Robinson+Cole

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Also admitted in Massachusetts

July 25, 2019

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
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 204 Burwell Road, West Haven, 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 on a 16.27-acre parcel at 204 Burwell Road in West Haven, Connecticut (the "Property"). The existing 180-foot tower is owned by Pinnacle Towers LLC, a Crown Castle ("Crown") company. The Property is owned by Florence S. Burwell, Jo B. Hollis and Dana C. Hollis Revocable Trust. Cellco identifies this site as its "West Haven 3 Relo Facility".[1]

Cellco requests that the Council find that the proposed shared use of the Crown tower satisfies the criteria of C.G.S § 16-50aa and issue an order approving the proposed shared use. A copy of this filing is being sent to West Haven Mayor, Nancy R. Rossi; Fred Messore, West Haven's Commissioner of Planning and Development; Florence S. Burwell, Jo B. Hollis and Dana C. Hollis Revocable Trust, the owners of the Property; and Crown, the tower owner.

[1] Cellco maintains a wireless facility at 85 Plainfield Road in West Haven, consisting of antennas at the 148-foot level on the existing tower and associated equipment at the base of the tower. If Cellco's proposed tower share request for the existing tower at 204 Burwell Road is approved, Cellco would remove its equipment from the 85 Plainfield Road site.

Background

Cellco is licensed by the Federal Communications Commission ("FCC") to provide wireless services throughout the State of Connecticut. Cellco and Crown have agreed to the proposed shared use of the 204 Burwell Road tower pursuant to mutually acceptable terms and conditions. Likewise, Crown and Cellco have agreed to the proposed installation of equipment on the ground within an existing fenced compound area. Crown 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 six (6) antennas and four (4) remote radio heads ("RRHs") on the tower at a height of 160 feet above ground level ("AGL"). Cellco's radio equipment and a diesel-fueled backup generator will be located inside a 12' x 30' equipment shelter near the base of the tower. The shelter will contain Cellco's radio equipment and a 30 kW diesel-fueled backup generator. Included in Attachment 2 are Cellco's project plans showing the location of all proposed site improvements. Attachment 3 contains specifications for Cellco's proposed antennas, RRHs and backup generator.

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 Crown tower is structurally capable of supporting Cellco's antennas, RRHs and related equipment. The proposed shared use of this tower is, therefore, technically feasible. A Structural Analysis Report ("Structural Report") prepared for this project confirms that the tower can support all existing and Cellco's proposed tower loading. A copy of the Structural Analysis Report is included in Attachment 4.

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 Crown tower. 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 Crown tower would have minimal environmental effects, for the following reasons:

1. The proposed installation of six (6) antennas and four (4) remote radio heads at a height of 160 feet AGL on the existing 180-foot tower in this industrial area would have an insignificant incremental visual impact on the area around the tower site. Cellco's equipment shelter will be installed within a fenced compound. Cellco's shared use of this tower would therefore, not cause any significant change or alteration in the physical or environmental characteristics of the existing site.

2. Noise associated with the equipment shelter's air conditioning ("A/C") units will not exceed State and/or local noise limits. Noise associated with Cellco's emergency backup generator, located inside the shelter 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 General Power Density table that demonstrates that the facility will operate well within the FCC RF emissions safety standards.

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 Crown facility other than periodic maintenance visits to the cell site.

The proposed shared use of the Crown tower would, therefore, have a minimal environmental effect, and is environmentally feasible.

D. **Economic Feasibility.** As previously mentioned, Cellco has entered into an agreement with Crown for the shared use of the existing facility subject to mutually agreeable terms. The proposed tower sharing is, therefore, economically feasible.

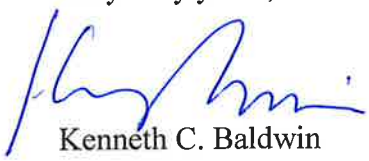
E. **Public Safety Concerns.** As discussed above, the tower is structurally capable of supporting Cellco's antennas, RRHs and all related equipment. Cellco is not aware of any public safety concerns relative to the proposed sharing of the existing Crown tower. In fact, the provision of new and improved 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 through the City of West Haven.

Conclusion

For the reasons discussed above, the proposed shared use of the existing Crown tower at 204 Burwell Road 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.

Thank you for your consideration of this matter.

