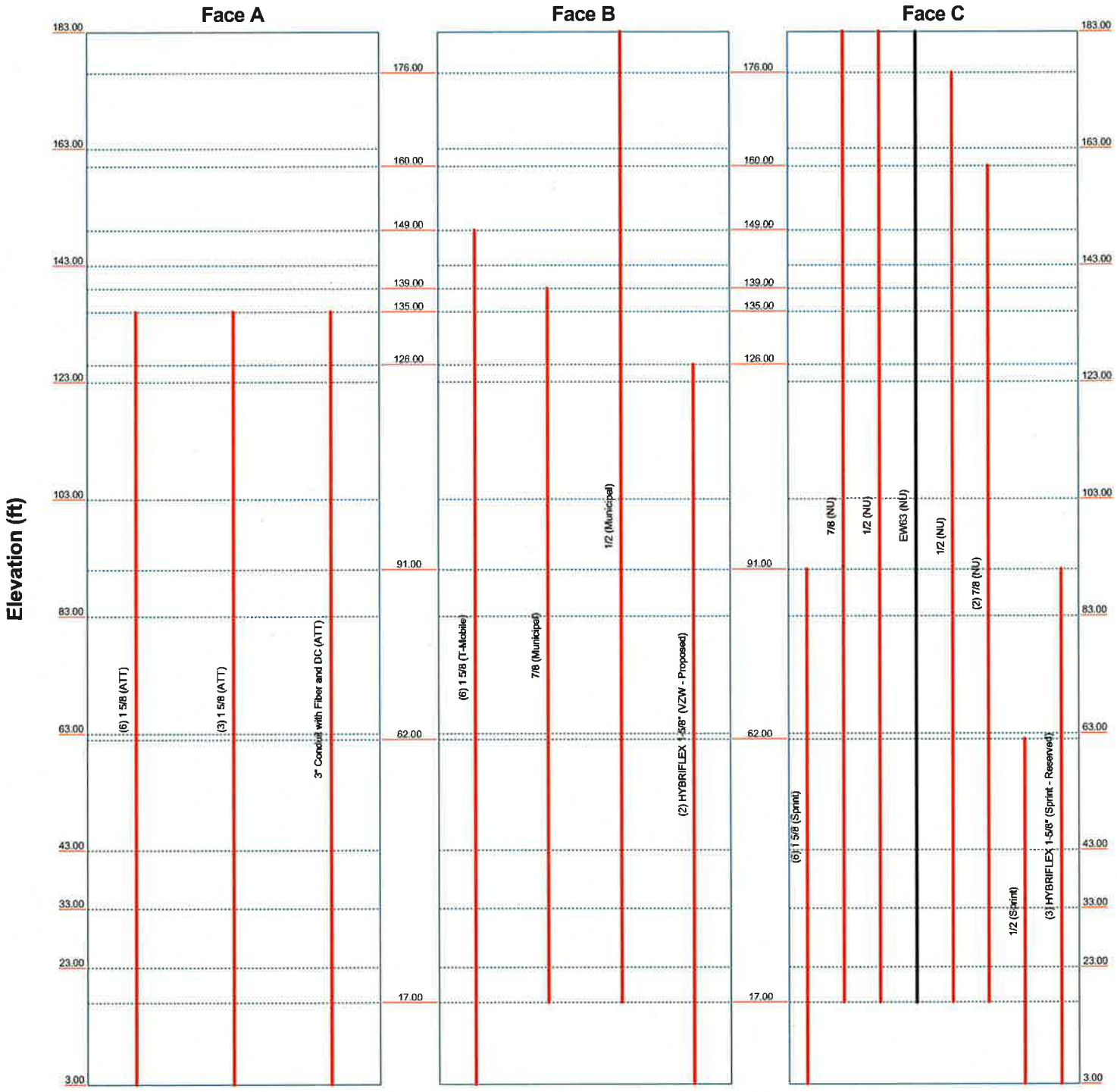
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	***13118 ~ 180-ft Rohn SSV - Newtown 2 - Rev ~ 1***		
Project:	***20 Barnabas Rd, Newtown, CT***		
Client: Verizon Wireless		Drawn by: jrm	App'd:
Code: TIA/EIA-222-F		Date: 11/13/13	Scale: NTS
Path:			Dwg No. E-7

Feedline Distribution Chart
3' - 183'

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



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Phone: (203) 488-0580
FAX: (203) 488-8587

Job: *13118 ~ 180-ft Rohn SSV - Newtown 2 - Rev ~ 1*			
Project: *20 Barnabas Rd, Newtown, CT*			
Client: Verizon Wireless	Drawn by: jrm	App'd:	
Code: TIA/EIA-222-F	Date: 11/13/13	Scale: NTS	
Path:		Dwg No. E-7	

tnxTower	Job	Page
	13118 ~ 180-ft Rohn SSV - Newtown 2 - Rev ~ 1.	1 of 35
Centek Engineering Inc. 63-2 N. Branford Road Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 20 Barnabas Rd, Newtown, CT	Date 10:13:56 11/13/13
	Client Verizon Wireless	Designed by jm

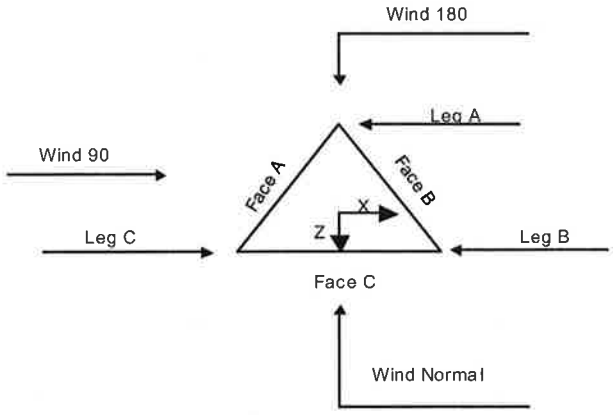
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 183.00 ft above the ground line.
The base of the tower is set at an elevation of 3.00 ft above the ground line.
The face width of the tower is 8.56 ft at the top and 24.86 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 85 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 85 mph.
Analysis per NU-SUB-090 Standard.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	183.00-163.00			8.56	1	20.00
T2	163.00-143.00			8.56	1	20.00
T3	143.00-123.00			10.60	1	20.00
T4	123.00-103.00			12.68	1	20.00
T5	103.00-83.00			14.77	1	20.00
T6	83.00-63.00			16.77	1	20.00
T7	63.00-43.00			18.77	1	20.00
T8	43.00-33.00			20.86	1	10.00
T9	33.00-23.00			21.86	1	10.00
T10	23.00-3.00			22.86	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	183.00-163.00	5.00	X Brace	No	No	0.0000	0.0000
T2	163.00-143.00	6.67	X Brace	No	No	0.0000	0.0000
T3	143.00-123.00	6.67	X Brace	No	No	0.0000	0.0000
T4	123.00-103.00	6.67	X Brace	No	No	0.0000	0.0000
T5	103.00-83.00	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
T6	83.00-63.00	10.00	X Brace	No	No	0.0000	0.0000
T7	63.00-43.00	10.00	X Brace	No	Yes	0.0000	0.0000
T8	43.00-33.00	10.00	X Brace	No	No	0.0000	0.0000
T9	33.00-23.00	10.00	X Brace	No	No	0.0000	0.0000
T10	23.00-3.00	10.00	X Brace	No	Yes	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 183.00-163.00	Pipe	P2.5x.203	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T2 163.00-143.00	Pipe	P2.5x.276	A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T3 143.00-123.00	Pipe	P3x.216	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 123.00-103.00	Pipe	P4x.337	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x5/16	A36 (36 ksi)
T5 103.00-83.00	Pipe	P5x.258	A572-50 (50 ksi)	Arbitrary Shape	L3X3X3/16 Reinf w/L2.5X2.5X3/16	A36 (36 ksi)
T6 83.00-63.00	Pipe	P5x.375	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T7 63.00-43.00	Pipe	P5x.375	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x3/8	A36 (36 ksi)
T8 43.00-33.00	Pipe	P6x.432	A572-50 (50 ksi)	Equal Angle	L4x4x3/8	A36 (36 ksi)
T9 33.00-23.00	Pipe	P6x.432	A572-50 (50 ksi)	Equal Angle	L4x4x3/8	A36 (36 ksi)
T10 23.00-3.00	Pipe	P6x.432	A572-50 (50 ksi)	Equal Angle	L4x4x3/8	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 183.00-163.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T7 63.00-43.00	Equal Angle	L3 1/2x3 1/2x1/4	A36	Equal Angle		A36

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T10 23.00-3.00	Equal Angle	L4x4x1/4	(36 ksi) A36 (36 ksi)	Equal Angle		(36 ksi) A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	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
T1 183.00-163.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 163.00-143.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 143.00-123.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 123.00-103.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 103.00-83.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 83.00-63.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T7 63.00-43.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T8 43.00-33.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T9 33.00-23.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T10 23.00-3.00	0.00	0.0000	A36 (36 ksi)	1	1	1	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 Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 183.00-163.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 163.00-143.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 143.00-123.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 123.00-103.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 103.00-83.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 83.00-63.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

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
T7	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
63.00-43.00				1	1	1	1	1	1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
43.00-33.00				1	1	1	1	1	1	1	1	1	1	1	1
T9	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
33.00-23.00				1	1	1	1	1	1	1	1	1	1	1	1
T10	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
23.00-3.00				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 Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
183.00-163.00														
T2	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
163.00-143.00														
T3	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
143.00-123.00														
T4	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
123.00-103.00														
T5	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
103.00-83.00														
T6 83.00-63.00	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 63.00-43.00	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 43.00-33.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 33.00-23.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 23.00-3.00	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 Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T1	Flange	0.6250	4	0.5000	1	0.5000	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0
183.00-163.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T2	Flange	0.7500	4	0.5000	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
163.00-143.00		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T3	Flange	0.8750	4	0.5000	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
143.00-123.00		A325N		A325X		A325N		A325N		A325N		A325N		A325N	

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T4 123.00-103.00	Flange	1.0000 A325N	4	0.5000 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 103.00-83.00	Flange	1.0000 A325N	4	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 83.00-63.00	Flange	1.0000 A325N	4	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 63.00-43.00	Flange	1.0000 A325N	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 43.00-33.00	Flange	0.0000 A325N	0	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 33.00-23.00	Flange	1.0000 A325N	6	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T10 23.00-3.00	Flange	1.0000 A449	6	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	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 plf
1 5/8 (Sprint)	C	No	Ar (Leg)	91.00 - 3.00	0.0000	-0.02	6	3	0.5000	1.9800		1.04
1 5/8 (T-Mobile)	B	No	Ar (Leg)	149.00 - 3.00	0.0000	0.03	6	3	0.5000	1.9800		1.04
1 5/8 (ATT)	A	Yes	Ar (CfAe)	135.00 - 3.00	2.0000	0.02	6	6	0.5000	1.9800		1.04
1 5/8 (ATT)	A	Yes	Ar (CfAe)	135.00 - 3.00	2.0000	-0.04	3	3	0.5000	1.9800		1.04
7/8 (Municipal)	B	Yes	Ar (CfAe)	139.00 - 17.00	2.0000	-0.47	1	1	1.1100	1.1100		0.54
1/2 (Municipal)	B	Yes	Ar (CfAe)	183.00 - 17.00	2.0000	-0.46	1	1	0.5800	0.5800		0.25
7/8 (NU)	C	Yes	Ar (CfAe)	183.00 - 17.00	2.0000	-0.45	1	1	1.1100	1.1100		0.54
1/2 (NU)	C	Yes	Ar (CfAe)	183.00 - 17.00	2.0000	-0.44	1	1	0.5800	0.5800		0.25
EW63 (NU)	C	Yes	Af (CfAe)	183.00 - 17.00	2.0000	-0.43	1	1	1.5742	1.5742	5.0668	0.51
1/2 (NU)	C	Yes	Ar (CfAe)	176.00 - 17.00	2.0000	-0.42	1	1	0.5800	0.5800		0.25
7/8 (NU)	C	Yes	Ar (CfAe)	160.00 - 17.00	2.0000	-0.4	2	2	1.1100	1.1100		0.54
1/2 (Sprint)	C	No	Ar (Leg)	62.00 - 3.00	0.0000	0	1	1	0.5800	0.5800		0.25
3" Conduit with Fiber and DC (ATT)	A	Yes	Ar (CfAe)	135.00 - 3.00	2.0000	-0.01	1	1	0.0000	3.0000		1.16
HYBRIFLEX 1-5/8" (Sprint - Reserved)	C	Yes	Ar (CfAe)	91.00 - 3.00	2.0000	0.45	3	3	1.9800	1.9800		1.90
HYBRIFLEX 1-5/8"	B	Yes	Ar (CfAe)	126.00 - 3.00	2.0000	-0.44	2	2	1.9800	1.9800		1.90

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
(VZW - Proposed)												

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	183.00-163.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.967	0.000	0.000	0.000	0.01
		C	3.445	2.624	0.000	0.000	0.03
T2	163.00-143.00	A	0.000	0.000	0.000	0.000	0.00
		B	3.937	0.000	0.000	0.000	0.04
		C	9.898	2.624	0.000	0.000	0.05
T3	143.00-123.00	A	20.820	0.000	0.000	0.000	0.13
		B	13.337	0.000	0.000	0.000	0.15
		C	17.383	2.624	0.000	0.000	0.05
T4	123.00-103.00	A	34.700	0.000	0.000	0.000	0.21
		B	19.317	0.000	0.000	0.000	0.22
		C	17.383	2.624	0.000	0.000	0.05
T5	103.00-83.00	A	38.660	0.000	0.000	0.000	0.21
		B	19.317	0.000	0.000	0.000	0.22
		C	25.303	2.624	0.000	0.000	0.15
T6	83.00-63.00	A	44.600	0.000	0.000	0.000	0.21
		B	19.317	0.000	0.000	0.000	0.22
		C	37.183	2.624	0.000	0.000	0.29
T7	63.00-43.00	A	45.518	0.000	0.000	0.000	0.21
		B	19.317	0.000	0.000	0.000	0.22
		C	38.102	2.624	0.000	0.000	0.30
T8	43.00-33.00	A	22.783	0.000	0.000	0.000	0.11
		B	9.658	0.000	0.000	0.000	0.11
		C	19.075	1.312	0.000	0.000	0.15
T9	33.00-23.00	A	22.783	0.000	0.000	0.000	0.11
		B	9.658	0.000	0.000	0.000	0.11
		C	19.075	1.312	0.000	0.000	0.15
T10	23.00-3.00	A	45.567	0.000	0.000	0.000	0.21
		B	17.345	0.000	0.000	0.000	0.21
		C	32.912	0.787	0.000	0.000	0.26

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	183.00-163.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		2.633	0.000	0.000	0.000	0.02
		C		7.862	3.735	0.000	0.000	0.10
T2	163.00-143.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		4.123	2.480	0.000	0.000	0.11
		C		16.252	6.215	0.000	0.000	0.16
T3	143.00-123.00	A	0.500	9.960	17.360	0.000	0.000	0.33
		B		11.903	8.267	0.000	0.000	0.37
		C		20.783	12.001	0.000	0.000	0.17
T4	123.00-103.00	A	0.500	16.600	28.933	0.000	0.000	0.55

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
		B		21.050	8.267	0.000	0.000	0.49
		C		20.783	12.001	0.000	0.000	0.17
T5	103.00-83.00	A	0.500	18.587	32.240	0.000	0.000	0.55
		B		21.050	8.267	0.000	0.000	0.49
		C		28.730	15.308	0.000	0.000	0.37
T6	83.00-63.00	A	0.500	21.567	37.200	0.000	0.000	0.55
		B		21.050	8.267	0.000	0.000	0.49
		C		40.650	20.268	0.000	0.000	0.67
T7	63.00-43.00	A	0.500	24.068	37.200	0.000	0.000	0.55
		B		21.050	8.267	0.000	0.000	0.49
		C		43.152	20.268	0.000	0.000	0.69
T8	43.00-33.00	A	0.500	12.100	18.600	0.000	0.000	0.27
		B		10.525	4.133	0.000	0.000	0.24
		C		21.642	10.134	0.000	0.000	0.35
T9	33.00-23.00	A	0.500	12.100	18.600	0.000	0.000	0.27
		B		10.525	4.133	0.000	0.000	0.24
		C		21.642	10.134	0.000	0.000	0.35
T10	23.00-3.00	A	0.500	24.200	37.200	0.000	0.000	0.55
		B		16.745	8.267	0.000	0.000	0.45
		C		32.212	17.654	0.000	0.000	0.58

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	183.00-163.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.113	0.075	0.205
		C	0.000	0.520	0.473	0.948
T2	163.00-143.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.080	0.059	0.161
		C	0.000	0.581	0.583	1.162
T3	143.00-123.00	A	0.000	0.788	1.501	1.969
		B	0.000	0.200	0.248	0.500
		C	0.000	0.580	0.729	1.449
T4	123.00-103.00	A	0.000	1.266	2.412	3.165
		B	0.000	0.447	0.655	1.118
		C	0.000	0.559	0.703	1.398
T5	103.00-83.00	A	0.000	0.000	2.270	3.577
		B	0.000	0.000	0.616	1.264
		C	0.000	0.000	0.920	2.048
T6	83.00-63.00	A	0.000	0.871	2.323	3.049
		B	0.000	0.308	0.630	1.077
		C	0.000	0.670	1.339	2.344
T7	63.00-43.00	A	0.000	1.230	3.280	4.304
		B	0.000	0.434	0.890	1.520
		C	0.000	0.945	1.891	3.309
T8	43.00-33.00	A	0.000	0.419	1.277	1.676
		B	0.000	0.148	0.347	0.592
		C	0.000	0.322	0.736	1.288
T9	33.00-23.00	A	0.000	0.416	1.267	1.663
		B	0.000	0.147	0.344	0.587
		C	0.000	0.320	0.731	1.278
T10	23.00-3.00	A	0.000	1.202	3.665	4.809
		B	0.000	0.311	0.786	1.244
		C	0.000	0.553	1.366	2.211

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	183.00-163.00	3.4327	1.7386	4.1619	1.7337
T2	163.00-143.00	7.8347	4.6236	8.3341	4.5416
T3	143.00-123.00	3.4889	0.7217	4.7316	0.8234
T4	123.00-103.00	0.3958	-3.9412	2.5805	-3.5943
T5	103.00-83.00	-3.2620	-1.6229	-0.5269	-1.8396
T6	83.00-63.00	-8.3428	1.6080	-4.8463	1.0369
T7	63.00-43.00	-8.0530	1.8689	-5.1863	1.5879
T8	43.00-33.00	-9.0545	1.9863	-6.0441	1.6860
T9	33.00-23.00	-9.3462	2.0510	-6.2443	1.7372
T10	23.00-3.00	-10.8989	1.1578	-9.3969	0.6937

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
2" Dia 8' Omni (NU)	C	From Leg	0.50 0.00 0.00	0.0000	189.00	No Ice 1/2" Ice	2.00 3.03	2.00 3.03	0.01 0.02
4'x4" Pipe Mount (NU)	C	From Leg	0.25 0.00 0.00	0.0000	183.00	No Ice 1/2" Ice	1.32 1.58	1.32 1.58	0.04 0.06
12' Dipole (NU)	C	From Leg	0.50 0.00 0.00	0.0000	176.00	No Ice 1/2" Ice	3.60 4.83	3.60 4.83	0.04 0.06
10' 2-Bay Dipole (Municipal)	A	From Leg	0.50 0.00 0.00	0.0000	188.00	No Ice 1/2" Ice	1.07 1.71	1.07 1.71	0.01 0.02
3'x2.5" Pipe Mount (NU)	A	From Leg	0.25 0.00 0.00	0.0000	183.00	No Ice 1/2" Ice	0.60 0.79	0.60 0.79	0.02 0.03
6'x4" Pipe Mount (NU Dish)	A	From Leg	0.25 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice	2.09 2.46	2.09 2.46	0.05 0.07
PD220 (NU)	B	From Leg	0.50 0.00 0.00	0.0000	191.00	No Ice 1/2" Ice	3.56 7.13	3.56 7.13	0.02 0.05
3' Standoff (Municipal)	A	From Leg	1.50 0.00 0.00	0.0000	139.00	No Ice 1/2" Ice	2.20 3.30	2.20 3.30	0.06 0.07
10' 2-Bay Dipole (Municipal)	A	From Leg	3.00 0.00 0.00	0.0000	144.00	No Ice 1/2" Ice	1.07 1.71	1.07 1.71	0.01 0.02
3' Standoff (T-Mobile)	C	From Leg	1.50 0.00 0.00	0.0000	149.00	No Ice 1/2" Ice	2.75 3.65	2.75 3.65	0.06 0.07

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
RR90-17-00DP w/Mount Pipe	A	From Leg	3.00	0.0000	149.00	No Ice	4.91	3.64	0.04
			0.00			1/2" Ice	5.57	4.70	0.08
(T-Mobile)			0.00						
(2) TMA 10"x8"x3"	A	From Leg	2.50	0.0000	149.00	No Ice	0.00	0.29	0.02
(T-Mobile)			0.00			1/2" Ice	0.00	0.38	0.02
			0.00						
3' Standoff	B	From Leg	1.50	0.0000	149.00	No Ice	2.75	2.75	0.06
(T-Mobile)			0.00			1/2" Ice	3.65	3.65	0.07
			0.00						
RR90-17-00DP w/Mount Pipe	B	From Leg	3.00	0.0000	149.00	No Ice	4.91	3.64	0.04
			0.00			1/2" Ice	5.57	4.70	0.08
(T-Mobile)			0.00						
(2) TMA 10"x8"x3"	B	From Leg	2.50	0.0000	149.00	No Ice	0.00	0.29	0.02
(T-Mobile)			0.00			1/2" Ice	0.00	0.38	0.02
			0.00						
3' Standoff	C	From Leg	1.50	0.0000	149.00	No Ice	2.75	2.75	0.06
(T-Mobile)			0.00			1/2" Ice	3.65	3.65	0.07
			0.00						
RR90-17-00DP w/Mount Pipe	C	From Leg	3.00	0.0000	149.00	No Ice	4.91	3.64	0.04
			0.00			1/2" Ice	5.57	4.70	0.08
(T-Mobile)			0.00						
(2) TMA 10"x8"x3"	C	From Leg	2.50	0.0000	149.00	No Ice	0.00	0.29	0.02
(T-Mobile)			0.00			1/2" Ice	0.00	0.38	0.02
			0.00						
800 10121	A	From Leg	2.00	0.0000	135.00	No Ice	5.46	3.29	0.05
(ATT)			4.00			1/2" Ice	5.88	3.64	0.08
			0.00						
(2) LPG21401 TMA	A	From Leg	2.00	0.0000	135.00	No Ice	0.95	0.37	0.02
(ATT)			4.00			1/2" Ice	1.09	0.48	0.02
			0.00						
800 10121	B	From Leg	2.00	0.0000	135.00	No Ice	5.46	3.29	0.05
(ATT)			4.00			1/2" Ice	5.88	3.64	0.08
			0.00						
(2) LPG21401 TMA	B	From Leg	2.00	0.0000	135.00	No Ice	0.95	0.37	0.02
(ATT)			4.00			1/2" Ice	1.09	0.48	0.02
			0.00						
800 10121	C	From Leg	2.00	0.0000	135.00	No Ice	5.46	3.29	0.05
(ATT)			4.00			1/2" Ice	5.88	3.64	0.08
			0.00						
(2) LPG21401 TMA	C	From Leg	2.00	0.0000	135.00	No Ice	0.95	0.37	0.02
(ATT)			4.00			1/2" Ice	1.09	0.48	0.02
			0.00						
P65-16-XL w/ mount pipe	A	From Leg	2.00	0.0000	135.00	No Ice	8.40	5.54	0.07
(ATT)			-4.00			1/2" Ice	8.95	6.48	0.12
			0.00						
P65-16-XL w/ mount pipe	B	From Leg	2.00	0.0000	135.00	No Ice	8.40	5.54	0.07
(ATT)			-4.00			1/2" Ice	8.95	6.48	0.12
			0.00						
P65-16-XL w/ mount pipe	C	From Leg	2.00	0.0000	135.00	No Ice	8.40	5.54	0.07
(ATT)			-4.00			1/2" Ice	8.95	6.48	0.12
			0.00						
(2) RRH	A	From Leg	0.00	0.0000	135.00	No Ice	2.94	1.25	0.06
(ATT)			0.00			1/2" Ice	3.17	1.41	0.07
			0.00						
(2) RRH	B	From Leg	0.00	0.0000	135.00	No Ice	2.94	1.25	0.06
(ATT)			0.00			1/2" Ice	3.17	1.41	0.07
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) RRH	C	From Leg	0.00	0.0000	135.00	No Ice	2.94	1.25	0.06
(ATT)			0.00			1/2" Ice	3.17	1.41	0.07
			0.00						
DC6-48-60-18-8F Surge Arrestor	C	From Leg	0.00	0.0000	135.00	No Ice	2.23	2.23	0.02
			0.00			1/2" Ice	2.45	2.45	0.04
(ATT)			0.00						
10'6" Site Pro T-Arm	A	From Leg	1.00	0.0000	135.00	No Ice	4.50	4.50	0.25
(ATT)			0.00			1/2" Ice	5.65	5.65	0.35
			0.00						
10'6" Site Pro T-Arm	B	From Leg	1.00	0.0000	135.00	No Ice	4.50	4.50	0.25
(ATT)			0.00			1/2" Ice	5.65	5.65	0.35
			0.00						
10'6" Site Pro T-Arm	C	From Leg	1.00	0.0000	135.00	No Ice	4.50	4.50	0.25
(ATT)			0.00			1/2" Ice	5.65	5.65	0.35
			0.00						
10' Frame	A	From Leg	2.00	0.0000	91.00	No Ice	17.20	12.50	1.00
(Sprint)			0.00			1/2" Ice	25.00	19.00	1.50
			0.00						
(2) DB980F90E-M w/Mount Pipe	A	From Leg	4.00	0.0000	91.00	No Ice	4.37	3.95	0.03
			0.00			1/2" Ice	4.96	5.04	0.07
(Sprint)			0.00						
10' Frame	B	From Leg	2.00	0.0000	91.00	No Ice	17.20	12.50	1.00
(Sprint)			0.00			1/2" Ice	25.00	19.00	1.50
			0.00						
(2) DB980F90E-M w/Mount Pipe	B	From Leg	4.00	0.0000	91.00	No Ice	4.37	3.95	0.03
			0.00			1/2" Ice	4.96	5.04	0.07
(Sprint)			0.00						
10' Frame	C	From Leg	2.00	0.0000	91.00	No Ice	17.20	12.50	1.00
(Sprint)			0.00			1/2" Ice	25.00	19.00	1.50
			0.00						
(2) DB950G65E-M w/Mount Pipe	C	From Leg	4.00	0.0000	91.00	No Ice	6.89	5.90	0.04
			0.00			1/2" Ice	7.56	7.01	0.10
(Sprint)			0.00						
GPS	C	From Leg	1.00	0.0000	62.00	No Ice	1.00	1.00	0.01
(Sprint)			0.00			1/2" Ice	1.50	1.50	0.01
			0.00						
1' Standoff	C	From Leg	0.50	0.0000	62.00	No Ice	0.25	0.25	0.01
(Sprint)			0.00			1/2" Ice	0.38	0.38	0.01
			0.00						
3' Standoff	B	From Leg	1.50	0.0000	160.00	No Ice	2.75	2.75	0.06
(NEU)			0.00			1/2" Ice	3.65	3.65	0.07
			0.00						
DB586-Y	B	From Leg	3.00	0.0000	164.00	No Ice	1.01	1.01	0.01
(NEU)			0.00			1/2" Ice	1.28	1.28	0.02
			0.00						
DB586-Y	B	From Leg	3.00	0.0000	156.00	No Ice	1.01	1.01	0.01
(NEU)			0.00			1/2" Ice	1.28	1.28	0.02
			0.00						
TMA	B	From Leg	0.00	0.0000	160.00	No Ice	0.78	0.29	0.02
(NEU)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
APXVSPP18-C-A20 w/ Mount	A	From Leg	4.00	0.0000	91.00	No Ice	8.96	8.08	0.12
			0.00			1/2" Ice	9.66	9.14	0.20
(Sprint - reserved)			0.00						
APXVSPP18-C-A20 w/ Mount	B	From Leg	4.00	0.0000	91.00	No Ice	8.96	8.08	0.12
			0.00			1/2" Ice	9.66	9.14	0.20
(Sprint - reserved)			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
P40-16-XLPP-RR-A w/ Mount	C	From Leg	4.00 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	11.73 12.47	6.32 7.27	0.11 0.20
(Sprint - reserved)									
FD-RRH 4x40 1900 (Sprint - reserved)	A	From Face	3.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	2.61 2.84	2.71 2.95	0.06 0.08
FD-RRH 4x40 1900 (Sprint - reserved)	B	From Leg	3.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	2.61 2.84	2.71 2.95	0.06 0.08
FD-RRH 4x40 1900 (Sprint - reserved)	C	From Leg	3.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	2.61 2.84	2.71 2.95	0.06 0.08
FD-RRH 2x50 800 (Sprint - reserved)	A	From Leg	3.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - reserved)	B	From Leg	3.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - reserved)	C	From Leg	3.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
BXA-70063/6CF (VZW - proposed)	A	From Leg	3.50 -6.00 0.00	0.0000	126.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (VZW - proposed)	B	From Leg	3.50 -6.00 0.00	0.0000	126.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (VZW - proposed)	C	From Leg	3.50 -6.00 0.00	0.0000	126.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (VZW - proposed)	A	From Leg	3.50 0.00 0.00	0.0000	126.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (VZW - proposed)	B	From Leg	3.50 0.00 0.00	0.0000	126.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-70063/6CF (VZW - proposed)	C	From Leg	3.50 0.00 0.00	0.0000	126.00	No Ice 1/2" Ice	7.73 8.27	4.16 4.60	0.02 0.06
BXA-171063-12CF (VZW - proposed)	A	From Leg	3.50 -4.00 0.00	0.0000	126.00	No Ice 1/2" Ice	4.79 5.24	3.62 4.06	0.02 0.04
BXA-171063-12CF (VZW - proposed)	B	From Leg	3.50 -4.00 0.00	0.0000	126.00	No Ice 1/2" Ice	4.79 5.24	3.62 4.06	0.02 0.04
BXA-171063-12CF (VZW - proposed)	C	From Leg	3.50 -4.00 0.00	0.0000	126.00	No Ice 1/2" Ice	4.79 5.24	3.62 4.06	0.02 0.04
BXA-171063-12CF (VZW - proposed)	A	From Leg	3.50 4.00 0.00	0.0000	126.00	No Ice 1/2" Ice	4.79 5.24	3.62 4.06	0.02 0.04
BXA-171063-12CF (VZW - proposed)	B	From Leg	3.50 4.00 0.00	0.0000	126.00	No Ice 1/2" Ice	4.79 5.24	3.62 4.06	0.02 0.04
BXA-171063-12CF (VZW - proposed)	C	From Leg	3.50 4.00 0.00	0.0000	126.00	No Ice 1/2" Ice	4.79 5.24	3.62 4.06	0.02 0.04

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
RRH2x40-07-U	A	From Face	0.50	0.0000	126.00	No Ice	2.25	1.23	0.05
(VZW - proposed)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	B	From Face	0.50	0.0000	126.00	No Ice	2.25	1.23	0.05
(VZW - proposed)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	C	From Face	0.50	0.0000	126.00	No Ice	2.25	1.23	0.05
(VZW - proposed)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-AWS	A	From Face	0.50	0.0000	126.00	No Ice	2.52	1.59	0.04
(VZW - proposed)			0.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Face	0.50	0.0000	126.00	No Ice	2.52	1.59	0.04
(VZW - proposed)			0.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	C	From Face	0.50	0.0000	126.00	No Ice	2.52	1.59	0.04
(VZW - proposed)			0.00			1/2" Ice	2.75	1.80	0.06
			0.00						
DB-T1-6Z-8AB-0Z	C	From Face	0.50	0.0000	126.00	No Ice	5.60	2.33	0.04
(VZW - proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
Site Pro Heavy Duty	A	From Leg	1.75	0.0000	126.00	No Ice	15.00	15.00	0.50
V-Frame			0.00			1/2" Ice	20.60	20.60	0.65
(VZW - proposed)			0.00						
Site Pro Heavy Duty	B	From Leg	1.75	0.0000	126.00	No Ice	15.00	15.00	0.50
V-Frame			0.00			1/2" Ice	20.60	20.60	0.65
(VZW - proposed)			0.00						
Site Pro Heavy Duty	C	From Leg	1.75	0.0000	126.00	No Ice	15.00	15.00	0.50
V-Frame			0.00			1/2" Ice	20.60	20.60	0.65
(VZW - proposed)			0.00						

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
6 FT DISH	A	Paraboloid	From	0.50	0.0000		180.00	6.00	No Ice	28.27	0.14
(NU)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.29
				0.00							

Tower Pressures - No Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	173.00	1.605	30	175.992	A	12.975	9.583	9.583	42.48	0.000	0.000
183.00-163.00					B	12.900	10.550		40.87	0.000	0.000
					C	15.126	13.028		34.04	0.000	0.000
T2	153.00	1.55	29	196.398	A	11.385	9.600	9.600	45.75	0.000	0.000
163.00-143.00					B	11.326	13.537		38.61	0.000	0.000
					C	13.426	19.498		29.16	0.000	0.000
T3	133.00	1.489	28	238.641	A	14.865	32.508	11.688	24.67	0.000	0.000
143.00-123.00					B	16.118	25.024		28.41	0.000	0.000
					C	18.260	29.071		24.69	0.000	0.000
T4	113.00	1.421	26	282.010	A	16.163	49.727	15.027	22.81	0.000	0.000
123.00-103.00					B	17.921	34.344		28.75	0.000	0.000
					C	20.497	32.411		28.40	0.000	0.000
T5	93.00	1.345	25	324.683	A	17.779	57.234	18.574	24.76	0.000	0.000
103.00-83.00					B	19.433	37.891		32.40	0.000	0.000
					C	21.753	43.878		28.30	0.000	0.000
T6 83.00-63.00	73.00	1.255	23	364.683	A	20.849	63.174	18.574	22.11	0.000	0.000
					B	22.542	37.891		30.74	0.000	0.000
					C	24.456	55.758		23.16	0.000	0.000
T7 63.00-43.00	53.00	1.145	21	405.584	A	33.293	64.095	18.577	19.08	0.000	0.000
					B	35.683	37.894		25.25	0.000	0.000
					C	37.305	56.679		19.77	0.000	0.000
T8 43.00-33.00	38.00	1.041	19	219.128	A	14.074	33.843	11.060	23.08	0.000	0.000
					B	15.004	20.718		30.96	0.000	0.000
					C	15.926	30.135		24.01	0.000	0.000
T9 33.00-23.00	28.00	1	18	229.128	A	14.660	33.843	11.060	22.80	0.000	0.000
					B	15.584	20.718		30.47	0.000	0.000
					C	16.509	30.135		23.71	0.000	0.000
T10 23.00-3.00	13.00	1	18	488.255	A	45.566	67.687	22.120	19.53	0.000	0.000
					B	48.445	39.465		25.16	0.000	0.000
					C	48.652	55.032		21.33	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	173.00	1.605	30	0.5000	177.658	A	12.975	20.034	12.917	39.13	0.000	0.000
183.00-163.00						B	12.770	22.555		36.57	0.000	0.000
						C	15.763	27.376		29.94	0.000	0.000
T2	153.00	1.55	29	0.5000	198.067	A	11.385	18.632	12.939	43.11	0.000	0.000
163.00-143.00						B	13.704	22.675		35.57	0.000	0.000
						C	16.438	34.302		25.50	0.000	0.000
T3	133.00	1.489	28	0.5000	240.310	A	31.756	30.745	15.027	24.04	0.000	0.000
143.00-123.00						B	24.132	33.276		26.18	0.000	0.000
						C	26.917	41.777		21.88	0.000	0.000
T4	113.00	1.421	26	0.5000	283.679	A	44.344	41.131	18.367	21.49	0.000	0.000
123.00-103.00						B	25.724	46.400		25.47	0.000	0.000
						C	29.179	46.021		24.42	0.000	0.000
T5 103.00-83.00	93.00	1.345	25	0.5000	326.352	A	52.746	40.500	21.913	23.50	0.000	0.000
						B	31.086	42.963		29.59	0.000	0.000
						C	37.344	50.643		24.91	0.000	0.000
T6 83.00-63.00	73.00	1.255	23	0.5000	366.352	A	57.324	49.229	21.913	20.57	0.000	0.000
						B	30.362	49.276		27.52	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	41.097	68.514		19.99	0.000	0.000
T7 63.00-43.00	53.00	1.145	21	0.5000	407.253	A	69.469	55.205	21.916	17.58	0.000	0.000
						B	43.319	52.981		22.76	0.000	0.000
						C	53.532	74.572		17.11	0.000	0.000
T8 43.00-33.00	38.00	1.041	19	0.5000	219.962	A	32.275	28.248	12.729	21.03	0.000	0.000
						B	18.892	26.944		27.77	0.000	0.000
						C	24.196	37.887		20.50	0.000	0.000
T9 33.00-23.00	28.00	1	18	0.5000	229.962	A	32.865	28.396	12.729	20.78	0.000	0.000
						B	19.474	27.090		27.34	0.000	0.000
						C	24.783	38.033		20.26	0.000	0.000
T10 23.00-3.00	13.00	1	18	0.5000	489.924	A	81.622	60.764	25.459	17.88	0.000	0.000
						B	56.254	54.201		23.05	0.000	0.000
						C	64.674	69.426		18.99	0.000	0.000