Very truly yours,



Kenneth C. Baldwin

Enclosures
Copy to:
Nancy R. Rossi, Mayor
Fred Messore, Commissioner, Planning and Development
Florence S. Burwell, Jo B. Hollis and Dana C. Hollis Revocable Trust
Crown Castle
Greg Milano

ATTACHMENT 1

CROWN CASTLE

3530 Toringdon Way
Charlotte, NC 28277

Phone: (980) 209-8221
Fax: (724) 416-4688
www.crowncastle.com

Crown Castle Letter of Authorization

CT - CONNECTICUT SITING COUNCIL,

Re: Application for Zoning/Building Permit
Crown Castle telecommunications site at: 2014 AND 240 BURWELL ROAD, WEST HAVEN, CT 06516

PINNACLE TOWERS LLC ("Crown Castle") hereby authorizes VERIZON WIRELESS, including their Agent, to act as our Agent in the processing of all zoning applications, building permits and approvals through the CT - CONNECTICUT SITING COUNCIL for the existing wireless communications site described below:

Crown Site ID/Name: 870694/West Haven (Burwell Hill)
Customer Site ID: 445644/West Haven 3 Relo CT
Site Address: 2014 and 240 Burwell Road, West Haven, CT 06516

Crown Castle

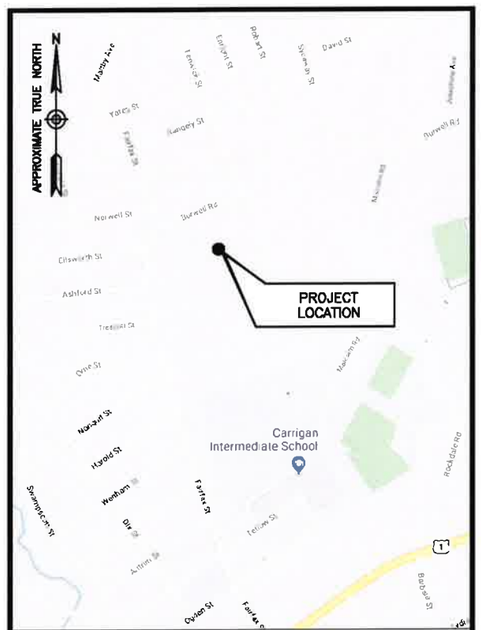
By: Bianca Reyes Date: 3/13/19

Bianca Reyes
Real Estate Project Coordinator

ATTACHMENT 2

CELLCO PARTNERSHIP d/b/a verizon WIRELESS

PROPOSED WIRELESS FACILITY
SITE NAME: WEST HAVEN 3 RELO CT
204 BURWELL ROAD
WEST HAVEN, CT 06516



VICINITY MAP

N.T.S.

20 ALEXANDER DRIVE, WALLINGFORD, CT:

TURN RIGHT ONTO BARNES INDUSTRIAL RD, TURN LEFT ONTO CT-68, TAKE RAMP RIGHT TOWARD MERIDEN, TURN RIGHT ONTO US-5 / N COLONY RD, TAKE RAMP LEFT FOR CT-15 SOUTH TOWARD NEW HAVEN, AT EXIT 57, TAKE RAMP RIGHT FOR CT-34 EAST TOWARD ORANGE, TURN RIGHT ONTO PLAINFIELD AVE, ROAD NAME CHANGES TO FENWICK ST, TURN RIGHT ONTO BURWELL RD, ARRIVE AT BURWELL RD, 204 BURWELL RD, WEST HAVEN, CT 06516

SITE COORDINATES:
LATITUDE: 41°-17'-45.50" N
LONGITUDE: 72°-58'-23.60" W

ELEVATION DATA
GRADE ELEVATION AT TOWER = 286'±

ELEVATION (TO TOP OF ANTENNA)
ELEVATION = 164'± A.G.L.

DATA SHOWN ABOVE BASED ON RFDS DATED 04/26/19 & GOOGLE EARTH

PROJECT INFORMATION

THE SCOPE OF WORK SHALL INCLUDE:

1. THE INSTALLATION OF (1) EQUIPMENT SHELTER (30'-0"x12'-0") ON CONCRETE PIERS. INSIDE SHELTER: INSTALL (1) 850 3G CABINET, (1) POWER PLANT, (2) FIF RACK, (1) DIESEL GENERATOR, (1) BATTERY RACK, (1) ATS/POWER PANEL. INSTALLATION OUTSIDE SHELTER: (1) METER/DISCONNECT.
2. THE INSTALLATION OF (4) PROPOSED CELLCO PARTNERSHIP ANTENNAS, (4) RRH'S & (1) OVP WHICH SHALL BE MOUNTED TO THE EXISTING TOWER AT A CENTERLINE ELEVATION OF 160'-0"± A.G.L.
3. THE PROPOSED WIRELESS FACILITY INSTALLATION WILL BE DESIGNED IN ACCORDANCE WITH THE 2016 CONNECTICUT STATE BUILDING CODE.