Tower Pressure - Service

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	173.00	1.605	30	175.992	A	12.975	9.583	9.583	42.48	0.000	0.000
183.00-163.00					B	12.900	10.550		40.87	0.000	0.000
					C	15.126	13.028		34.04	0.000	0.000
T2	153.00	1.55	29	196.398	A	11.385	9.600	9.600	45.75	0.000	0.000
163.00-143.00					B	11.326	13.537		38.61	0.000	0.000
					C	13.426	19.498		29.16	0.000	0.000
T3	133.00	1.489	28	238.641	A	14.865	32.508	11.688	24.67	0.000	0.000
143.00-123.00					B	16.118	25.024		28.41	0.000	0.000
					C	18.260	29.071		24.69	0.000	0.000
T4	113.00	1.421	26	282.010	A	16.163	49.727	15.027	22.81	0.000	0.000
123.00-103.00					B	17.921	34.344		28.75	0.000	0.000
					C	20.497	32.411		28.40	0.000	0.000
T5	93.00	1.345	25	324.683	A	17.779	57.234	18.574	24.76	0.000	0.000
103.00-83.00					B	19.433	37.891		32.40	0.000	0.000
					C	21.753	43.878		28.30	0.000	0.000
T6 83.00-63.00	73.00	1.255	23	364.683	A	20.849	63.174	18.574	22.11	0.000	0.000
					B	22.542	37.891		30.74	0.000	0.000
					C	24.456	55.758		23.16	0.000	0.000
T7 63.00-43.00	53.00	1.145	21	405.584	A	33.293	64.095	18.577	19.08	0.000	0.000
					B	35.683	37.894		25.25	0.000	0.000
					C	37.305	56.679		19.77	0.000	0.000
T8 43.00-33.00	38.00	1.041	19	219.128	A	14.074	33.843	11.060	23.08	0.000	0.000
					B	15.004	20.718		30.96	0.000	0.000
					C	15.926	30.135		24.01	0.000	0.000
T9 33.00-23.00	28.00	1	18	229.128	A	14.660	33.843	11.060	22.80	0.000	0.000
					B	15.584	20.718		30.47	0.000	0.000
					C	16.509	30.135		23.71	0.000	0.000
T10 23.00-3.00	13.00	1	18	488.255	A	45.566	67.687	22.120	19.53	0.000	0.000
					B	48.445	39.465		25.16	0.000	0.000
					C	48.652	55.032		21.33	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.03	0.93	A	0.128	2.853	0.578	1	1	18.518	2.07	103.42	C
183.00-163.00			B	0.133	2.834	0.579	1	1	19.009			
			C	0.16	2.735	0.583	1	1	22.722			
T2	0.09	0.81	A	0.107	2.937	0.576	1	1	16.913	2.16	107.98	C
163.00-143.00			B	0.127	2.859	0.578	1	1	19.153			
			C	0.168	2.708	0.584	1	1	24.820			
T3	0.33	1.20	A	0.199	2.601	0.59	1	1	34.047	2.84	142.22	C
143.00-123.00			B	0.172	2.691	0.585	1	1	30.761			
			C	0.198	2.602	0.59	1	1	35.414			
T4	0.48	2.27	A	0.234	2.487	0.598	1	1	45.892	3.36	168.20	A
123.00-103.00			B	0.185	2.646	0.588	1	1	38.098			
			C	0.188	2.638	0.588	1	1	39.552			
T5	0.58	3.33	A	0.231	2.496	0.597	1	1	51.961	3.61	180.73	A
103.00-83.00			B	0.177	2.676	0.586	1	1	41.633			
			C	0.202	2.589	0.591	1	1	47.677			
T6	0.72	2.66	A	0.23	2.498	0.597	1	1	58.569	3.80	190.24	A
83.00-63.00			B	0.166	2.715	0.584	1	1	44.670			
			C	0.22	2.531	0.595	1	1	57.614			
T7	0.72	4.18	A	0.24	2.467	0.599	1	1	71.712	4.21	210.60	C
63.00-43.00			B	0.181	2.659	0.587	1	1	57.918			
			C	0.232	2.493	0.597	1	1	71.164			
T8	0.36	2.24	A	0.219	2.535	0.594	1	1	34.190	1.87	187.06	A
43.00-33.00			B	0.163	2.724	0.584	1	1	27.094			
			C	0.21	2.562	0.593	1	1	33.782			
T9	0.36	2.29	A	0.212	2.557	0.593	1	1	34.725	1.84	184.11	A
33.00-23.00			B	0.158	2.741	0.583	1	1	27.658			
			C	0.204	2.584	0.591	1	1	34.323			
T10	0.68	5.69	A	0.232	2.493	0.597	1	1	86.005	4.44	222.23	A
23.00-3.00			B	0.18	2.664	0.587	1	1	71.592			
			C	0.212	2.555	0.593	1	1	81.286			
Sum Weight:	4.35	25.58						OTM	2373.57 kip-ft	30.22		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.03	0.93	A	0.128	2.853	0.578	0.8	1	15.923	1.79	89.65	C
183.00-163.00			B	0.133	2.834	0.579	0.8	1	16.429			
			C	0.16	2.735	0.583	0.8	1	19.697			
T2	0.09	0.81	A	0.107	2.937	0.576	0.8	1	14.636	1.93	96.29	C
163.00-143.00			B	0.127	2.859	0.578	0.8	1	16.887			
			C	0.168	2.708	0.584	0.8	1	22.134			
T3	0.33	1.20	A	0.199	2.601	0.59	0.8	1	31.074	2.55	127.56	C
143.00-123.00			B	0.172	2.691	0.585	0.8	1	27.537			
			C	0.198	2.602	0.59	0.8	1	31.762			
T4	0.48	2.27	A	0.234	2.487	0.598	0.8	1	42.660	3.13	156.35	A
123.00-103.00			B	0.185	2.646	0.588	0.8	1	34.514			
			C	0.188	2.638	0.588	0.8	1	35.453			
T5	0.58	3.33	A	0.231	2.496	0.597	0.8	1	48.405	3.37	168.36	A
103.00-83.00			B	0.177	2.676	0.586	0.8	1	37.747			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.202	2.589	0.591	0.8	1	43.327			
T6	0.72	2.66	A	0.23	2.498	0.597	0.8	1	54.399	3.53	176.70	A
83.00-63.00			B	0.166	2.715	0.584	0.8	1	40.162			
			C	0.22	2.531	0.595	0.8	1	52.723			
T7	0.72	4.18	A	0.24	2.467	0.599	0.8	1	65.053	3.81	190.51	A
63.00-43.00			B	0.181	2.659	0.587	0.8	1	50.782			
			C	0.232	2.493	0.597	0.8	1	63.703			
T8	0.36	2.24	A	0.219	2.535	0.594	0.8	1	31.375	1.72	171.66	A
43.00-33.00			B	0.163	2.724	0.584	0.8	1	24.094			
			C	0.21	2.562	0.593	0.8	1	30.597			
T9	0.36	2.29	A	0.212	2.557	0.593	0.8	1	31.793	1.69	168.56	A
33.00-23.00			B	0.158	2.741	0.583	0.8	1	24.542			
			C	0.204	2.584	0.591	0.8	1	31.021			
T10	0.68	5.69	A	0.232	2.493	0.597	0.8	1	76.891	3.97	198.68	A
23.00-3.00			B	0.18	2.664	0.587	0.8	1	61.903			
			C	0.212	2.555	0.593	0.8	1	71.555			
Sum Weight:	4.35	25.58						OTM	2152.21 kip-ft	27.48		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.03	0.93	A	0.128	2.853	0.578	0.85	1	16.572	1.86	93.09	C
183.00-163.00			B	0.133	2.834	0.579	0.85	1	17.074			
			C	0.16	2.735	0.583	0.85	1	20.453			
T2	0.09	0.81	A	0.107	2.937	0.576	0.85	1	15.205	1.98	99.21	C
163.00-143.00			B	0.127	2.859	0.578	0.85	1	17.454			
			C	0.168	2.708	0.584	0.85	1	22.806			
T3	0.33	1.20	A	0.199	2.601	0.59	0.85	1	31.818	2.62	131.22	C
143.00-123.00			B	0.172	2.691	0.585	0.85	1	28.343			
			C	0.198	2.602	0.59	0.85	1	32.675			
T4	0.48	2.27	A	0.234	2.487	0.598	0.85	1	43.468	3.19	159.32	A
123.00-103.00			B	0.185	2.646	0.588	0.85	1	35.410			
			C	0.188	2.638	0.588	0.85	1	36.478			
T5	0.58	3.33	A	0.231	2.496	0.597	0.85	1	49.294	3.43	171.45	A
103.00-83.00			B	0.177	2.676	0.586	0.85	1	38.718			
			C	0.202	2.589	0.591	0.85	1	44.414			
T6	0.72	2.66	A	0.23	2.498	0,597	0.85	1	55.441	3.60	180.08	A
83.00-63.00			B	0.166	2.715	0.584	0.85	1	41.289			
			C	0.22	2.531	0.595	0.85	1	53.946			
T7	0.72	4.18	A	0.24	2.467	0.599	0.85	1	66.718	3.91	195.38	A
63.00-43.00			B	0.181	2.659	0.587	0.85	1	52.566			
			C	0.232	2.493	0.597	0.85	1	65.569			
T8	0.36	2.24	A	0.219	2.535	0.594	0.85	1	32.079	1.76	175.51	A
43.00-33.00			B	0.163	2.724	0.584	0.85	1	24.844			
			C	0.21	2.562	0.593	0.85	1	31.393			
T9	0.36	2.29	A	0.212	2.557	0.593	0.85	1	32.526	1.72	172.45	A
33.00-23.00			B	0.158	2.741	0.583	0.85	1	25.321			
			C	0.204	2.584	0.591	0.85	1	31.846			
T10	0.68	5.69	A	0.232	2.493	0.597	0.85	1	79.170	4.09	204.57	A
23.00-3.00			B	0.18	2.664	0.587	0.85	1	64.325			
			C	0.212	2.555	0.593	0.85	1	73.988			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
Sum Weight:	4.35	25.58						OTM	2207.40 kip-ft	28.17		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.12	1.53	A	0.186	2.644	0.588	1	1	24.747	2.63	131.74	C
183.00-163.00			B	0.199	2.6	0.59	1	1	26.081			
			C	0.243	2.459	0.6	1	1	32.190			
T2	0.27	1.34	A	0.152	2.766	0.582	1	1	22.223	2.89	144.35	C
163.00-143.00			B	0.184	2.651	0.587	1	1	27.019			
			C	0.256	2.419	0.603	1	1	37.138			
T3	0.86	1.91	A	0.26	2.408	0.604	1	1	50.342	3.78	189.07	C
143.00-123.00			B	0.239	2.471	0.599	1	1	44.068			
			C	0.286	2.334	0.612	1	1	52.471			
T4	1.20	3.09	A	0.301	2.293	0.616	1	1	69.692	4.71	235.42	A
123.00-103.00			B	0.254	2.425	0.603	1	1	53.701			
			C	0.265	2.393	0.606	1	1	57.061			
T5	1.41	4.33	A	0.286	2.335	0.612	1	1	77.517	5.04	252.23	A
103.00-83.00			B	0.227	2.509	0.596	1	1	56.703			
			C	0.27	2.38	0.607	1	1	68.087			
T6	1.71	3.64	A	0.291	2.321	0.613	1	1	87.508	5.28	264.10	A
83.00-63.00			B	0.217	2.539	0.594	1	1	59.637			
			C	0.299	2.298	0.616	1	1	83.278			
T7	1.73	5.60	A	0.306	2.28	0.618	1	1	103.574	5.60	280.25	A
63.00-43.00			B	0.236	2.479	0.599	1	1	75.030			
			C	0.315	2.258	0.62	1	1	99.801			
T8	0.86	2.86	A	0.275	2.364	0.609	1	1	49.467	2.52	252.43	A
43.00-33.00			B	0.208	2.568	0.592	1	1	34.847			
			C	0.282	2.344	0.611	1	1	47.331			
T9	0.86	2.93	A	0.266	2.389	0.606	1	1	50.078	2.48	248.05	A
33.00-23.00			B	0.202	2.588	0.591	1	1	35.481			
			C	0.273	2.37	0.608	1	1	47.910			
T10	1.58	7.53	A	0.291	2.321	0.613	1	1	118.875	5.72	286.03	A
23.00-3.00			B	0.225	2.513	0.596	1	1	88.553			
			C	0.274	2.368	0.608	1	1	106.899			
Sum Weight:	10.60	34.75						OTM	3202.02 kip-ft	40.67		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.12	1.53	A	0.186	2.644	0.588	0.8	1	22.152	2.38	118.83	C
183.00-163.00			B	0.199	2.6	0.59	0.8	1	23.527			
			C	0.243	2.459	0.6	0.8	1	29.037			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T2	0.27	1.34	A	0.152	2.766	0.582	0.8	1	19.946	2.63	131.57	C
163.00-143.00			B	0.184	2.651	0.587	0.8	1	24.278			
			C	0.256	2.419	0.603	0.8	1	33.850			
T3	0.86	1.91	A	0.26	2.408	0.604	0.8	1	43.990	3.39	169.68	C
143.00-123.00			B	0.239	2.471	0.599	0.8	1	39.242			
			C	0.286	2.334	0.612	0.8	1	47.088			
T4	1.20	3.09	A	0.301	2.293	0.616	0.8	1	60.824	4.11	205.46	A
123.00-103.00			B	0.254	2.425	0.603	0.8	1	48.557			
			C	0.265	2.393	0.606	0.8	1	51.225			
T5	1.41	4.33	A	0.286	2.335	0.612	0.8	1	66.968	4.36	217.90	A
103.00-83.00			B	0.227	2.509	0.596	0.8	1	50.486			
			C	0.27	2.38	0.607	0.8	1	60.619			
T6	1.71	3.64	A	0.291	2.321	0.613	0.8	1	76.044	4.59	229.50	A
83.00-63.00			B	0.217	2.539	0.594	0.8	1	53.565			
			C	0.299	2.298	0.616	0.8	1	75.058			
T7	1.73	5.60	A	0.306	2.28	0.618	0.8	1	89.680	4.85	242.65	A
63.00-43.00			B	0.236	2.479	0.599	0.8	1	66.366			
			C	0.315	2.258	0.62	0.8	1	89.095			
T8	0.86	2.86	A	0.275	2.364	0.609	0.8	1	43.012	2.19	219.49	A
43.00-33.00			B	0.208	2.568	0.592	0.8	1	31.069			
			C	0.282	2.344	0.611	0.8	1	42.492			
T9	0.86	2.93	A	0.266	2.389	0.606	0.8	1	43.505	2.15	215.49	A
33.00-23.00			B	0.202	2.588	0.591	0.8	1	31.586			
			C	0.273	2.37	0.608	0.8	1	42.953			
T10	1.58	7.53	A	0.291	2.321	0.613	0.8	1	102.550	4.94	246.75	A
23.00-3.00			B	0.225	2.513	0.596	0.8	1	77.302			
			C	0.274	2.368	0.608	0.8	1	93.964			
Sum Weight:	10.60	34.75						OTM	2828.13 kip-ft	35.60		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.12	1.53	A	0.186	2.644	0.588	0.85	1	22.801	2.44	122.06	C
183.00-163.00			B	0.199	2.6	0.59	0.85	1	24.165			
			C	0.243	2.459	0.6	0.85	1	29.826			
T2	0.27	1.34	A	0.152	2.766	0.582	0.85	1	20.516	2.70	134.76	C
163.00-143.00			B	0.184	2.651	0.587	0.85	1	24.963			
			C	0.256	2.419	0.603	0.85	1	34.672			
T3	0.86	1.91	A	0.26	2.408	0.604	0.85	1	45.578	3.49	174.53	C
143.00-123.00			B	0.239	2.471	0.599	0.85	1	40.448			
			C	0.286	2.334	0.612	0.85	1	48.433			
T4	1.20	3.09	A	0.301	2.293	0.616	0.85	1	63.041	4.26	212.95	A
123.00-103.00			B	0.254	2.425	0.603	0.85	1	49.843			
			C	0.265	2.393	0.606	0.85	1	52.684			
T5	1.41	4.33	A	0.286	2.335	0.612	0.85	1	69.605	4.53	226.48	A
103.00-83.00			B	0.227	2.509	0.596	0.85	1	52.041			
			C	0.27	2.38	0.607	0.85	1	62.486			
T6	1.71	3.64	A	0.291	2.321	0.613	0.85	1	78.910	4.76	238.15	A
83.00-63.00			B	0.217	2.539	0.594	0.85	1	55.083			
			C	0.299	2.298	0.616	0.85	1	77.113			
T7	1.73	5.60	A	0.306	2.28	0.618	0.85	1	93.154	5.04	252.05	A
63.00-43.00			B	0.236	2.479	0.599	0.85	1	68.532			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.315	2.258	0.62	0.85	1	91.771			
T8	0.86	2.86	A	0.275	2.364	0.609	0.85	1	44.626	2.28	227.72	A
43.00-33.00			B	0.208	2.568	0.592	0.85	1	32.013			
			C	0.282	2.344	0.611	0.85	1	43.702			
T9	0.86	2.93	A	0.266	2.389	0.606	0.85	1	45.148	2.24	223.63	A
33.00-23.00			B	0.202	2.588	0.591	0.85	1	32.560			
			C	0.273	2.37	0.608	0.85	1	44.192			
T10	1.58	7.53	A	0.291	2.321	0.613	0.85	1	106.632	5.13	256.57	A
23.00-3.00			B	0.225	2.513	0.596	0.85	1	80.115			
			C	0.274	2.368	0.608	0.85	1	97.198			
Sum Weight:	10.60	34.75						OTM	2921.61 kip-ft	36.86		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.03	0.93	A	0.128	2.853	0.578	1	1	18.518	2.07	103.42	C
183.00-163.00			B	0.133	2.834	0.579	1	1	19.009			
			C	0.16	2.735	0.583	1	1	22.722			
T2	0.09	0.81	A	0.107	2.937	0.576	1	1	16.913	2.16	107.98	C
163.00-143.00			B	0.127	2.859	0.578	1	1	19.153			
			C	0.168	2.708	0.584	1	1	24.820			
T3	0.33	1.20	A	0.199	2.601	0.59	1	1	34.047	2.84	142.22	C
143.00-123.00			B	0.172	2.691	0.585	1	1	30.761			
			C	0.198	2.602	0.59	1	1	35.414			
T4	0.48	2.27	A	0.234	2.487	0.598	1	1	45.892	3.36	168.20	A
123.00-103.00			B	0.185	2.646	0.588	1	1	38.098			
			C	0.188	2.638	0.588	1	1	39.552			
T5	0.58	3.33	A	0.231	2.496	0.597	1	1	51.961	3.61	180.73	A
103.00-83.00			B	0.177	2.676	0.586	1	1	41.633			
			C	0.202	2.589	0.591	1	1	47.677			
T6	0.72	2.66	A	0.23	2.498	0.597	1	1	58.569	3.80	190.24	A
83.00-63.00			B	0.166	2.715	0.584	1	1	44.670			
			C	0.22	2.531	0.595	1	1	57.614			
T7	0.72	4.18	A	0.24	2.467	0.599	1	1	71.712	4.21	210.60	C
63.00-43.00			B	0.181	2.659	0.587	1	1	57.918			
			C	0.232	2.493	0.597	1	1	71.164			
T8	0.36	2.24	A	0.219	2.535	0.594	1	1	34.190	1.87	187.06	A
43.00-33.00			B	0.163	2.724	0.584	1	1	27.094			
			C	0.21	2.562	0.593	1	1	33.782			
T9	0.36	2.29	A	0.212	2.557	0.593	1	1	34.725	1.84	184.11	A
33.00-23.00			B	0.158	2.741	0.583	1	1	27.658			
			C	0.204	2.584	0.591	1	1	34.323			
T10	0.68	5.69	A	0.232	2.493	0.597	1	1	86.005	4.44	222.23	A
23.00-3.00			B	0.18	2.664	0.587	1	1	71.592			
			C	0.212	2.555	0.593	1	1	81.286			
Sum Weight:	4.35	25.58						OTM	2373.57 kip-ft	30.22		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.03	0.93	A	0.128	2.853	0.578	0.8	1	15.923	1.79	89.65	C
183.00-163.00			B	0.133	2.834	0.579	0.8	1	16.429			
			C	0.16	2.735	0.583	0.8	1	19.697			
T2	0.09	0.81	A	0.107	2.937	0.576	0.8	1	14.636	1.93	96.29	C
163.00-143.00			B	0.127	2.859	0.578	0.8	1	16.887			
			C	0.168	2.708	0.584	0.8	1	22.134			
T3	0.33	1.20	A	0.199	2.601	0.59	0.8	1	31.074	2.55	127.56	C
143.00-123.00			B	0.172	2.691	0.585	0.8	1	27.537			
			C	0.198	2.602	0.59	0.8	1	31.762			
T4	0.48	2.27	A	0.234	2.487	0.598	0.8	1	42.660	3.13	156.35	A
123.00-103.00			B	0.185	2.646	0.588	0.8	1	34.514			
			C	0.188	2.638	0.588	0.8	1	35.453			
T5	0.58	3.33	A	0.231	2.496	0.597	0.8	1	48.405	3.37	168.36	A
103.00-83.00			B	0.177	2.676	0.586	0.8	1	37.747			
			C	0.202	2.589	0.591	0.8	1	43.327			
T6	0.72	2.66	A	0.23	2.498	0.597	0.8	1	54.399	3.53	176.70	A
83.00-63.00			B	0.166	2.715	0.584	0.8	1	40.162			
			C	0.22	2.531	0.595	0.8	1	52.723			
T7	0.72	4.18	A	0.24	2.467	0.599	0.8	1	65.053	3.81	190.51	A
63.00-43.00			B	0.181	2.659	0.587	0.8	1	50.782			
			C	0.232	2.493	0.597	0.8	1	63.703			
T8	0.36	2.24	A	0.219	2.535	0.594	0.8	1	31.375	1.72	171.66	A
43.00-33.00			B	0.163	2.724	0.584	0.8	1	24.094			
			C	0.21	2.562	0.593	0.8	1	30.597			
T9	0.36	2.29	A	0.212	2.557	0.593	0.8	1	31.793	1.69	168.56	A
33.00-23.00			B	0.158	2.741	0.583	0.8	1	24.542			
			C	0.204	2.584	0.591	0.8	1	31.021			
T10	0.68	5.69	A	0.232	2.493	0.597	0.8	1	76.891	3.97	198.68	A
23.00-3.00			B	0.18	2.664	0.587	0.8	1	61.903			
			C	0.212	2.555	0.593	0.8	1	71.555			
Sum Weight:	4.35	25.58						OTM	2152.21 kip-ft	27.48		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.03	0.93	A	0.128	2.853	0.578	0.85	1	16.572	1.86	93.09	C
183.00-163.00			B	0.133	2.834	0.579	0.85	1	17.074			
			C	0.16	2.735	0.583	0.85	1	20.453			
T2	0.09	0.81	A	0.107	2.937	0.576	0.85	1	15.205	1.98	99.21	C
163.00-143.00			B	0.127	2.859	0.578	0.85	1	17.454			
			C	0.168	2.708	0.584	0.85	1	22.806			
T3	0.33	1.20	A	0.199	2.601	0.59	0.85	1	31.818	2.62	131.22	C
143.00-123.00			B	0.172	2.691	0.585	0.85	1	28.343			
			C	0.198	2.602	0.59	0.85	1	32.675			
T4	0.48	2.27	A	0.234	2.487	0.598	0.85	1	43.468	3.19	159.32	A
123.00-103.00			B	0.185	2.646	0.588	0.85	1	35.410			
			C	0.188	2.638	0.588	0.85	1	36.478			
T5	0.58	3.33	A	0.231	2.496	0.597	0.85	1	49.294	3.43	171.45	A
103.00-83.00			B	0.177	2.676	0.586	0.85	1	38.718			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.202	2.589	0.591	0.85	1	44.414			
T6	0.72	2.66	A	0.23	2.498	0.597	0.85	1	55.441	3.60	180.08	A
83.00-63.00			B	0.166	2.715	0.584	0.85	1	41.289			
			C	0.22	2.531	0.595	0.85	1	53.946			
T7	0.72	4.18	A	0.24	2.467	0.599	0.85	1	66.718	3.91	195.38	A
63.00-43.00			B	0.181	2.659	0.587	0.85	1	52.566			
			C	0.232	2.493	0.597	0.85	1	65.569			
T8	0.36	2.24	A	0.219	2.535	0.594	0.85	1	32.079	1.76	175.51	A
43.00-33.00			B	0.163	2.724	0.584	0.85	1	24.844			
			C	0.21	2.562	0.593	0.85	1	31.393			
T9	0.36	2.29	A	0.212	2.557	0.593	0.85	1	32.526	1.72	172.45	A
33.00-23.00			B	0.158	2.741	0.583	0.85	1	25.321			
			C	0.204	2.584	0.591	0.85	1	31.846			
T10	0.68	5.69	A	0.232	2.493	0.597	0.85	1	79.170	4.09	204.57	A
23.00-3.00			B	0.18	2.664	0.587	0.85	1	64.325			
			C	0.212	2.555	0.593	0.85	1	73.988			
Sum Weight:	4.35	25.58						OTM	2207.40 kip-ft	28.17		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	8.98					
Bracing Weight	16.60					
Total Member Self-Weight	25.58			3.74	7.49	
Total Weight	38.37			3.74	7.49	
Wind 0 deg - No Ice		0.06	-41.31	-3726.17	2.46	-12.36
Wind 30 deg - No Ice		19.60	-33.95	-3071.72	-1764.36	-9.61
Wind 60 deg - No Ice		33.18	-19.16	-1724.30	-2987.40	-4.62
Wind 90 deg - No Ice		38.96	0.06	21.08	-3503.81	1.51
Wind 120 deg - No Ice		35.63	20.67	1876.51	-3199.73	7.63
Wind 150 deg - No Ice		19.62	34.11	3114.96	-1778.67	10.87
Wind 180 deg - No Ice		-0.06	38.73	3541.24	12.52	11.49
Wind 210 deg - No Ice		-19.73	34.18	3119.99	1802.37	9.40
Wind 240 deg - No Ice		-35.70	20.78	1885.22	3219.74	4.73
Wind 270 deg - No Ice		-38.96	0.19	31.14	3518.79	-1.51
Wind 300 deg - No Ice		-33.11	-19.06	-1715.59	2997.35	-6.87
Wind 330 deg - No Ice		-19.49	-33.88	-3066.69	1770.63	-10.67
Member Ice	9.17					
Total Weight Ice	58.17			9.82	14.44	
Wind 0 deg - Ice		0.07	-54.16	-4839.95	9.18	-8.28
Wind 30 deg - Ice		25.16	-43.57	-3936.27	-2260.11	-5.78
Wind 60 deg - Ice		42.29	-24.43	-2201.23	-3817.20	-2.14
Wind 90 deg - Ice		50.07	0.06	27.55	-4501.22	1.91
Wind 120 deg - Ice		46.76	27.10	2442.66	-4162.11	5.89
Wind 150 deg - Ice		25.18	43.74	3992.57	-2274.67	7.43
Wind 180 deg - Ice		-0.07	49.26	4515.45	19.69	7.24
Wind 210 deg - Ice		-25.29	43.81	3997.83	2312.65	5.57
Wind 240 deg - Ice		-46.83	27.21	2451.77	4196.24	2.39
Wind 270 deg - Ice		-50.07	0.20	38.07	4530.10	-1.91
Wind 300 deg - Ice		-42.22	-24.31	-2192.13	3840.82	-5.10
Wind 330 deg - Ice		-25.05	-43.50	-3931.01	2279.89	-7.22
Total Weight	38.37			3.74	7.49	

Load Case	*Vertical Forces* *K*	*Sum of Forces X* *K*	*Sum of Forces Z* *K*	*Sum of Overturning Moments, M_x* *kip-ft*	*Sum of Overturning Moments, M_z* *kip-ft*	*Sum of Torques* *kip-ft*
Wind 0 deg - Service		0.06	-41.31	-3729.56	-4.09	-12.36
Wind 30 deg - Service		19.60	-33.95	-3075.11	-1770.91	-9.61
Wind 60 deg - Service		33.18	-19.16	-1727.69	-2993.95	-4.62
Wind 90 deg - Service		38.96	0.06	17.69	-3510.36	1.51
Wind 120 deg - Service		35.63	20.67	1873.12	-3206.29	7.63
Wind 150 deg - Service		19.62	34.11	3111.57	-1785.23	10.87
Wind 180 deg - Service		-0.06	38.73	3537.84	5.97	11.49
Wind 210 deg - Service		-19.73	34.18	3116.59	1795.81	9.40
Wind 240 deg - Service		-35.70	20.78	1881.82	3213.19	4.73
Wind 270 deg - Service		-38.96	0.19	27.74	3512.24	-1.51
Wind 300 deg - Service		-33.11	-19.06	-1718.98	2990.80	-6.87
Wind 330 deg - Service		-19.49	-33.88	-3070.08	1764.08	-10.67

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	183 - 163	Leg	Max Tension	21	5.12	-0.00	-0.02
			Max. Compression	15	-6.77	0.04	0.10
			Max. Mx	19	-0.23	0.37	-0.11
			Max. My	20	-0.77	-0.08	0.36
			Max. Vy	18	0.31	-0.24	-0.03
			Max. Vx	21	-0.31	0.00	0.00
		Diagonal	Max Tension	20	1.55	0.00	0.00
			Max. Compression	20	-1.60	0.00	0.00
			Max. Mx	26	0.33	0.01	-0.00
			Max. My	19	-1.18	0.01	0.00
			Max. Vy	26	-0.01	0.01	-0.00
			Max. Vx	19	0.00	0.00	0.00
		Top Girt	Max Tension	19	0.05	0.00	0.00
			Max. Compression	17	-0.14	0.00	0.00
			Max. Mx	14	-0.04	-0.05	0.00
			Max. My	26	-0.03	0.00	-0.00
			Max. Vy	14	0.02	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
T2	163 - 143	Leg	Max Tension	21	14.92	-0.14	0.00
			Max. Compression	15	-17.99	0.05	-0.02
			Max. Mx	15	-13.52	0.17	-0.01
			Max. My	22	-1.69	-0.02	0.22
			Max. Vy	17	-0.33	-0.14	-0.02
			Max. Vx	26	0.34	0.01	0.05
		Diagonal	Max Tension	20	2.49	0.00	0.00
			Max. Compression	20	-2.48	0.00	0.00
			Max. Mx	20	1.14	0.02	0.00
			Max. My	26	-2.42	0.01	-0.01
			Max. Vy	20	0.01	0.02	0.00
			Max. Vx	21	-0.00	0.00	0.00
T3	143 - 123	Leg	Max Tension	21	29.34	-0.88	0.01
			Max. Compression	19	-37.59	1.37	0.01
			Max. Mx	21	28.42	1.49	0.02
			Max. My	16	-4.14	0.00	1.49
			Max. Vy	21	0.97	-1.36	0.02
			Max. Vx	16	0.88	0.00	-1.09
		Diagonal	Max Tension	20	4.75	0.00	0.00
			Max. Compression	20	-4.90	0.00	0.00
			Max. Mx	20	1.60	0.05	0.00
			Max. My	20	-3.63	0.01	0.01
			Max. Vy	20	-0.02	0.05	0.00
			Max. Vx	20	-0.00	0.00	0.00
T4	123 - 103	Leg	Max Tension	21	53.29	-0.23	0.01
			Max. Compression	15	-66.77	-0.10	-0.02
			Max. Mx	15	-46.76	1.40	-0.02
			Max. My	22	-4.78	0.03	1.09
			Max. Vy	15	0.32	1.40	-0.02
			Max. Vx	16	-0.19	0.00	-1.09
		Diagonal	Max Tension	20	6.44	0.00	0.00
			Max. Compression	20	-6.23	0.00	0.00
			Max. Mx	20	2.65	0.07	0.01
			Max. My	20	-6.20	0.04	0.02
			Max. Vy	22	0.04	0.07	-0.01
			Max. Vx	26	0.00	0.00	0.00
T5	103 - 83	Leg	Max Tension	21	75.95	-1.19	-0.04

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	15	-96.59	0.43	0.05
			Max. Mx	23	-93.67	1.42	-0.01
			Max. My	26	-6.69	0.08	-1.24
			Max. Vy	17	-1.31	-1.22	0.00
			Max. Vx	20	-1.23	0.09	-1.19
		Diagonal	Max Tension	20	9.06	0.00	0.00
			Max. Compression	20	-8.80	0.00	0.00
			Max. Mx	21	5.47	-0.19	-0.02
			Max. My	21	-6.97	-0.11	-0.03
			Max. Vy	21	-0.08	-0.19	0.02
			Max. Vx	21	0.00	0.00	0.00
T6	83 - 63	Leg	Max Tension	21	103.46	0.04	-0.02
			Max. Compression	15	-131.92	-0.24	0.04
			Max. Mx	17	86.26	-1.01	0.01
			Max. My	20	-9.92	-0.31	-0.86
			Max. Vy	17	-0.20	-1.01	0.01
			Max. Vx	26	0.17	-0.31	0.86
		Diagonal	Max Tension	20	9.72	0.00	0.00
			Max. Compression	20	-9.63	0.00	0.00
			Max. Mx	15	8.44	0.15	0.01
			Max. My	15	-0.55	0.13	-0.02
			Max. Vy	21	0.05	0.13	-0.01
			Max. Vx	15	-0.00	0.00	0.00
T7	63 - 43	Leg	Max Tension	21	130.92	0.83	-0.03
			Max. Compression	23	-166.97	-1.29	-0.01
			Max. Mx	17	126.28	-1.47	0.01
			Max. My	20	-14.01	0.40	-1.25
			Max. Vy	15	0.57	1.43	-0.02
			Max. Vx	20	-0.40	0.40	-1.25
		Diagonal	Max Tension	22	10.44	0.00	0.00
			Max. Compression	22	-10.22	0.00	0.00
			Max. Mx	21	7.67	0.24	0.02
			Max. My	21	-8.48	0.15	0.03
			Max. Vy	21	0.08	0.24	0.02
			Max. Vx	21	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	23	2.90	0.00	0.00
			Max. Compression	23	-2.90	0.00	0.00
			Max. Mx	14	0.24	-0.46	0.00
			Max. My	14	0.25	0.00	0.01
			Max. Vy	14	0.09	0.00	0.00
			Max. Vx	14	-0.00	0.00	0.00
T8	43 - 33	Leg	Max Tension	21	145.99	-1.46	-0.02
			Max. Compression	23	-183.80	2.61	-0.01
			Max. Mx	15	-183.35	2.62	0.02
			Max. My	20	-14.31	-1.34	-0.81
			Max. Vy	15	-0.47	2.62	0.02
			Max. Vx	20	-0.12	-1.34	-0.81
		Diagonal	Max Tension	16	9.70	0.00	0.00
			Max. Compression	22	-11.60	0.00	0.00
			Max. Mx	21	7.45	0.34	-0.03
			Max. My	21	-10.03	0.24	-0.03
			Max. Vy	21	0.10	0.34	-0.03
			Max. Vx	21	0.01	0.00	0.00
T9	33 - 23	Leg	Max Tension	21	157.43	1.10	-0.02
			Max. Compression	23	-202.81	-2.08	-0.02
			Max. Mx	15	-201.92	2.62	0.02
			Max. My	20	-17.88	-2.17	-0.70
			Max. Vy	15	0.55	2.62	0.02
			Max. Vx	20	0.10	-2.17	-0.70
		Diagonal	Max Tension	16	12.12	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	16	-9.69	0.00	0.00
			Max. Mx	10	7.23	0.22	-0.02
			Max. My	22	6.85	0.20	-0.03
			Max. Vy	21	0.09	0.21	0.03
			Max. Vx	22	-0.00	0.00	0.00
T10	23 - 3	Leg	Max Tension	21	182.60	3.75	-0.05
			Max. Compression	23	-238.77	-0.00	-0.00
			Max. Mx	21	182.60	3.75	-0.05
			Max. My	20	-21.31	3.11	-2.47
			Max. Vy	21	-1.15	-1.91	0.02
			Max. Vx	20	0.68	3.11	-2.47
		Diagonal	Max Tension	16	14.15	0.00	0.00
			Max. Compression	16	-13.12	0.00	0.00
			Max. Mx	21	7.18	0.43	-0.03
			Max. My	22	-13.04	0.29	-0.05
			Max. Vy	21	0.11	0.43	-0.03
			Max. Vx	22	0.01	0.00	0.00
		Secondary Horizontal	Max Tension	23	4.14	0.00	0.00
			Max. Compression	23	-4.14	0.00	0.00
			Max. Mx	14	0.35	-0.75	0.00
			Max. My	20	3.45	0.00	0.02
			Max. Vy	14	-0.12	0.00	0.00
			Max. Vx	20	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	23	245.75	25.17	-14.59
	Max. H_x	23	245.75	25.17	-14.59
	Max. H_z	16	-163.45	-22.91	15.84
	Min. Vert	17	-185.85	-26.68	15.47
	Min. H_x	17	-185.85	-26.68	15.47
	Min. H_z	23	245.75	25.17	-14.59
Leg B	Max. Vert	19	244.16	-25.20	-14.37
	Max. H_x	25	-186.59	26.73	15.30
	Max. H_z	26	-164.12	23.01	15.56
	Min. Vert	25	-186.59	26.73	15.30
	Min. H_x	19	244.16	-25.20	-14.37
	Min. H_z	19	244.16	-25.20	-14.37
Leg A	Max. Vert	15	244.82	-0.21	29.08
	Max. H_x	24	17.62	4.17	-2.51
	Max. H_z	15	244.82	-0.21	29.08
	Min. Vert	21	-190.93	0.16	-31.15
	Min. H_x	18	18.11	-4.20	-2.43
	Min. H_z	21	-190.93	0.16	-31.15

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear$_x$ K	Shear$_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	38.37	0.00	0.00	3.74	7.49	0.00
Dead+Wind 0 deg - No Ice	38.37	0.06	-41.31	-3733.55	2.47	-12.37
Dead+Wind 30 deg - No Ice	38.37	19.60	-33.95	-3077.79	-1767.83	-9.61
Dead+Wind 60 deg - No Ice	38.37	33.18	-19.16	-1727.69	-2993.28	-4.62
Dead+Wind 90 deg - No Ice	38.37	38.96	0.06	21.13	-3510.71	1.51
Dead+Wind 120 deg - No Ice	38.37	35.63	20.67	1880.23	-3206.06	7.64
Dead+Wind 150 deg - No Ice	38.37	19.62	34.11	3121.15	-1782.20	10.88
Dead+Wind 180 deg - No Ice	38.37	-0.06	38.73	3548.26	12.54	11.50
Dead+Wind 210 deg - No Ice	38.37	-19.73	34.18	3126.17	1805.94	9.40
Dead+Wind 240 deg - No Ice	38.37	-35.70	20.78	1888.95	3226.09	4.73
Dead+Wind 270 deg - No Ice	38.37	-38.96	0.19	31.20	3525.71	-1.51
Dead+Wind 300 deg - No Ice	38.37	-33.11	-19.06	-1718.96	3003.24	-6.89
Dead+Wind 330 deg - No Ice	38.37	-19.49	-33.88	-3072.75	1774.13	-10.68
Dead+Ice+Temp	58.17	0.00	-0.00	9.84	14.45	-0.00
Dead+Wind 0 deg+Ice+Temp	58.17	0.07	-54.16	-4853.41	9.18	-8.29
Dead+Wind 30 deg+Ice+Temp	58.17	25.16	-43.57	-3947.27	-2266.45	-5.75
Dead+Wind 60 deg+Ice+Temp	58.17	42.29	-24.43	-2207.38	-3827.88	-2.13
Dead+Wind 90 deg+Ice+Temp	58.17	50.07	0.06	27.66	-4513.79	1.91
Dead+Wind 120 deg+Ice+Temp	58.17	46.76	27.10	2449.46	-4173.69	5.92
Dead+Wind 150 deg+Ice+Temp	58.17	25.18	43.74	4003.77	-2281.08	7.45
Dead+Wind 180 deg+Ice+Temp	58.17	-0.07	49.26	4528.15	19.71	7.26
Dead+Wind 210 deg+Ice+Temp	58.17	-25.29	43.81	4009.04	2319.11	5.54
Dead+Wind 240 deg+Ice+Temp	58.17	-46.83	27.21	2458.59	4207.85	2.37
Dead+Wind 270 deg+Ice+Temp	58.17	-50.07	0.20	38.18	4542.69	-1.93
Dead+Wind 300 deg+Ice+Temp	58.17	-42.22	-24.31	-2198.26	3851.51	-5.13
Dead+Wind 330 deg+Ice+Temp	58.17	-25.04	-43.50	-3942.01	2286.23	-7.24
Dead+Wind 0 deg - Service	38.37	0.06	-41.31	-3733.55	2.47	-12.37
Dead+Wind 30 deg - Service	38.37	19.60	-33.95	-3077.79	-1767.83	-9.61
Dead+Wind 60 deg - Service	38.37	33.18	-19.16	-1727.69	-2993.28	-4.62
Dead+Wind 90 deg - Service	38.37	38.96	0.06	21.13	-3510.71	1.51
Dead+Wind 120 deg - Service	38.37	35.63	20.67	1880.23	-3206.06	7.64
Dead+Wind 150 deg - Service	38.37	19.62	34.11	3121.15	-1782.20	10.88
Dead+Wind 180 deg - Service	38.37	-0.06	38.73	3548.26	12.54	11.50
Dead+Wind 210 deg - Service	38.37	-19.73	34.18	3126.17	1805.94	9.40
Dead+Wind 240 deg - Service	38.37	-35.70	20.78	1888.95	3226.09	4.73
Dead+Wind 270 deg - Service	38.37	-38.96	0.19	31.20	3525.71	-1.51
Dead+Wind 300 deg - Service	38.37	-33.11	-19.06	-1718.96	3003.24	-6.89
Dead+Wind 330 deg - Service	38.37	-19.49	-33.88	-3072.75	1774.13	-10.68