SCOPE OF WORK

SITE NAME:
WEST HAVEN 3 RELO CT

SITE ADDRESS:
204 BURWELL ROAD
WEST HAVEN, CT 06516

PROPERTY OWNER:
FLORENCE S. BURWELL
JO B. HOLLIS & DANA
C REVOCABLE TRUST
4302 S. RIMVIEW WAY
BOISE, ID 83716

APPLICANT:
CELLCO PARTNERSHIP
d/b/a VERIZON WIRELESS
20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

SITE ACQUISITION CONTACT:
GREG MILANO
SAI COMMUNICATIONS LLC
(860) 707-9001

LEGAL/REGULATORY COUNSEL:
KENNETH C. BALDWIN, ESQ.
ROBINSON & COLE
(860) 275-8345

PROJECT INFORMATION

SHEET NUMBER	DESCRIPTION
T-1	TITLE SHEET
C-1	IMMEDIATE ABUTTERS MAP
C-2	PARTIAL SITE PLAN
C-3	SOUTH ELEVATION & MOUNTING DETAIL

SHEET INDEX

CELLCO PARTNERSHIP
d/b/a verizon WIRELESS
20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

WEST HAVEN 3 RELO CT

CSC DRAWINGS		
5	07/22/19	FOR FILING
4	07/17/19	FOR FILING
3	04/25/19	FOR FILING
2	04/05/19	FOR FILING
1	11/01/18	FOR FILING
0	10/19/18	FOR FILING
A	10/03/18	FOR COMMENT

Dewberry
Dewberry Engineers Inc.
800 PARSIPPANY ROAD
SUITE 301
PARSIPPANY, NJ 07054
PHONE: 973.739.9400
FAX: 973.739.9710