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-38.37	0.00	0.00	38.37	0.00	0.000%
2	0.06	-38.37	-41.31	-0.06	38.37	41.31	0.000%
3	19.60	-38.37	-33.95	-19.60	38.37	33.95	0.000%
4	33.18	-38.37	-19.16	-33.18	38.37	19.16	0.000%
5	38.96	-38.37	0.06	-38.96	38.37	-0.06	0.000%
6	35.63	-38.37	20.67	-35.63	38.37	-20.67	0.000%
7	19.62	-38.37	34.11	-19.62	38.37	-34.11	0.000%
8	-0.06	-38.37	38.73	0.06	38.37	-38.73	0.000%
9	-19.73	-38.37	34.18	19.73	38.37	-34.18	0.000%
10	-35.70	-38.37	20.78	35.70	38.37	-20.78	0.000%
11	-38.96	-38.37	0.19	38.96	38.37	-0.19	0.000%
12	-33.11	-38.37	-19.06	33.11	38.37	19.06	0.000%
13	-19.49	-38.37	-33.88	19.49	38.37	33.88	0.000%
14	0.00	-58.17	0.00	-0.00	58.17	0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
15	0.07	-58.17	-54.16	-0.07	58.17	54.16	0.000%
16	25.16	-58.17	-43.57	-25.16	58.17	43.57	0.000%
17	42.29	-58.17	-24.43	-42.29	58.17	24.43	0.000%
18	50.07	-58.17	0.06	-50.07	58.17	-0.06	0.000%
19	46.76	-58.17	27.10	-46.76	58.17	-27.10	0.000%
20	25.18	-58.17	43.74	-25.18	58.17	-43.74	0.000%
21	-0.07	-58.17	49.26	0.07	58.17	-49.26	0.000%
22	-25.29	-58.17	43.81	25.29	58.17	-43.81	0.000%
23	-46.83	-58.17	27.21	46.83	58.17	-27.21	0.000%
24	-50.07	-58.17	0.20	50.07	58.17	-0.20	0.000%
25	-42.22	-58.17	-24.31	42.22	58.17	24.31	0.000%
26	-25.05	-58.17	-43.50	25.04	58.17	43.50	0.000%
27	0.06	-38.37	-41.31	-0.06	38.37	41.31	0.000%
28	19.60	-38.37	-33.95	-19.60	38.37	33.95	0.000%
29	33.18	-38.37	-19.16	-33.18	38.37	19.16	0.000%
30	38.96	-38.37	0.06	-38.96	38.37	-0.06	0.000%
31	35.63	-38.37	20.67	-35.63	38.37	-20.67	0.000%
32	19.62	-38.37	34.11	-19.62	38.37	-34.11	0.000%
33	-0.06	-38.37	38.73	0.06	38.37	-38.73	0.000%
34	-19.73	-38.37	34.18	19.73	38.37	-34.18	0.000%
35	-35.70	-38.37	20.78	35.70	38.37	-20.78	0.000%
36	-38.96	-38.37	0.19	38.96	38.37	-0.19	0.000%
37	-33.11	-38.37	-19.06	33.11	38.37	19.06	0.000%
38	-19.49	-38.37	-33.88	19.49	38.37	33.88	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000199
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000149
16	Yes	4	0.00000001	0.00000174
17	Yes	4	0.00000001	0.00000183
18	Yes	4	0.00000001	0.00000171
19	Yes	4	0.00000001	0.00000148
20	Yes	4	0.00000001	0.00000347
21	Yes	4	0.00000001	0.00000190
22	Yes	4	0.00000001	0.00000179
23	Yes	4	0.00000001	0.00000148
24	Yes	4	0.00000001	0.00000328
25	Yes	4	0.00000001	0.00000181
26	Yes	4	0.00000001	0.00000345
27	Yes	4	0.00000001	0.00000001

28	Yes	4	0.00000001	0.00000199
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	183 - 163	9.525	27	0.4172	0.0210
T2	163 - 143	7.770	27	0.4059	0.0126
T3	143 - 123	6.063	27	0.3773	0.0031
T4	123 - 103	4.529	27	0.3246	0.0023
T5	103 - 83	3.179	27	0.2808	0.0036
T6	83 - 63	2.095	27	0.2186	0.0040
T7	63 - 43	1.205	35	0.1655	0.0036
T8	43 - 33	0.577	35	0.1034	0.0027
T9	33 - 23	0.353	35	0.0791	0.0022
T10	23 - 3	0.183	35	0.0537	0.0015

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
191.00	PD220	27	9.525	0.4172	0.0210	Inf
189.00	2" Dia 8' Omni	27	9.525	0.4172	0.0210	Inf
188.00	10' 2-Bay Dipole	27	9.525	0.4172	0.0210	Inf
183.00	4'x4" Pipe Mount	27	9.525	0.4172	0.0210	Inf
180.00	6 FT DISH	27	9.262	0.4159	0.0197	Inf
176.00	12' Dipole	27	8.910	0.4140	0.0179	742846
164.00	DB586-Y	27	7.857	0.4067	0.0130	223913
160.00	3' Standoff	27	7.508	0.4033	0.0112	97705
156.00	DB586-Y	27	7.160	0.3990	0.0092	53875
149.00	3' Standoff	27	6.561	0.3891	0.0057	29945
144.00	10' 2-Bay Dipole	27	6.144	0.3795	0.0035	23399
139.00	3' Standoff	27	5.741	0.3676	0.0019	23458
135.00	800 10121	27	5.427	0.3569	0.0014	25537
126.00	BXA-70063/6CF	27	4.748	0.3321	0.0020	31786
91.00	10' Frame	27	2.502	0.2439	0.0040	22637
62.00	GPS	35	1.167	0.1625	0.0036	16339

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	183 - 163	12.272	15	0.5370	0.0280
T2	163 - 143	10.015	15	0.5218	0.0224
T3	143 - 123	7.822	15	0.4851	0.0112
T4	123 - 103	5.854	23	0.4174	0.0049
T5	103 - 83	4.122	23	0.3617	0.0036
T6	83 - 63	2.724	23	0.2825	0.0040
T7	63 - 43	1.570	23	0.2146	0.0036
T8	43 - 33	0.753	23	0.1345	0.0027
T9	33 - 23	0.462	23	0.1029	0.0022
T10	23 - 3	0.240	23	0.0699	0.0015

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
191.00	PD220	15	12.272	0.5370	0.0280	765009
189.00	2" Dia 8' Omni	15	12.272	0.5370	0.0280	765009
188.00	10' 2-Bay Dipole	15	12.272	0.5370	0.0280	765009
183.00	4'x4" Pipe Mount	15	12.272	0.5370	0.0280	765009
180.00	6 FT DISH	15	11.933	0.5352	0.0272	765009
176.00	12' Dipole	15	11.481	0.5326	0.0262	546447
164.00	DB586-Y	15	10.127	0.5229	0.0227	166634
160.00	3' Standoff	15	9.678	0.5184	0.0211	74559
156.00	DB586-Y	15	9.231	0.5129	0.0190	41629
149.00	3' Standoff	15	8.462	0.5001	0.0147	23293
144.00	10' 2-Bay Dipole	15	7.927	0.4879	0.0117	18195
139.00	3' Standoff	15	7.408	0.4726	0.0094	18259
135.00	800 10121	15	7.006	0.4589	0.0080	19847
126.00	BXA-70063/6CF	23	6.135	0.4270	0.0056	24513
91.00	10' Frame	23	3.249	0.3146	0.0040	17921
62.00	GPS	23	1.520	0.2108	0.0036	12705

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	183	Leg	A325N	0.6250	4	1.28	13.50	0.095 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	1.60	4.12	0.388 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.5000	1	0.14	4.12	0.035 ✔	1.333	Bolt Shear
T2	163	Leg	A325N	0.7500	4	3.73	19.44	0.192 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2.49	3.17	0.784 ✔	1.333	Member Bearing
T3	143	Leg	A325N	0.8750	4	7.33	26.45	0.277 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.5000	1	4.75	4.76	0.999 ✔	1.333	Member Bearing
T4	123	Leg	A325N	1.0000	4	13.32	34.56	0.386 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.5000	1	6.44	5.89	1.093 ✔	1.333	Bolt Shear

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
T5	103	Leg	A325N	1.0000	4	18.99	34.55	0.550 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	9.06	9.28	0.977 ✓	1.333	Bolt Shear
T6	83	Leg	A325N	1.0000	4	25.87	34.56	0.748 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	9.72	9.06	1.073 ✓	1.333	Member Bearing
T7	63	Leg	A325N	1.0000	6	21.77	34.56	0.630 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	10.44	9.28	1.125 ✓	1.333	Bolt Shear
T8	43	Diagonal	A325X	0.7500	1	11.60	13.25	0.876 ✓	1.333	Bolt Shear
T9	33	Leg	A325N	1.0000	6	26.24	34.56	0.759 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.8750	1	12.12	12.63	0.960 ✓	1.333	Bolt Shear
T10	23	Leg	A449	1.0000	6	30.36	31.10	0.976 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.8750	1	14.15	12.63	1.121 ✓	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	183 - 163	P2.5x.203	20.00	5.00	63.3 K=1.00	22.141	1.7040	-6.77	37.73	0.180 ✓
T2	163 - 143	P2.5x.276	20.03	6.68	86.7 K=1.00	17.634	2.2535	-17.99	39.74	0.453 ✓
T3	143 - 123	P3x.216	20.04	6.68	68.9 K=1.00	21.145	2.2285	-37.59	47.12	0.798 ✓
T4	123 - 103	P4x.337	20.04	6.68	54.3 K=1.00	23.671	4.4074	-66.77	104.33	0.640 ✓
T5	103 - 83	P5x.258	20.03	10.02	64.0 K=1.00	22.021	4.2999	-96.59	94.69	1.020 ✓
T6	83 - 63	P5x.375	20.03	10.02	65.4 K=1.00	21.782	6.1120	-131.92	133.13	0.991 ✓
T7	63 - 43	P5x.375	20.04	5.14	33.6 K=1.00	26.700	6.1120	-166.97	163.19	1.023 ✓
T8	43 - 33	P6x.432	10.02	10.02	54.8 K=1.00	23.591	8.4049	-183.81	198.28	0.927 ✓
T9	33 - 23	P6x.432	10.02	10.02	54.8 K=1.00	23.591	8.4049	-202.81	198.28	1.023 ✓
T10	23 - 3	P6x.432	20.03	5.12	28.0 K=1.00	27.400	8.4049	-238.77	230.30	1.037 ✓

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	183 - 163	L1 3/4x1 3/4x3/16	9.91	4.70	164.3 K=1.00	5.530	0.6211	-1.60	3.43	0.466 ✔
T2	163 - 143	L2x2x1/8	12.24	6.06	183.0 K=1.00	4.457	0.4844	-2.48	2.16	1.150 ✔
T3	143 - 123	L2 1/2x2 1/2x3/16	14.02	6.93	167.9 K=1.00	5.295	0.9020	-4.90	4.78	1.027 ✔
T4	123 - 103	L2 1/2x2 1/2x5/16	15.89	7.82	191.8 K=1.00	4.060	1.4600	-6.22	5.93	1.050 ✔
T5	103 - 83	L3X3X3/16 Reinf w/L2.5X2.5X3/16	19.10	9.57	143.2 K=1.00	7.281	3.2137	-8.80	23.40	0.376 ✔
T6	83 - 63	L3 1/2x3 1/2x1/4	20.83	10.29	177.9 K=1.00	4.717	1.6900	-9.30	7.97	1.166 ✔
T7	63 - 43	L3 1/2x3 1/2x3/8	22.67	11.22	196.0 K=1.00	3.888	2.4800	-9.59	9.64	0.995 ✔
T8	43 - 33	L4x4x3/8	23.59	11.62	176.9 K=1.00	4.770	2.8600	-11.60	13.64	0.851 ✔
T9	33 - 23	L4x4x3/8	24.50	12.05	183.5 K=1.00	4.433	2.8600	-9.69	12.68	0.764 ✔
T10	23 - 3	L4x4x3/8	25.41	12.51	190.6 K=1.00	4.113	2.8600	-13.12	11.76	1.115 ✔

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	63 - 43	L3 1/2x3 1/2x1/4	20.32	19.86	267.1 K=0.78	2.093	1.6900	-2.90	3.54	0.819 ✔
T10	23 - 3	KL/R > 250 (C) - 133 L4x4x1/4 KL/R > 250 (C) - 172	24.35	23.80	277.4 K=0.77	1.940	1.9400	-4.14	3.76	1.100 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	183 - 163	L2 1/2x2 1/2x3/16	8.56	8.09	196.2 K=1.00	3.881	0.9020	-0.14	3.50	0.041 ✔

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	183 - 163	P2.5x.203	20.00	5.00	63.3	30.000	1.7040	5.12	51.12	0.100 ✔
T2	163 - 143	P2.5x.276	20.03	6.68	86.7	30.000	2.2535	14.92	67.61	0.221 ✔
T3	143 - 123	P3x.216	20.04	6.68	68.9	30.000	2.2285	29.34	66.85	0.439 ✔
T4	123 - 103	P4x.337	20.04	6.68	54.3	30.000	4.4074	53.29	132.22	0.403 ✔
T5	103 - 83	P5x.258	20.03	10.02	64.0	30.000	4.2999	75.95	129.00	0.589 ✔
T6	83 - 63	P5x.375	20.03	10.02	65.4	30.000	6.1120	103.46	183.36	0.564 ✔
T7	63 - 43	P5x.375	20.04	5.14	33.6	30.000	6.1120	130.92	183.36	0.714 ✔
T8	43 - 33	P6x.432	10.02	10.02	54.8	30.000	8.4049	145.99	252.15	0.579 ✔
T9	33 - 23	P6x.432	10.02	10.02	54.8	30.000	8.4049	157.43	252.15	0.624 ✔
T10	23 - 3	P6x.432	20.03	5.12	28.0	30.000	8.4049	182.60	252.15	0.724 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	183 - 163	L1 3/4x1 3/4x3/16	9.91	4.70	107.7	29.000	0.3779	1.55	10.96	0.142 ✔
T2	163 - 143	L2x2x1/8	12.24	6.06	118.4	29.000	0.3047	2.49	8.84	0.281 ✔
T3	143 - 123	L2 1/2x2 1/2x3/16	14.02	6.93	108.6	29.000	0.5886	4.75	17.07	0.279 ✔
T4	123 - 103	L2 1/2x2 1/2x5/16	15.89	7.82	125.0	29.000	0.9485	6.44	27.51	0.234 ✔
T5	103 - 83	L3X3X3/16 Reinf w/L2.5X2.5X3/16	19.10	9.57	143.2	21.600	3.2137	9.06	69.42	0.131 ✔
T6	83 - 63	L3 1/2x3 1/2x1/4	20.83	10.29	114.9	29.000	1.1034	9.72	32.00	0.304 ✔
T7	63 - 43	L3 1/2x3 1/2x3/8	22.67	11.22	127.5	29.000	1.6139	10.44	46.80	0.223 ✔
T8	43 - 33	L4x4x3/8	23.59	11.62	114.8	29.000	1.8989	9.70	55.07	0.176 ✔
T9	33 - 23	L4x4x3/8	24.50	12.05	119.2	29.000	1.8637	12.12	54.05	0.224 ✔
T10	23 - 3	L4x4x3/8	26.33	12.97	128.2	29.000	1.8637	14.15	54.05	0.262

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
										✔

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	63 - 43	L3 1/2x3 1/2x1/4	20.32	19.86	218.6	21.600	1.6900	2.90	36.50	0.079 ✔
T10	23 - 3	L4x4x1/4	24.35	23.80	228.5	21.600	1.9400	4.14	41.90	0.099 ✔

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	183 - 163	L2 1/2x2 1/2x3/16	8.56	8.09	128.3	29.000	0.5886	0.05	17.07	0.003 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	183 - 163	Leg	P2.5x.203	3	-6.77	50.29	13.5	Pass
T2	163 - 143	Leg	P2.5x.276	33	-17.99	52.97	34.0	Pass
T3	143 - 123	Leg	P3x.216	53	-37.59	62.81	59.8	Pass
T4	123 - 103	Leg	P4x.337	75	-66.77	139.07	48.0	Pass
T5	103 - 83	Leg	P5x.258	96	-96.59	126.22	76.5	Pass
T6	83 - 63	Leg	P5x.375	111	-131.92	177.46	74.3	Pass
T7	63 - 43	Leg	P5x.375	124	-166.97	217.53	76.8	Pass
T8	43 - 33	Leg	P6x.432	145	-183.81	264.31	69.5	Pass
T9	33 - 23	Leg	P6x.432	154	-202.81	264.31	76.7	Pass
T10	23 - 3	Leg	P6x.432	163	-238.77	306.99	77.8	Pass
T1	183 - 163	Diagonal	L1 3/4x1 3/4x3/16	9	-1.60	4.58	35.0	Pass
T2	163 - 143	Diagonal	L2x2x1/8	36	-2.48	2.88	86.3	Pass
T3	143 - 123	Diagonal	L2 1/2x2 1/2x3/16	57	-4.90	6.37	77.0	Pass
T4	123 - 103	Diagonal	L2 1/2x2 1/2x5/16	78	-6.22	7.90	78.8 82.0 (b)	Pass
T5	103 - 83	Diagonal	L3X3X3/16 Reinf w/L2.5X2.5X3/16	99	-8.80	31.19	28.2 73.3 (b)	Pass
T6	83 - 63	Diagonal	L3 1/2x3 1/2x1/4	114	-9.30	10.63	87.5	Pass
T7	63 - 43	Diagonal	L3 1/2x3 1/2x3/8	132	-9.59	12.85	74.6 84.4 (b)	Pass
T8	43 - 33	Diagonal	L4x4x3/8	153	-11.60	18.19	63.8 65.7 (b)	Pass
T9	33 - 23	Diagonal	L4x4x3/8	161	-9.69	16.90	57.4	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
							72.0 (b)	
T10	23 - 3	Diagonal	L4x4x3/8	179	-13.12	15.68	83.7	Pass
							84.1 (b)	
T7	63 - 43	Secondary Horizontal	L3 1/2x3 1/2x1/4	135	-2.90	4.72	61.4	Pass
T10	23 - 3	Secondary Horizontal	L4x4x1/4	174	-4.14	5.02	82.5	Pass
T1	183 - 163	Top Girt	L2 1/2x2 1/2x3/16	5	-0.14	4.67	3.1	Pass
							Summary	
						Leg (T10)	77.8	Pass
						Diagonal (T6)	87.5	Pass
						Secondary Horizontal (T10)	82.5	Pass
						Top Girt (T1)	3.1	Pass
						Bolt Checks	84.4	Pass
						RATING =	**87.5**	**Pass**

Program Version 6.0.0.8 - 9/7/2011 File:J:/Jobs/1311800.WI/Rev 1/Calcs/ERI Files/With Original Bolt Sizes_Revised Grade and Type_09-05-12/Reinforced/180 ROHN SSV Lattice Newton CT.eri

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Subject:	Lattice Tower Foundation Anaylsis
Location:	Newtown, CT
Rev. 1: 11/13/13	Prepared by: JRM. Checked by: C.F.C. Job No. 13118

Pad and Pier Foundation:

Input Data:

(With AT&T Foundation Reinforcements)

Tower Data

Max Uplift Force =	Uplift := 191·kips	(User Input from RISATower)	(Leg)
Max Shear Force =	Shear := 31·kips	(User Input from RISATower)	(Leg)
Max Compressive Force =	Compression := 246·kips	(User Input from RISATower)	(Leg)
Base Shear =	$Shear_{tot}$:= 54·kips	(User Input from RISATower)	(Tower)
Base Compression =	$Comp_{tot}$:= 58·kips	(User Input from RISATower)	(Tower)
Base Moment =	Moment := 4873·ft·kips	(User Input from RISATower)	(Tower)
Tower Height =	H_t := 180·ft	(User Input)	

Original Foundation Data (Foundation #1): (North East Leg):

Overall Depth of Footing =	D_{f1} := 7.1·ft	(User Input)	Foundation #1. Refer to Sketch SKRAD101498 Sheet 1 of 3 prepared for Connecticut Light and Power Company, dated 10/14/98
Length of Pier =	L_{p1} := 10.0·ft	(User Input)	
Pier Projection Above Grade =	P_{P1} := 4.9·ft	(User Input)	
Width of Pier =	d_{p1} := 2.5·ft	(User Input)	
Pad Width =	PD_{w1} := 10.0·ft	(User Input)	
Pad Thickness =	PD_{t1} := 2.0·ft	(User Input)	

Original Foundation Data (Foundation #2): (South West Leg):

Overall Depth of Footing =	D_{f2} := 8.5·ft	(User Input)	Foundation #2. Refer to Sketch SKRAD101498 Sheet 1 of 3 prepared for Connecticut Light and Power Company, dated 10/14/98
Length of Pier =	L_{p2} := 10.0·ft	(User Input)	
Pier Projection Above Grade =	P_{P2} := 3.5·ft	(User Input)	
Width of Pier =	d_{p2} := 2.5·ft	(User Input)	
Pad Width =	PD_{w2} := 10.0·ft	(User Input)	
Pad Thickness =	PD_{t2} := 2.0·ft	(User Input)	

Original Foundation Data (Foundation #3): (South East Leg):

Overall Depth of Footing =	D_{f3} := 10.75·ft	(User Input)	Foundation #3. Refer to Sketch SKRAD101498 Sheet 1 of 3 prepared for Connecticut Light and Power Company, dated 10/14/98
Length of Pier =	L_{p3} := 10.0·ft	(User Input)	
Pier Projection Above Grade =	P_{P3} := 1.25·ft	(User Input)	
Width of Pier =	d_{p3} := 2.5·ft	(User Input)	
Pad Width =	PD_{w3} := 10.0·ft	(User Input)	
Pad Thickness =	PD_{t3} := 2.0·ft	(User Input)	

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Material Properties:

Internal Friction Angle of Soil =	$\Phi_s := 34 \cdot deg$	(User Input)	Based on Geotech Report prepared by Clarence Welti & Assoc., INC., dated October 19, 2011
Allowable Soil Bearing Capacity =	$q_s := 6000 \cdot psf$	(User Input)	
Allowable Soil Bearing Capacity =	$q_{suse} := 3000 \cdot psf$	(User Input)	Note: 3000psf used for evaluation of existing concrete at grade and proposed concrete infill for soil bearing condition.
Unit Weight of Soil =	$\gamma_s := 125 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_c := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Calculated Factors:

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Calculated Data:

Active Pressure =

$$K_a := \frac{\left(1 - \sin\left(\Phi_s\right)\right)}{\left(1 + \sin\left(\Phi_s\right)\right)} = 0.283$$

$$P_a := \frac{1}{2} \cdot \left(PD_{t1}\right)^2 \cdot PD_{w1} \cdot \gamma_s \cdot K_a = 0.71 \cdot kips$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin\left(\Phi_s\right)}{1 - \sin\left(\Phi_s\right)} = 3.537$$

$$P_p := \frac{1}{2} \cdot \left(PD_{t1}\right)^2 \cdot PD_{w1} \cdot \gamma_s \cdot K_p = 8.84 \cdot kips$$

Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_{cw} := if\left(Bouyancy = 1, \gamma_c - 62.4pcf, \gamma_c\right) = 150 \cdot pcf$$

Adjusted Soil Unit Weight =

$$\gamma_{sw} := if\left(Bouyancy = 1, \gamma_s - 62.4pcf, \gamma_s\right) = 125 \cdot pcf$$

Cross Sectional Area 1 of Resisting Pyramid =

$$B_1 := PD_{w1}^2 = 100ft^2$$

Cross Sectional Area 2 of Resisting Pyramid =

$$B_2 := \left[2\left(L_{p1} - P_{P1} - n\right) \cdot \tan\left(\Phi_s\right) + PD_{w1}\right]^2 = 284.9ft^2$$

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Volume and Weight of Soil Above Original Footing to Underside of Previous Reinforcement

Foundation #1:

Volume of Soil Above Footing = $V_{soilfnd1} := \left(PD_{w1}^2 - d_{p1}^2\right)\left(L_{p1} - P_{P1}\right) = 478.12 \cdot ft^3$

Foundation #2:

Volume of Soil Above Footing = $V_{soilfnd2} := \left(PD_{w2}^2 - d_{p2}^2\right)\left(L_{p2} - P_{P2}\right) = 609.38 \cdot ft^3$

Foundation #3:

Volume of Soil Above Footing = $V_{soilfnd3} := \left(PD_{w3}^2 - d_{p3}^2\right)\left(L_{p3} - P_{P3}\right) = 820.31 \cdot ft^3$

Total Weight of Soil = $WT_s := \left(V_{soilfnd1} + V_{soilfnd2} + V_{soilfnd3}\right) \cdot \gamma_s = 238.5 \cdot kip$

Volume and Weight of Previous Concrete Reinforcement and Proposed Infill

Foundation #1:

Contact Area of Concrete At Grade = $A_{concfnd1} := \left(102.87ft^2 - 6.25ft^2\right) = 96.62ft^2$

Volume of Concrete At Grade = $V_{concfnd1} := \left(A_{concfnd1} \cdot 6.0ft\right) = 579.72 \cdot ft^3$

Foundation #2:

Contact Area of Concrete At Grade = $A_{concfnd2} := \left(260ft^2 - 6.25ft^2\right) = 253.75ft^2$

Volume of Concrete At Grade = $V_{concfnd2} := \left[\left(A_{concfnd2}\right)4.0ft\right] = 1015 \cdot ft^3$ (Minus pier area)

Foundation #3:

Contact Area of Concrete At Grade = $A_{concfnd3} := \left(169ft^2 - 6.25ft^2\right) = 162.75ft^2$

Volume of Concrete At Grade = $V_{concfnd3} := \left[\left(A_{concfnd3}\right)4.5ft\right] = 732.38 \cdot ft^3$

Area of Existing Reinforced Concrete At Grade = $A_{origreinf} := \left(A_{concfnd1} + A_{concfnd2} + A_{concfnd3}\right) = 513.1 \cdot ft^2$

Area of Proposed Reinforced Concrete Infill = $A_{reinfprop} := 255ft^2$

Average Depth of Mat (Existing and Proposed Infill) = $Mat_t := 4.0ft$

Area of Proposed Reinforced Concrete Infill = $A_{mattot} := A_{origreinf} + A_{reinfprop} = 768.1ft^2$

Weight of Concrete At Grade (Proposed Infill) = $WT_{concgrade} := \left(V_{concfnd1} + V_{concfnd2} + V_{concfnd3}\right) \cdot \gamma_c = 349.1 \cdot kip$

Weight of Concrete At Grade (Proposed Infill) = $WT_{concgradeinfill} := \left[\left(A_{reinfprop}\right)Mat_t\right] \cdot \gamma_c = 153 \cdot kip$

Total Weight of Concrete At Grade = $WT_{concgradetot} := \left(WT_{concgrade} + WT_{concgradeinfill}\right) = 502.1 \cdot kip$

Total Weight of Original Concrete Foundation System (x3), Soil, Previous Concrete Reinforcement and Proposed R.C. Infill

Total Weight = $WT_{tot} := WT_{origconc} + WT_s + WT_{concgradetot} = 858.7 \cdot kip$

Soil Bearing Pressure:

Section Modulus of Mat = $S := 2274.5ft^3$ (Calculated external of program)

Minimum Distance From Tower Centroid to Edge of Mat at Foundation #1 (North East leg) = $y1 := 14.62ft$ (Calculated external of program)

Minimum Distance From Reinforced Mat Centroid to Edge of Mat at Foundation #1 (North East leg) = $y2 := 16.83ft$ (Shortest Lever Arm Calculated external of program)

Maximum Pressure Under Mat = $P_{max} := \frac{WT_{tot} - WT_{origconc} - WT_s + Comp_{tot}}{A_{mattot}} + \frac{Shear_{tot} \cdot (Mat_t)}{S} = 0.82 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < q_{suse}, "Okay", "No Good")$

Max_Pressure_Check = "Okay"

Minimum Pressure Under Mat = $P_{min} := \frac{WT_{tot} - WT_{origconc} - WT_s + Comp_{tot}}{A_{mattot}} - \frac{Shear_{tot} \cdot (Mat_t)}{S} = 0.63 \cdot ksf$

$Min\_Pressure\_Check := if[(P_{min} \geq 0) \cdot (P_{min} < q_{suse}), "Okay", "No Good"]$

Min_Pressure_Check = "Okay"

Overturning Moment Check:

Overturning Moment = $M_{ot} := Moment + Shear_{tot} \cdot (Mat_t) = 5089 \cdot kip \cdot ft$

Resisting Moment = $M_r := (WT_{origconc} + WT_s) \cdot y1 + (WT_{concgradetot} \cdot y2) = 13663.3\,ft \cdot kips$

Factor of Safety = $\frac{M_r}{M_{ot}} = 2.68$

$Overturning\_Moment := if\left(\frac{M_r}{M_{ot}} > 2, "OK", "NG"\right)$

Overturning_Moment = "OK"

Concrete Infill Reinforcement:

Note:
Reinforcement calculation for concrete infill based on temperature and shrinkage steel requirements only. Moment strength okay by inspection due to thickness of slab.
Top and bottom reinforcement combined to account for required amount

Concrete Cover = $c := 3in$

Assumed Min Rebar Diameter = $d_{bar} := 0.5in$

Concrete Infill Thickness = $h := Mat_t$

Effective Depth = $d := h - c - \left(.5 \cdot d_{bar}\right) = 44.75 \cdot in$

Reinforcement = $Reinf_{reqd} := (.0018 \cdot d \cdot 1 \cdot ft) \cdot \frac{1}{2} = 0.48 \cdot in^2$

(Temperature and Shrinkage Reinforcement Distributed Between Top and Bottom of Concrete Slab)

Use #6 bars @ 10" o.c. or #7 bars @ 12" o.c.

verizonwireless

TOWER MODIFICATION DESIGN

NEWTOWN 2
20 BARNABAS ROAD
NEWTOWN, CT 06470

VICINITY MAP — NORTH

PROJECT SUMMARY

SITE ADDRESS:	20 BARNABAS ROAD NEWTOWN, CT 06470
PROJECT COORDINATES:	LAT: 41°-25'-39.50"N LON: 73°-20'-37.42"W ELEV: ±452' AMSL
TOWER OWNER:	NORTHEAST UTILITIES SYSTEM 107 SELDEN STREET BERLIN, CT 06037
VERIZON CONTACT:	JAMES SMITH 860.608.0028
VERIZON SITE NUMBER:	NA
VERIZON SITE NAME:	NEWTOWN 2
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD ROAD BRANFORD, CT 06405
CENTEK CONTACT:	CARLO F. CENTORE, PE 203.488.0580 ext. 122

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS & GENERAL NOTES	0
N-2	STRUCTURAL STEEL NOTES	0
MI-1	MODIFICATION INSPECTION REQUIREMENTS	0
S-1	TOWER REINFORCEMENT ELEVATION	0

DESIGNED BY: JRM
DRAWN BY: JRM
CHK'D BY: CFC

REV	DATE	BY	DESCRIPTION
0	6/11/13	CFC	ISSUED FOR CONSTRUCTION
1	07/09/13	JRM	ADDENDUM #1 - REVISED SECTION 13 KIT REINFORCEMENTS PER RFI REQUIREMENT
2	07/17/13	CFC	REVISED MAX TOWER LOADS PER REVISED VERIZON CABLE LAYOUT
3	07/31/13	JRM	

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VERIZON WIRELESS
NEWTOWN 2

DATE: 6/11/13
SCALE: AS SHOWN
JOB NO. 13118

TITLE SHEET

SHEET NO.
T-1
Sheet No. 1 of 5

DESIGN BASIS

GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2009 CONNECTICUT SUPPLEMENT.

1. DESIGN CRITERIA:

   WIND SPEED OF 85 MPH (FASTEST MILE) AND 85 MPH (FASTEST MILE) CONCURRENT WITH 0.5" OF RADIAL ICE NEU SUB-090.

   - SEISMIC LOAD: PER ASCE 7-95 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES (DOES NOT GOVERN).

PROJECT SCOPE

1. INSTALLATION OF SIX (6) ANTEL BXA-70063-6CF PANEL ANTENNAS, SIX (6) ANTEL BXA-171063-12CF PANEL ANTENNAS, THREE (3) ALCATEL-LUCENT RRH2X40-AWS REMOTE RADIO UNITS AND THREE (3) ALCATEL-LUCENT RRH2X40-07-U REMOTE RADIO UNITS MOUNTED ON THREE (3) SITE PRO 12-FT 6-IN HEAVY DUTY V-FRAMES (P/N VFA12) WITH A RAD CENTER ELEVATION OF 126'-0".
2. INSTLLATION OF ONE (1) RFS DB-T1-6Z-8AB-0Z MAIN DISTRIBUTION BOX LEG MOUNTED ON WITH AN ELEVATION OF 126'-0".

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS AND REINFORCEMENT DESIGN PREPARED BY CENTEK ENGINEERING, INC., FOR VERIZON WIRELESS, DATED 6/11/13.
2. TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM A PREVIOUS STRUCTURAL REPORT PREPARED BY CENTEK ENGINEERING PROJECT #12047.C06, DATED MARCH 28, 2013.
3. THE TEMPORARY DETACHMENT AND/OR REPLACEMENT OF TOWER MEMBERS SHALL BE DONE ONE AT A TIME AND SHALL BE CONDUCTED ON DAYS WITH LESS THAN 15 MPH WIND PRESENT. NO MEMBER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY.
4. ALL REINFORCEMENT SHOWN HEREIN APPLIES TO ALL SIDES OF THE TOWER.
5. PROVIDE TEMPORARY ANCHORS, GUYING AND/OR BRACING AS REQUIRED TO SAFELY CONDUCT THE WORK.
6. ALL WORK SHALL BE IN ACCORDANCE WITH TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES".
7. THE TOWER STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER REINFORCEMENTS ARE COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIE-DOWNS, WHICH MIGHT BE NECESSARY.
8. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
9. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
10. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
12. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.
13. TOWER REINFORCING SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.
14. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE TEMPORARILY RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER REINFORCEMENT.
15. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

DESIGNED BY:			JRM
DRAWN BY:			JRM
CHK'D BY:			DTC
1	10/10/13	JRM	DTC	REVISED MAX TOWER LOADS PER REVISED VERIZON CABLE LAYOUT
0	07/09/13	JRM	DTC	ADDENDUM #1 - INCLUDES SECTION 13 TIA/EIA-222-F REINFORCEMENTS PER RFI REQUIRMENT
A	6/11/13	T.S.	DTC	FOR CONSTRUCTION
REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION

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VERIZON WIRELESS

NEWTOWN 2

DATE:	6/11/13
SCALE:	AS SHOWN
JOB NO.	13118

DESIGN BASIS & GENERAL NOTES

SHEET NO.
N-1
Sheet No. 2 of 5

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).

2. MATERIAL SPECIFICATIONS

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI).
   C. STRUCTURAL STEEL (TOWER REINF. PLATES---ASTM A572_GR50 (50 KSI)
   D. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   E. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   F. PIPE---ASTM A53 GRADE B (FY = 35 KSI)

3. FASTENER SPECIFICATIONS

   A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
   B. U-BOLTS---ASTM A307
   C. ANCHOR RODS---ASTM F1554
   D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572_GR50 STEELS, ASTM E80XX FOR A572_GR65 STEEL.
   E. BLIND BOLTS---AS1252 PROPERTY CLASS 8.8 (FU=120 KSI).

4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.

5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.

6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.

7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.

8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.

9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.

10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.

11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".

12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.

13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.

15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.

16. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.

17. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.

18. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

19. FABRICATE BEAMS WITH MILL CAMBER UP.

20. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.

21. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

DESIGNED BY:	JRM
DRAWN BY:	JRM
CHK'D BY:	DTC

NO.	DATE	BY	CHK'D	REVISION / ISSUE
A	12/10/13	JRM	DTC	REVISED MAX TOWER LOADS PER REVISED VERIZON CABLE LAYOUT
0	07/09/13	JRM	DTC	ADDENDUM #1 - INCLUDED SECTION 13 30 67 REINFORCEMENTS PER RFI RESPONSE#1
0	6/11/13	T.S.	DTC	ISSUED FOR CONSTRUCTION

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VERIZON WIRELESS

NEWTOWN 2

DATE: 6/11/13
SCALE: AS SHOWN
JOB NO. 13118

STRUCTURAL STEEL NOTES

SHEET NO.
N-2

MODIFICATION INSPECTION REPORT REQUIREMENTS

PRE-CONSTUCTION		DURING CONSTRUCTION		POST-CONSTRUCTION	
SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM
X	EOR MODIFICATION INSPECTION DRAWING	–	FOUNDATIONS	X	MODIFICATION INSPECTOR RECORD REDLINE DRAWING
X	EOR APPROVED SHOP DRAWINGS	–	EARTHWORK: BACKFILL MATERIAL & COMPACTION	–	POST–INSTALLED ANCHOR ROD PULL–OUT TEST
–	EOR APPROVED POST–INSTALLED ANCHOR MPII	–	CONCRETE TESTING	X	PHOTOGRAPHS
–	FABRICATION INSPECTION	X	STEEL INSPECTION		
–	FABRICATOR CERTIFIED WELDER INSPECTION	–	POST INSTALLED ANCHOR ROD VERIFICATION		
X	MATERIAL CERTIFICATIONS	–	BASE PLATE GROUT VERIFICATION		
		–	CONTRACTOR'S CERTIFIED WELD INSPECTION		
		X	ON–SITE COLD GALVANIZING VERIFICATION		
		–	GUY WIRE TENSION REPORT		
		X	CONTRACTOR AS–BUILT REDLINE DRAWINGS		

NOTES:
1. REFER TO MODIFICATION INSPECTION NOTES FOR ADDITIONAL REQUIREMENTS
2. "X" DENOTES DOCUMENT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
3. "–" DENOTES DOCUMENT NOT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
4. EOR – ENGINEER OF RECORD
4. MPII – "MANUFACTURER'S PRINTED INSTALLATION GUIDELINES"

GENERAL

1. THE MODIFICATION INSPECTION IS A VISUAL INSPECTION OF STRUCTURAL MODIFICATIONS, TO INCLUDE A REVIEW AND COMPILATION OF SPECIFIED SUBMITTALS AND CONSTRUCTION INSPECTIONS, AS AN ASSURANCE OF COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS PREPARED UNDER THE DIRECTION OF THE ENGINEER OF RECORD (EOR).
2. THE MODIFICATION INSPECTION IS TO CONFIRM INSTALLATION CONFIGURATION AND GENERAL WORKMANSHIP AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE MODIFICATION DESIGN EFFECTIVENESS AND INTENT RESIDES WITH THE ENGINEER OF RECORD.
3. TO ENSURE COMPLIANCE WITH THE MODIFICATION INSPECTION REQUIREMENTS THE GENERAL CONTRACTOR (GC) AND THE MODIFICATION INSPECTOR (MI) COMMENCE COMMUNICATION UPON AUTHORIZATION TO PROCEED BY THE CLIENT. EACH PARTY SHALL BE PROACTIVE IN CONTACTING THE OTHER. THE EOR SHALL BE CONTACTED IF SPECIFIC GC/MI CONTACT INFORMATION IS NOT MADE AVAILABLE.
4. THE GC SHALL PROVIDE THE MI WITH A MINIMUM OF 5 BUSINESS DAYS NOTICE OF IMPENDING INSPECTIONS.
5. WHEN POSSIBLE, THE GC AND MI SHALL BE ON SITE DURING THE MODIFICATION INSPECTION TO HAVE ANY NOTED DEFICIENCIES ADDRESSED DURING THE INITIAL MODIFICATION INSPECTION.

MODIFICATION INSPECTOR (MI)

1. THE MI SHALL CONTACT THE GC UPON AUTHORIZATION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.
2. THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON–SITE INSPECTIONS AND COMPILATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

1. THE GC IS REQUIRED TO CONTACT THE GC UPON AUTHORIZATION TO PROCEED WITH CONSTRUCTION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.
2. THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

1. SHOULD THE STRUCTURAL MODIFICATION NOT COMPLY WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS, THE GC SHALL WORK WITH THE MODIFICATION INSPECTOR IN A VIABLE REMEDIATION PLAN AS FOLLOWS:

   – CORRECT ALL DEFICIENCIES TO COMPLY WITH THE CONTRACT DOCUMENTS AND COORDINATE WITH THE MI FOR A FOLLOW UP INSPECTION.
   – WITH CLIENT AUTHORIZATION, THE GC MAY WORK WITH THE EOR TO REANALYZE THE MODIFICATION USING THE AS–BUILT CONDITION.