STATE OF CONNECTICUT
BENJAMIN B. HOWITT
28971
LICENSED PROFESSIONAL ENGINEER

DRAWN BY:	JC
REVIEWED BY:	GWY
CHECKED BY:	GHN
PROJECT NUMBER:	50067815
JOB NUMBER:	50094424

SITE ADDRESS

204 BURWELL ROAD
WEST HAVEN, CT 06516

SHEET TITLE

TITLE SHEET

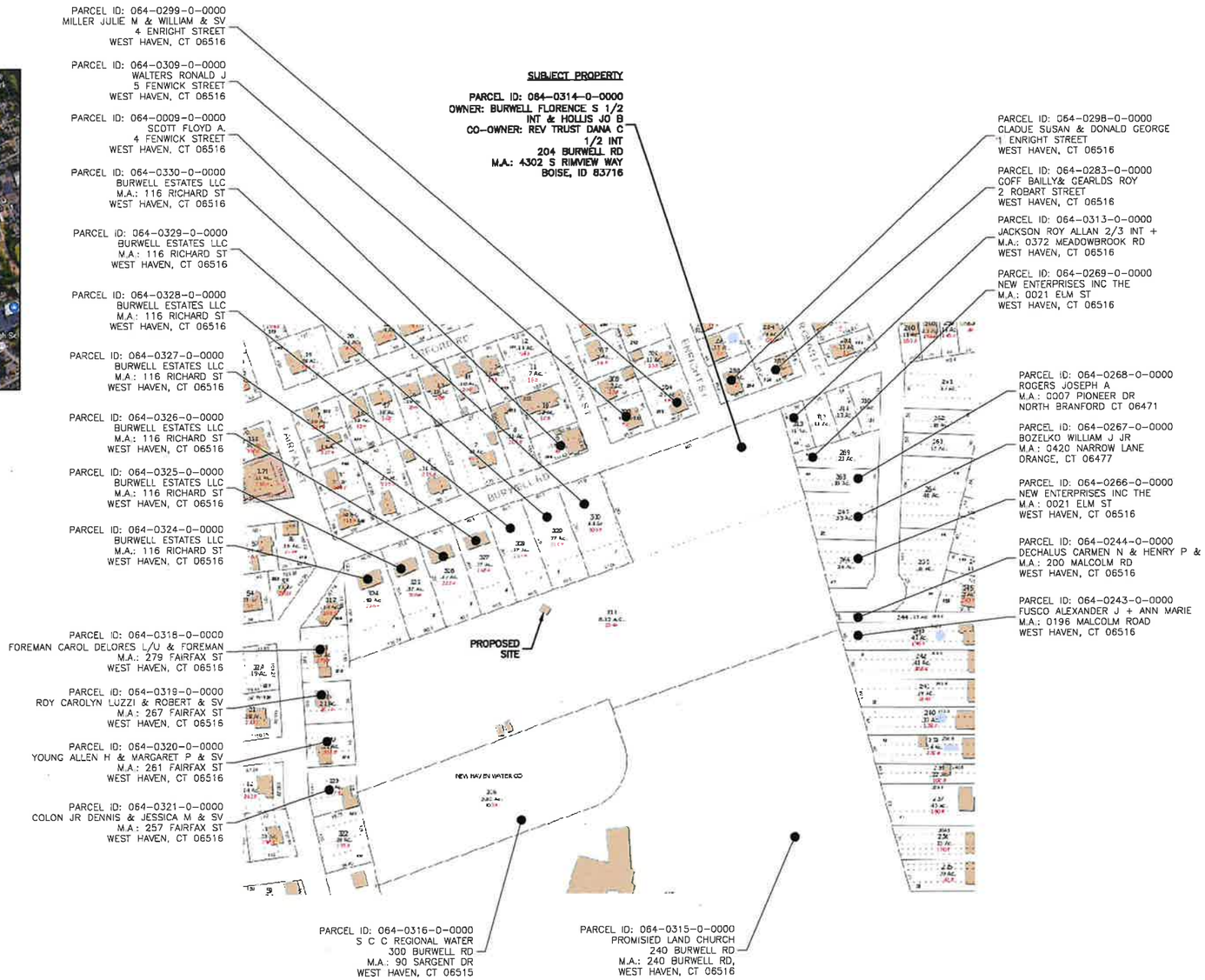
SHEET NUMBER

T-1

N

APPROXIMATE TRUE NORTH

MUNICIPALITY NOTIFICATION LIMIT MAP (1)
SCALE: N.T.S.



IMMEDIATE ABUTTERS MAP (2)
SCALE: N.T.S.

NOTES:

1. ABUTTERS MAP BASED ON INFORMATION OBTAINED FROM THE CITY OF WEST HAVEN, GEOGRAPHIC & PROPERTY INFORMATION APPLICATION (http://www.westhavengis.com/).

CELLCO PARTNERSHIP
d/b/a verizon WIRELESS
20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

WEST HAVEN 3
RELO CT

CSC DRAWINGS		
5	07/22/19	FOR FILING
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PHONE: 973.739.9400
FAX: 973.739.9710