REQUIRED PHOTOGRAPHS

1. THE GC AND MI SHALL AT MINIMUM PHOTO DOCUMENT THE FOLLOWING FOR INCLUSION IN THE MODIFICATION INSPECTION REPORT:

   – PRE–CONSTRUCTION: GENERAL CONDITION OF THE SITE.
   – DURING CONSTRUCTION: RAW MATERIALS, CRITICAL DETAILS, WELD PREPARATION, BOLT INSTALLATION & TORQUE, FINAL INSTALLED CONDITION & SURFACE COATING REPAIRS.
   – POST–CONSTRUCTION: FINAL CONDITION OF THE SITE

NO.	DATE	BY	DESCRIPTION
2	08/13/13	JRM	REVISED MAX TOWER USAGE PER REVISED VERIZON CABLE LAYOUT
1	07/09/13	CFC	ADDENDUM #1 – INCLUDED SECTION 13 SEAT REINFORCEMENTS PER MI REQUIREMENT
0	6/11/13	CFC	ISSUED FOR CONSTRUCTION

DESIGNED BY: JRM
DRAWN BY: JRM
CHK'D BY: CFC

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VERIZON WIRELESS
NEWTOWN 2
DATE: 6/11/13
SCALE: AS SHOWN
JOB NO.: 13118

MODIFICATION INSPECTION REQUIREMENTS

SHEET NO.
MI-1

I. REINFORCEMENT SCHEDULE KEY:
(MEMBERS INDICATED WITHIN SCHEDULE ARE EXISTING UNLESS NOTED OTHERWISE)

A. REPLACE EXIST. L2.5X2.5X1/4 DIAGONAL MEMBERS WITH L2.5X2.5X5/16 MEMBERS. REPLACE EXIST. 1/2" ø A325-X BOLTS W/ NEW 1/2" ø A325-X BOLTS.

B. INSTALL L4X4X1/4 SECONDARY HORIZONTAL MEMBERS (PRIMUS PART NO. RSH-0623-25) W/ LEG BUTTERFLY BRACKETS (PRIMUS PART NO. RSH-0568-68)

C. INSTALL L3.5X3.5X1/4 SECONDARY HORIZONTAL MEMBERS (PRIMUS PART NO. RSH-0619-21) W/ LEG BUTTERFLY BRACKETS (PRIMUS PART NO. RSH-0568-68)

MAX. TOWER STEEL USAGE w/ ABOVE REINFORCEMENTS = 87.5% (DIAGONAL MEMBERS SECTION T6 60'-0"-80'-0" ATB) UNDER LOAD CASE #2

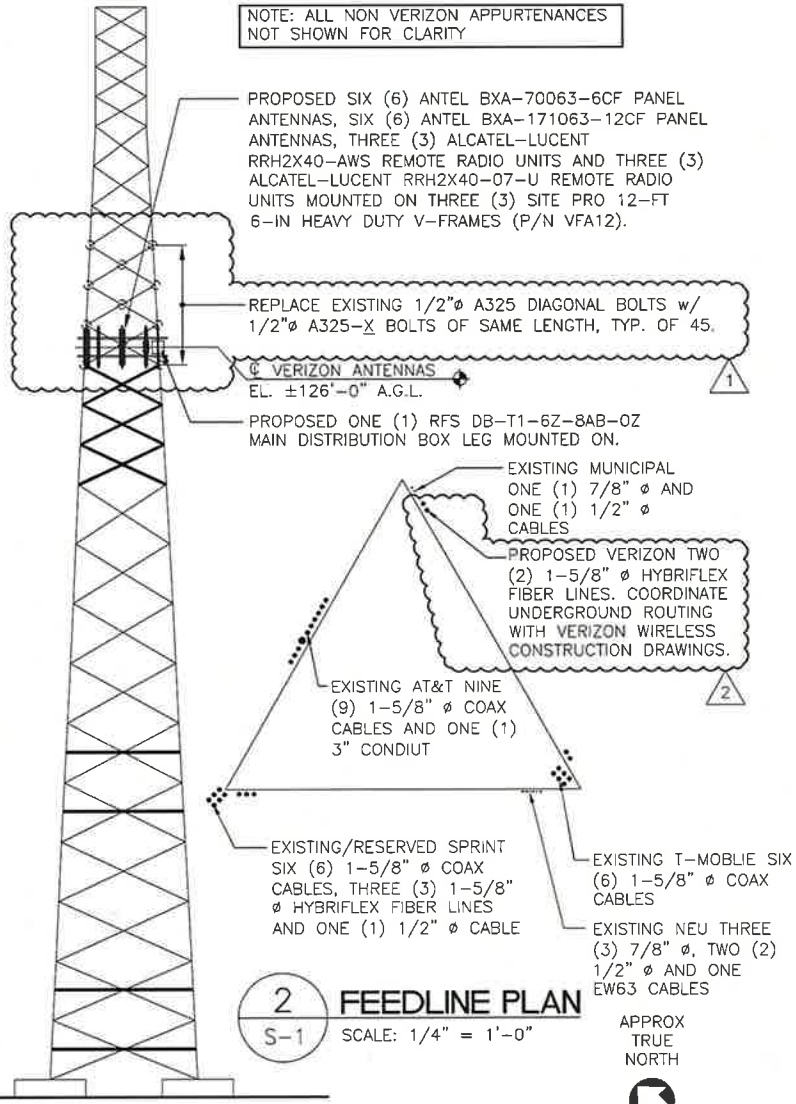
2

LEGEND:

1. A.T.B. DENOTES ABOVE TOWER BASE.
2. A.G.L. DENOTES ABOVE GRADE LEVEL.
3. TXX DENOTES TNXTOWER OUTPUT SECTION NUMBER.

SECTION	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
LEGS	P6X0.432			P5X0.375		P5X0.258	P4X0.337	P3X0.216	P2.5X0.276	P2.5X0.203
LEG GRADE	A572-50									
DIAGONALS	L4X4X3/8			L3.5X3.5X5/16		L3X3X3/16 REIN.	A	L2.5X2.5X5/16	L2X2X1/4	L1.75X1.75X3/16
DIAG.GRADE	A36									
TOP GIRTS	N.A.									L2.5X2.5X3/16
SEC. HORZ.	B	N.A.		C		N.A.				

180.0'
160.0'
140.0'
120.0'
100.0'
80.0'
60.0'
40.0'
20.0'
0.0'



1 / S-1 TOWER ELEVATION - PROPOSED
SCALE: 1" = 20'-0"

2 / S-1 FEEDLINE PLAN
SCALE: 1/4" = 1'-0"

1	5/15/13	JRM	PROPOSED MAX POWER USAGE PER REVISED VERIZON CABLE LAYOUT
2	5/29/13	DFC	ADDENDUM #1 - INCLUDED SECTION 13 BOLT REINFORCEMENTS PER NU REQUIREMENT
3	6/11/13	DFC	ISSUED FOR CONSTRUCTION

DESIGNED BY: JRM
DRAWN BY: JRM
CHK'D BY: DFC

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VERIZON WIRELESS
NEWTOWN 2
DATE: 6/11/13
SCALE: AS SHOWN
JOB NO. 13118

TOWER REINFORCEMENT ELEVATION

SHEET NO.
S-1

Site Name	NEWTOWN 2, CT		Site #		5-0073	
Latitude	41-25-40 N		Longitude		73-20-37.4 W	
NU communications tower			GEL (Feet)		441	
700 MHz LTE Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 700MHz RRH		ALU 700MHz RRH		ALU 700MHz RRH	
ANTENNA TYPE	BXA-70063-6CF_2		BXA-70063-6CF_2		BXA-70063-6CF_2	
QUANTITY PER FACE	1		1		1	
ORIENTATION	1		110		240	
DOWN TILT (DEG.)	0° Mech + 0° Elec		0° Mech + 0° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	TBD		TBD		TBD	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						
850 MHz Cellular Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	N/A		N/A		N/A	
ANTENNA TYPE	BXA-70063-6CF_2		BXA-70063-6CF_2		BXA-70063-6CF_2	
QUANTITY PER FACE	1		1		1	
ORIENTATION	1		110		240	
DOWN TILT (DEG.)	0° Mech + 0° Elec		0° Mech + 0° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	TBD		TBD		TBD	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
1900 MHz PCS Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	N/A		N/A		N/A	
ANTENNA TYPE	BXA-171063-12CF_2		BXA-171063-12CF_2		BXA-171063-12CF_2	
QUANTITY PER FACE	1		1		1	
ORIENTATION	1		110		240	
DOWN TILT (DEG.)	0° Mech + 0° Elec		0° Mech + 0° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	TBD		TBD		TBD	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
2100 MHz LTE Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz RRH		2100 MHz RRH		2100 MHz RRH	
ANTENNA TYPE	BXA-171063-12CF_2		BXA-171063-12CF_2		BXA-171063-12CF_2	
QUANTITY PER FACE	1		1		1	
ORIENTATION	1		110		240	
DOWN TILT (DEG.)	0° Mech + 0° Elec		0° Mech + 0° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	TBD		TBD		TBD	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS
SECTOR DISTRIBUTION BOX	1	DB-E1-3B-8AB-0Z	1	DB-E1-3B-8AB-0Z	1	DB-E1-3B-8AB-0Z
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

Coax Cable Ordering					
MAINLINE SIZE	1 5/8"	TOTAL # OF MAIN LINES	0	COAX LINE MODEL #	
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS	12	TOP JUMPER MODEL #	
Fiber Cable Ordering					
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES	2	FIBER LINE MODEL #	HB158-1-08U8-S8J18
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS	6	TOP JUMPER MODEL #	HB058-1-08U1-S1J

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - Block	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-2155	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-1755	RX - 776-787	700 MHz / 2100 MHz (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/ WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/ WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/ BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/ BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	RF INITIALS	DATE
Prepared By: Mark Brauer	Robert Hesselbach	MB	4/24/2013

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

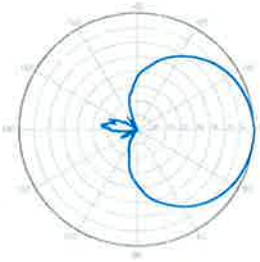
Replace "X" with desired electrical downtilt!

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

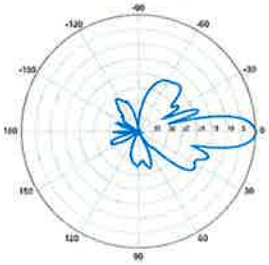
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



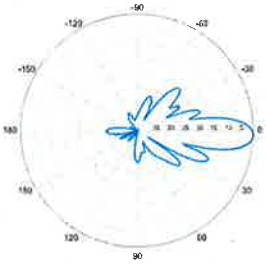
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

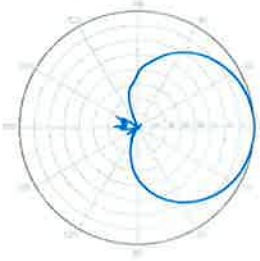


0° | Vertical | 750 MHz

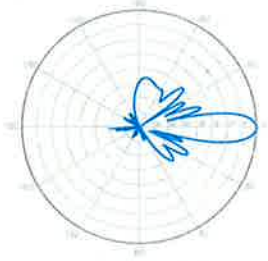
BXA-70063-6CF-EDIN-2



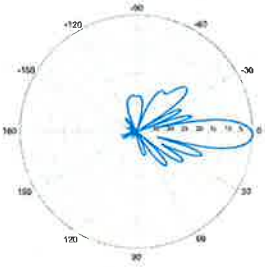
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-12CF-EDIN-X

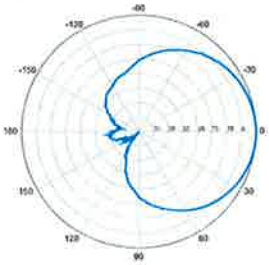
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 19.0 dBi

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1840 x 154 x 105 mm	72.4 x 6.1 x 4.1 in	
Depth with z-brackets	133 mm	5.2 in	
Weight without mounting brackets	6.8 kg	15 lbs	
Survival wind speed	> 201 km/hr	> 125 mph	
Wind area	Front: 0.28 m² Side: 0.19 m²	Front: 3.1 ft² Side: 2.1 ft²	
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf	

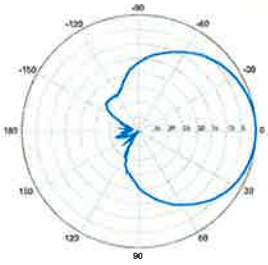
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



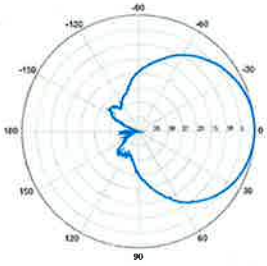
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



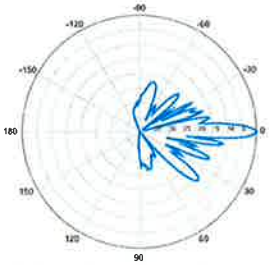
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



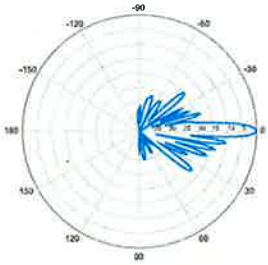
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



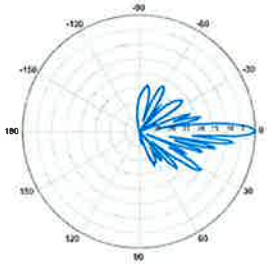
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1920-2170 MHz

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

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

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

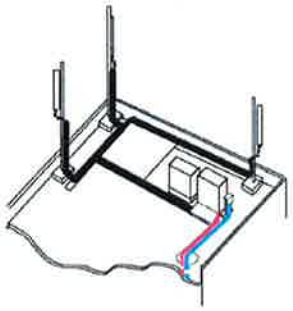
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.

Features

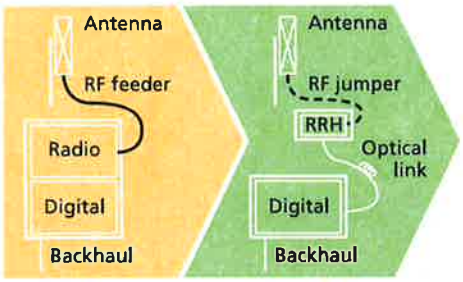
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

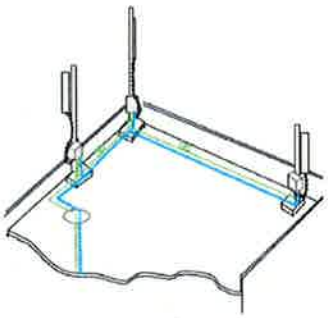
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - ¬ TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
  - ¬ One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - ¬ Single mode dual fiber (SM/DF)
- Multi-mode variant
  - ¬ Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

CPG2809100912 (09)

Alcatel·Lucent

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

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

The Alcatel-Lucent RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-07-U is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-07-U is compact and weights less than 23 kg (50 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

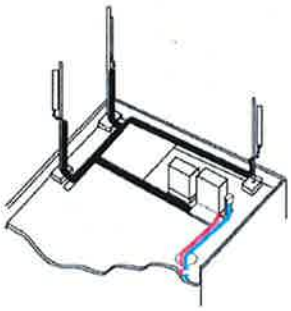
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-07-U provides more RF power while at the same time consuming less electricity.

Features

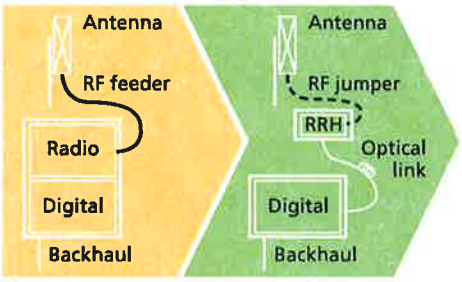
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

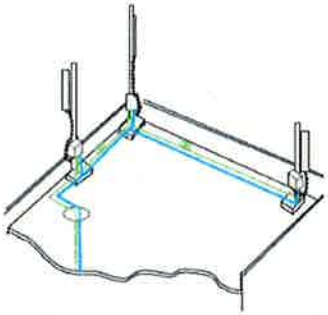
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - ¬ 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - ¬ TMA
  - ¬ Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - ¬ One SM fiber (9/125 µm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - ¬ Two MM fibers (50/125 µm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Alarms and ports

- Six external alarms
- Two optical ports to support daisy-chaining

Alcatel·Lucent

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

The RFS Distribution Box design comes with the option for pluggable over voltage protection (OVP) for up to 6 remote radios and the connection for 6 pairs of optical fiber with LC optical fiber cable management. There is a hybrid cable input with a jumper configuration for power and optical fiber to the remote radio heads (RRHs). A custom wall, a 2-inch pole, and an H-Frame mounting bracket are included. Both the compact and standard design are available with lightening protection.

Features/Benefits

- Designed to accommodate varying diameters of HYBRIFLEX™ (combined power and fiber optic) cables – up to 2 inches
- Supports Single- and Multi-Mode Optical fiber
- NEMA 4x rated enclosure – allows **flexibility for indoor or outdoor installation** on a roof or tower top
- Weatherproof enclosure and ports – **improves system reliability**
- Modular design – makes replacement or addition of OVP easy without removal of other components within the box
- Strikesorb OVP technology – protects equipment from damaging surges up to 60 kA on an 8/20 waveform and up to 5 kA on a 10/350 waveform (certain models only)
- Low residual voltage and high impedance – **ideally suited for RRH technology** – won't shut down the RRH the way spark gap technology does (certain models only)

Technical Specifications

Mechanical Specifications

Model Number	DB-B1-6C-8AB-0Z	DB-T1-6Z-8AB-0Z
Enclosure Design	Standard, 6 OVP's	Standard without OVP
Dimensions - H x W x D, mm (in)	610 x 610 x 254 (24 x 24 x 10)	610 x 610 x 254 (24 x 24 x 10)
Weight, kg (lb)	20 (44)	20 (44)
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum	
Fiber Connection Method	LC-LC Single- or Multi-mode duplex	
Environmental Rating	NEMA 4x	
Operating Temperature, °C (°F)	-40 to +80 (-40 to +176)	
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs	

Electrical Specifications

Nominal Operating Voltage	48 VDC	
Nominal Discharge Current (I_n) per UL 1449 3rd Ed	20 kA 8/20 µs	N/A
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs	N/A
Maximum Impulse (Lightning) Current (I_{imp}) per IEC 61643-1	5 kA 10/350 µs	N/A
Maximum Continuous Operating Voltage (U_c)	75 VDC	N/A
Voltage Protection Rating per UL1449 3rd Ed	400 V	N/A
Protection Class as per IEC 61643-1	Class 1	N/A
Strikesorb OVP Compliance	ANSI/UL 1449-3rd Ed	N/A
	IEEE C62.41	N/A
	NEMA LS-1	N/A
	IEC 61643-1	N/A
	IEC 61643-12	N/A
	EN 61643-11	N/A

* This data is provisional and subject to change.

DR. CLARENCE WELTI, P.E., P.C.

GEOTECHNICAL ENGINEERING

227 Williams Street • P.O. Box 397
Glastonbury, CT 06033-0397

(860) 633-4623 / FAX (860) 657-2514

October 19, 2011

Mr. Dan Bolan
Centek Engineering
63-2 North Branford Road
Branford, CT 06405

Ref: Geotechnical Study for Evaluation of Existing Tower Foundation at NEU Service Center 20 Barnabas Road, Newtown, CT

Dear Mr. Bolan:

1.0 Herewith is the data from the test boring taken at the above referenced site. One boring was taken about 5 feet from the one of the existing tower leg foundations. The boring was drilled to a depth of depth of 32 feet. *The boring was drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

2.0 The boring was taken to provide soils properties and foundation design parameters to evaluate the adequacy of existing lattice tower foundation with an increase in loading on the structure. The foundation plans (1991) show the original tower foundation design included a 10'x10' footing and 24" sq pier supporting each of the 3 tower legs. The bottom of the footings are shown at 9.5 feet below the finished grades. A subsequent foundation plan (1998) shows modifications to the existing foundations to provide additional weight to resist overturning, presumably to address a increase in tower loading or changes in tower design requirements.

3.0 The **Soils Cross Section** from the borings is generally as follows:

Topsoil to 13"

FILL; fine to coarse SAND, little Silt and Gravel to 10.5 feet, medium compact

SILT, some fine SAND, trace Gravel to 26 feet, medium compact

Fine SAND and SILT, little Gravel to 32+ feet, dense

3.1 The **Ground Water Table** was at 13 feet below the existing grade at the completion of the

borings. The soils below about 10 feet were saturated. The recommended design water table is at 10 feet below existing grades.

4.0 In general the criteria for tower support is that the foundation capacity would exceed the loads, which might collapse the tower. **Movements from strains in the soils should be limited to differential settlement (or lateral movements of less than ½").**

5.0 The following is a **summary the soil properties and design values which can be used to evaluate the existing tower foundation design.**

Soil Property/Parameter	Value
Soil Unit Weight (Backfill)	125 pcf
Soil Unit Weight (Natural)	125 pcf
Soil Unit Weight Submerged (Natural)	65 pcf
Angle of Internal Friction (φ)	34°
Cohesion	0
Pull Out Angle from Vertical	30°
Sliding Coefficient	0.6
Allowable Soil Bearing Pressure on the natural soil at 9.5± feet below grade	3 Tons/sf

6.0 The soils at the subject site are generally in OSHA class C which would require excavations that are in excess of 5 feet to have slopes which are less than 34° (i.e., 1.5H to1.0V).

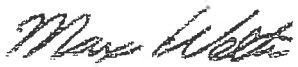
7.0 This report has been prepared for specific a application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Dr. Clarence Welti, P.E., P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

If you have any questions please call me.

Very truly yours,



Max Welti, P. E.

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN 06033

CLIENT
CENTEK ENGINEERING

PROJECT NAME
TOWER @ NEU SERVICE CENTER
LOCATION
20 BARNABAS RD., NEWTOWN, CT.

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	
SIZE I.D.	3.75"		1.375"	
HAMMER WT.			140 lbs	
HAMMER FALL			30"	

OFFSET 5' OFF PIER
LINE & STA.
N. COORDINATE
E. COORDINATE

SURFACE ELEV.
HOLE NO. **B-1**

GROUND WATER OBSERVATIONS
AT 13.0 FT AFTER 0 HOURS
AT FT. AFTER HOURS

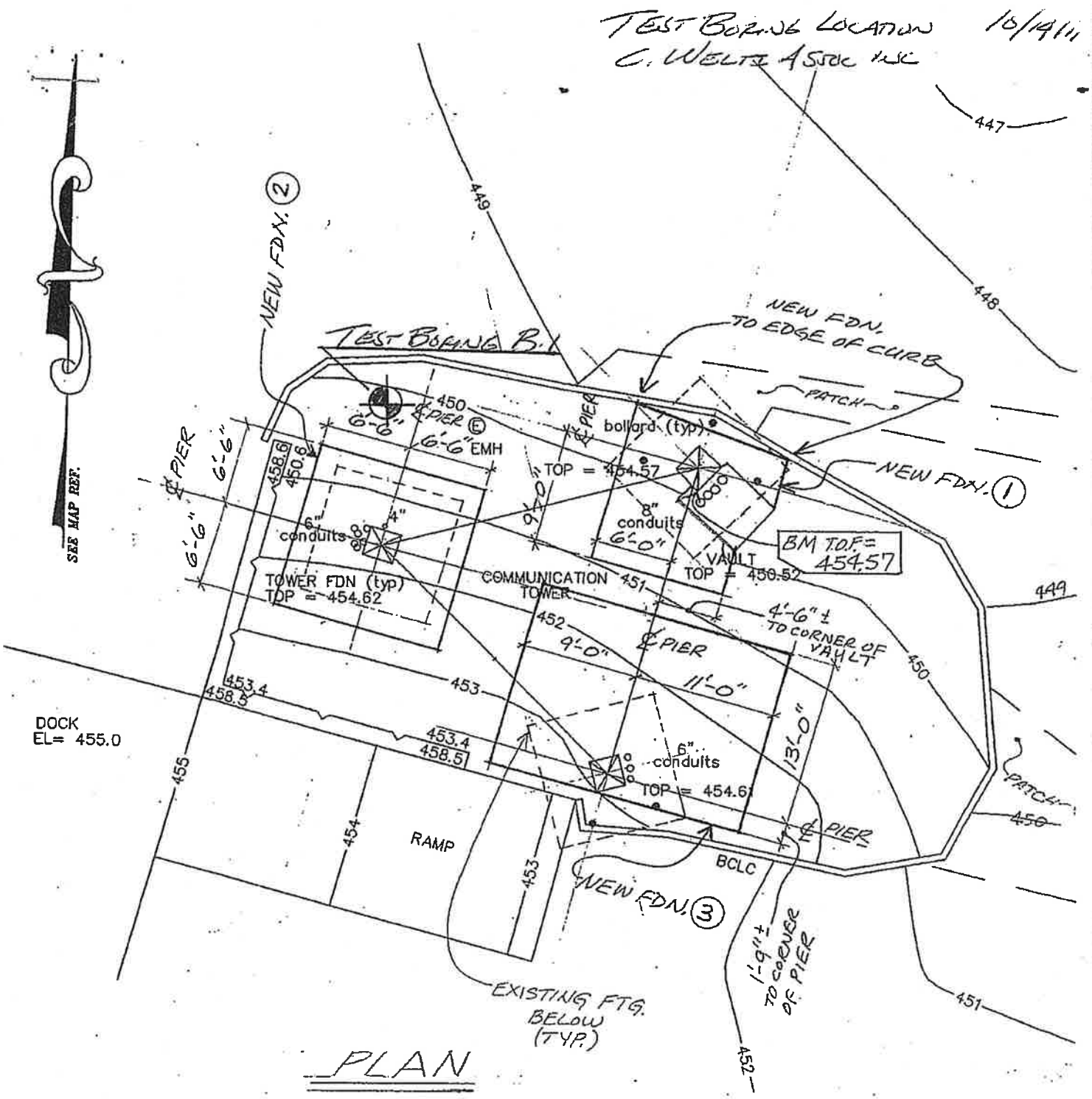
START DATE 10/14/11
FINISH DATE 10/14/11

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
0					TOPSOIL	
					BR. FINE-CRS. SAND, LITTLE SILT & GRAVEL - FILL	1.1
5	1	9-11-11-11	5.00'-7.00'			
10	2	2-8-8-9	10.00'-12.00'		GREY SILT, SOME FINE SAND, TRACE GRAVEL	10.5
15	3	5-7-10-9	15.00'-17.00'			
20	4	4-5-8-10	20.00'-22.00'			
25	5	9-15-27-25	25.00'-27.00'		GREY FINE SAND AND SILT, LITTLE GRAVEL	26.0
30	6	9-15-19-23	30.00'-32.00'			
35					BOTTOM OF BORING @ 32.0'	32.0

LEGEND: COL. A:RECOVERY "
SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER
INSPECTOR:

SHEET 1 OF 1 | HOLE NO. **B-1**



THE CONNECTICUT LIGHT & POWER COMPANY
MICROWAVE TOWER FOUNDATION MODIFICATIONS
AT NEWTOWN SERVICE CENTER FOR OMNIPOINT ANTENNAS
R. Drasdis 10/14/98 Sketch SKRAD101498, Sht. 1 of 3

GRAPHIC SCALE

0 0 5 10 20 40

(IN FEET)
1 inch = 10 ft.

ATTACHMENT 4

HMB

HMB Acoustics LLC 3 CherryTree Lane, Avon, Ct. 06001 860-677-5955

February 12, 2014

Doug Drost
Project Engineer, Wireless
Centek Engineering, Inc.
63-2 North Branford Road
Branford, Ct. 06405

Subject: Newtown 2 - CSC Noise Compliance Study

Dear Mr. Drost:

The noise levels for the V1; V2; A1; A2; N1 and N2 wall mounted HVAC units were calculated while each one was operating separately. Typically only one of the two units on each equipment shelter operates at any one time. There is no carry-over acoustical effect from one shelter to the other due to orientation and distance between the shelters. The noise level was then projected to each property line. The resultant noise level was compared to the State of Ct. Noise Regulation. The Regulation allows a noise level of 70 dBA (daytime and nighttime) when measured between an Industrial zone emitter and an Industrial zone receptor's property line. In addition, the Regulation allows a noise level of 61 dBA (daytime); and 51 dBA (nighttime) when measured between an Industrial zone emitter and a residential zone receptor's property line.
I found that the six (6) air-conditioner units meet the conditions for compliance as set forth in the noise regulation, at all property lines.

Allan Smardin
HMB Acoustics LLC

PROJECT INFORMATION:	Centek Job #: 13146.000
Applicant:	Cellco Partnership d.b.a. Verizon Wireless
Applicant Site ID:	Newtown 2
Site Owner:	Northeast Utilities
Site Address:	20 Barnabas Road, Newtown, CT
Subject Zoning District:	Industrial
Abutting Zoning District(s):	East: Residential, South: Industrial West: Industrial, North: Industrial

APPLICANT EQUIPMENT:

ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West
V-1	Wall Mounted HVAC	Bard / W61A1-105EPXXXJ	842	334	121	661
V-2	Wall Mounted HVAC	Bard / W61A1-105EPXXXJ	842	335	115	668

EXISTING COLOCATORS:

☒ AT&T	☐ Metro PCS	☒ Other: Northeast Utilities
☒ Sprint	☒ T Mobile	☐ Other:
☐ Nextel	☐ None	☐ Other:

EXISTING COLOCATOR EQUIPMENT OWNER: AT&T

ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West
A-1	Wall Mounted HVAC	Marvair / Unknown	745	430	104	679
A-1	Wall Mounted HVAC	Marvair / Unknown	746	431	97	685

EXISTING COLOCATOR EQUIPMENT OWNER: NU

ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West
N-1	Wall Mounted HVAC	Unknown / Unknown	796	379	103	682
N-2	Wall Mounted HVAC	Unknown / Unknown	801	374	104	681

EXISTING COLOCATOR EQUIPMENT OWNER:						
ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

EXISTING COLOCATOR EQUIPMENT OWNER:						
ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

EXISTING COLOCATOR EQUIPMENT OWNER:						
ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

CONCLUSION:			
Daytime Regulation: **Compliance:**	70 dBA Ind. to Ind. Zone 61 dBA Ind. to res. Zone Yes	**Nighttime Regulation:** **Compliance:**	70 dBA Ind. to Ind. Zone 51 dBA Ind. to Res. Zone Yes

BASIS OF FINDINGS:

North property line: V1=18dBA; V2=18 dBA; A1=29 dBA; A2=29 dBA; N1=27dBA; N2=27 dBA

South property line: V1=26dBA; V2=26 dBA; A1=23 dBA; A2=26 dBA; N1=35dBA; N2=35 dBA

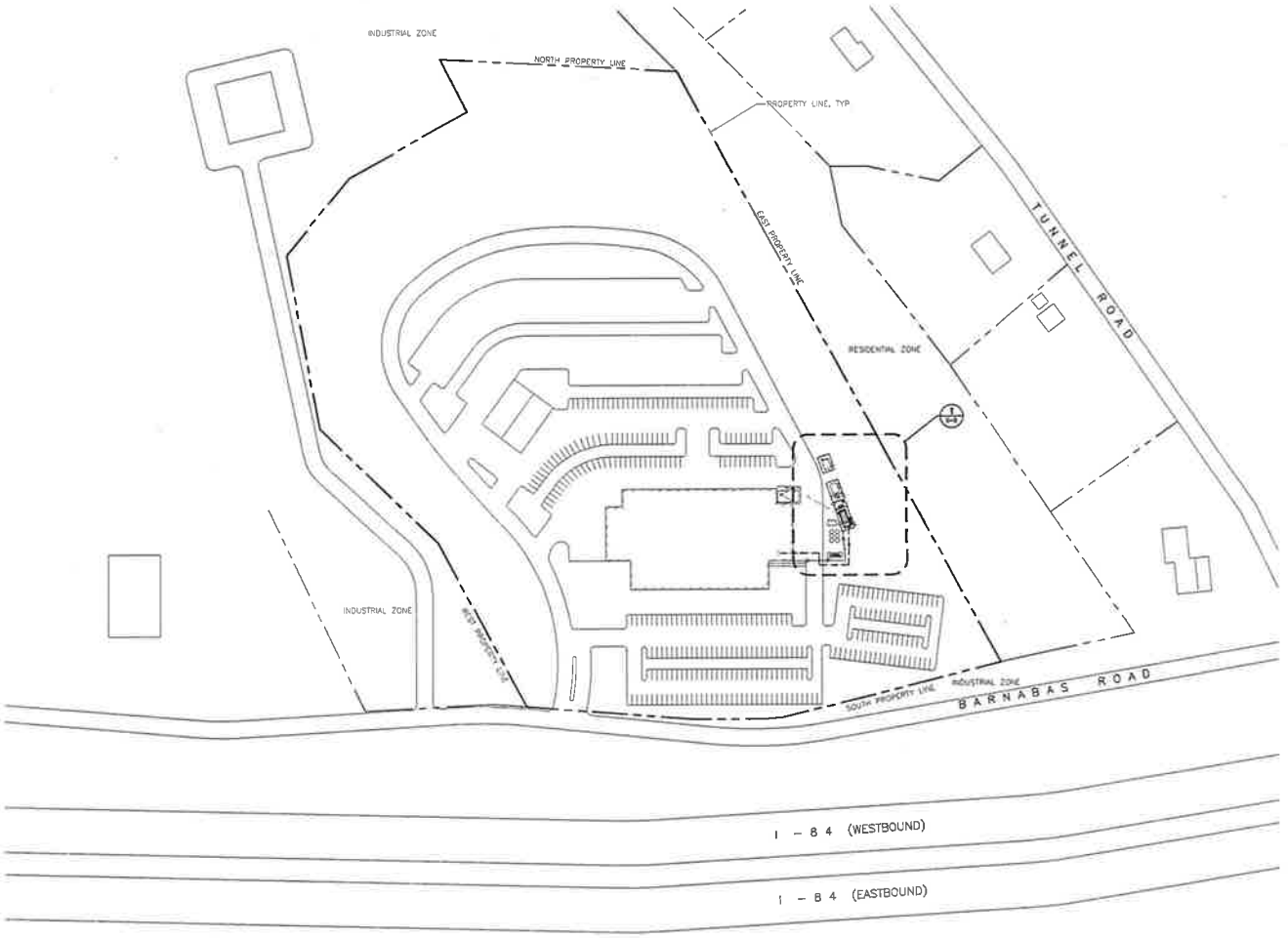
East property line: V1=45dBA; V2=45 dBA; A1=45 dBA; A2=46 dBA; N1=45dBA; N2=45 dBA

West property line: V1=30dBA; V2=30 dBA; A1=28 dBA; A2=28 dBA; N1=18dBA; N2=18 dBA

The above dBA levels take into account the acoustical effect provided by other structures on the property.

The projected noise levels from T-Mobile and Sprint pad mounted equipment is inaudible at the distance of 15 feet or greater. This equipment will have no adverse acoustical effect on the V1 and V2 noise projections.

Prepared By: Alan Smardin, HMB ACOUSTICS LLC　　Date: 02/12/14



1 / C-1 SITE PLAN - PROPOSED
SCALE: 1" = 100'

APPROXIMATE NORTH

GRAPHIC SCALE
(IN FEET)
1 inch = 100 ft.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	02/11/14	CMD	CPS	NOISE EMITTER INFORMATION

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d/b/a Verizon Wireless

CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless

WIRELESS COMMUNICATIONS FACILITY
NEWTOWN 2

20 BARNABAS ROAD
NEWTOWN, CT 06470

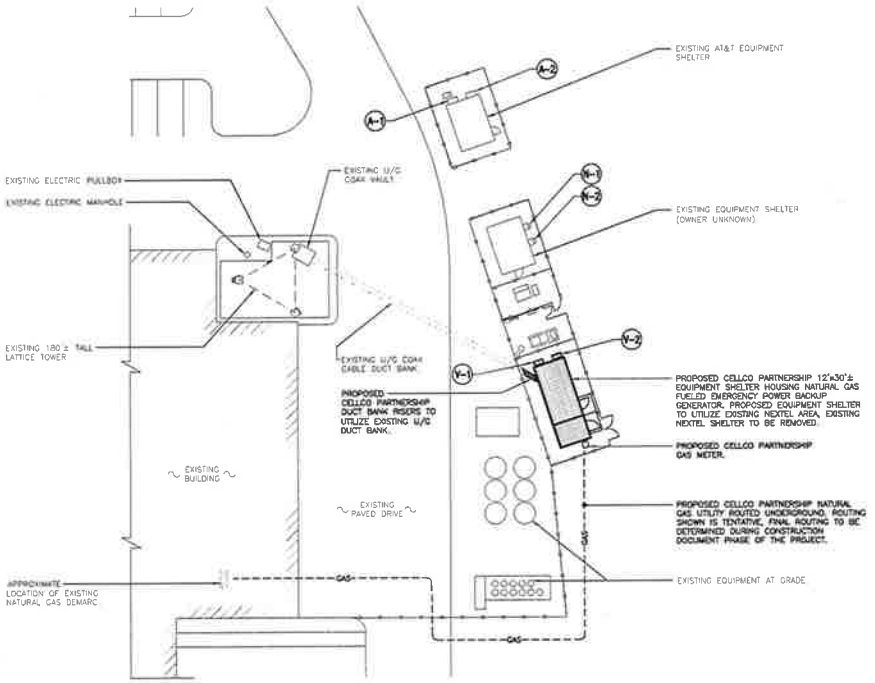
DATE: 02/04/14
SCALE: AS NOTED
JOB NO. 13146.000

SITE PLAN

C-1

Sheet No. 1 of 2

NODE EMMITTER INFORMATION		
A-4	WALL MOUNTED HVAC UNIT, MAKE: BARD,	MODEL: WS1A1-A05D*X00J
A-3	WALL MOUNTED HVAC UNIT, MAKE: BARD,	MODEL: WS1A1-A05D*X00J
A-2	WALL MOUNTED HVAC UNIT, MAKE: UNKNOWN,	MODEL: UNKNOWN
A-1	WALL MOUNTED HVAC UNIT, MAKE: UNKNOWN,	MODEL: UNKNOWN
A-1	WALL MOUNTED HVAC UNIT, MAKE: MARVAIR,	MODEL: UNKNOWN
A-1	WALL MOUNTED HVAC UNIT, MAKE: MARVAIR,	MODEL: UNKNOWN



1 C-2 **PARTIAL SITE PLAN**
SCALE: 1" = 20'

APPROXIMATE NORTH

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

NO.	DATE	DRAWN BY	CHKD	CFC	NODE EMITTER INFORMATION
0	03/31/14				

ARCHITECTURAL DESIGNER SEAL

Cellco Partnership d/b/a Verizon wireless

CENTEK engineering
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(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
NEWTOWN 2
20 BARNABAS ROAD
NEWTOWN, CT 06470

DATE: 03/24/14
SCALE: AS NOTED
JOB NO.: 13146.000

COMPOUND PLAN

C-2
Sheet No. 2 of 3

ATTACHMENT 5

	General	Power	Density					
Site Name: Newtown 2								
Tower Height: Verizon @ 126ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Nextel	9	100	110	0.0267	851	0.5673	4.71%	
*Omnipoint			147.67	0.0044	1930	1.0000	0.44%	
*6755 MHz system				0.0000	6755	1.0000	0.00%	
*37.48, 37.74, 48.34, 154.46375 MHz systems				0.0096		0.2000	4.80%	
*Sprint CDMA/LTE	2	693	91	0.0602	1900	1.0000	6.02%	
*Sprint CDMA/LTE	1	390	91	0.0169	850	0.5667	2.99%	
*AT&T UMTS	1	500	135	0.0099	880	0.5867	1.68%	
*AT&T UMTS	1	500	135	0.0099	1900	1.0000	0.99%	
*AT&T GSM	3	427	135	0.0253	1900	1.0000	2.53%	
*AT&T GSM	6	296	135	0.0350	880	0.5867	5.97%	
*AT&T LTE	1	500	135	0.0099	740	0.4933	2.00%	
Verizon	**15**	**432**	**126**	**0.1468**	**1970**	**1.0000**	**14.68%**	
Verizon	**9**	**400**	**126**	**0.0815**	**869**	**0.5793**	**14.07%**	
Verizon	**1**	**1750**	**126**	**0.0396**	**2145**	**1.0000**	**3.96%**	
Verizon	**1**	**828**	**126**	**0.0188**	**698**	**0.4653**	**4.03%**	
								68.87%
* Source: Siting Council								