STATE OF CONNECTICUT
BENJAMIN P. HEWITT
28971
REGISTERED
PROFESSIONAL ENGINEER

DRAWN BY:	JC
REVIEWED BY:	GWY
CHECKED BY:	GHN
PROJECT NUMBER:	50057815
JOB NUMBER:	50094424

SITE ADDRESS

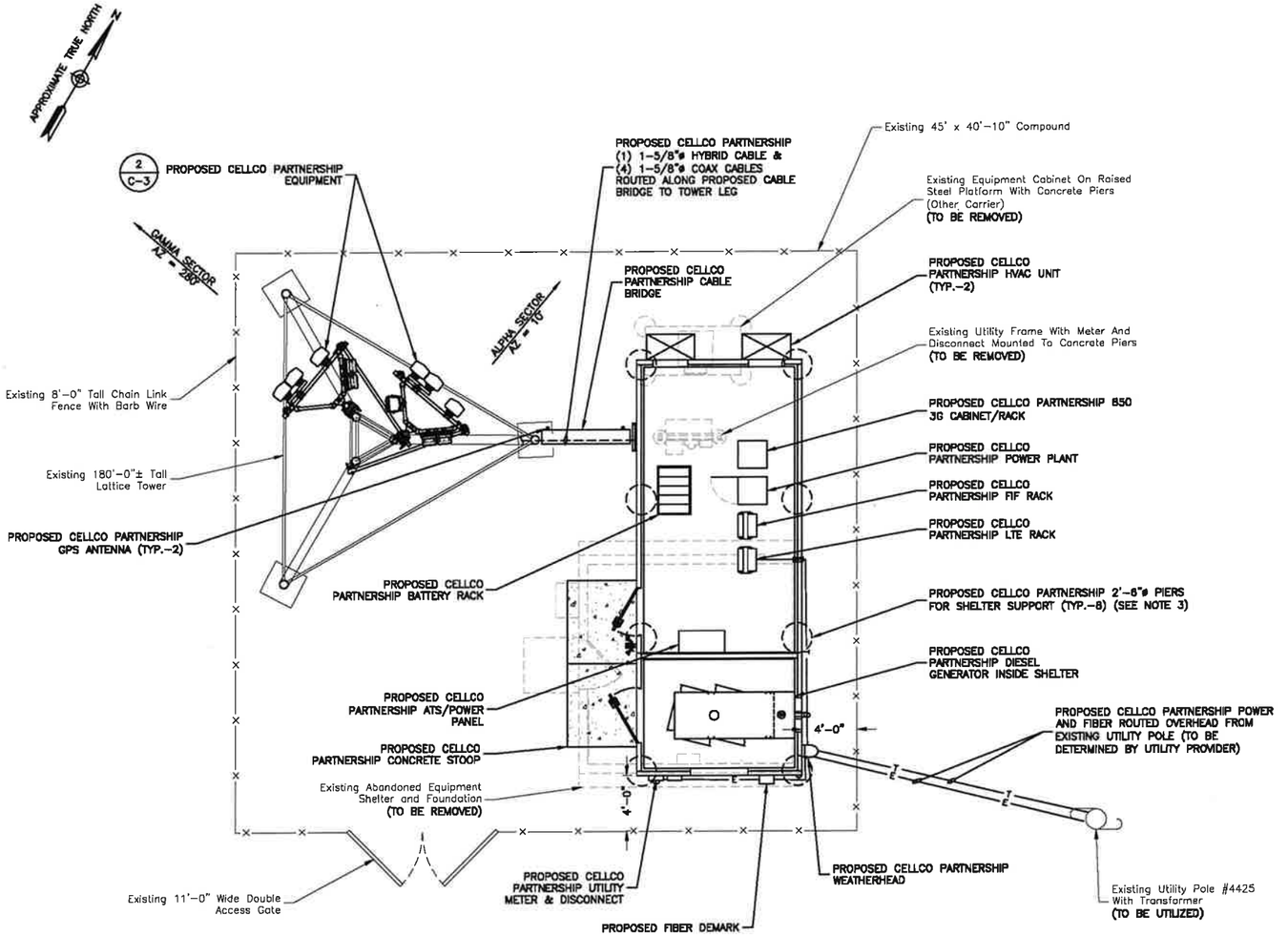
204 BURWELL ROAD
WEST HAVEN, CT 06516

SHEET TITLE

IMMEDIATE ABUTTERS MAP

SHEET NUMBER

C-1



1
C-3

PARTIAL SITE PLAN (1)

SCALE: 1"=120' FOR 11"x17"
1"=60' FOR 22"x34"

0' 60' 120'

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME EXISTING AND PROPOSED INFORMATION NOT SHOWN FOR CLARITY.
3. THESE DRAWINGS ARE PROVIDED FOR SITING COUNCIL REVIEW. CONSTRUCTION LEVEL DRAWINGS WILL BE DEVELOPED SUBSEQUENT TO THE APPROVAL OF THESE DRAWINGS.
4. ALL ANTENNAS, COAX & EQUIPMENT TO BE INSTALLED IN ACCORDANCE WITH THE STRUCTURAL ANALYSIS REPORT BY PAUL J. FORD & COMPANY DATED 08/28/19.
5. GROUND WILL BE TO PROPOSED GROUND RING AT EQUIPMENT AREA.
6. SITE PLAN & ELEVATION BASED ON SITE VISIT BY DEWBERRY ENGINEERS INC. ON 02/27/17.

CELLCO PARTNERSHIP
d/b/a verizon WIRELESS
20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

WEST HAVEN 3
RELO CT

CSC DRAWINGS		
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PARSIPPANY, NJ 07054
PHONE: 973.739.9400
FAX: 973.739.9710

STATE OF CONNECTICUT
BENJAMIN G. HEATH
28971
LICENSED PROFESSIONAL ENGINEER

DRAWN BY:	JC
REVIEWED BY:	GWY
CHECKED BY:	GHN
PROJECT NUMBER:	50057815
JOB NUMBER:	50094424

SITE ADDRESS

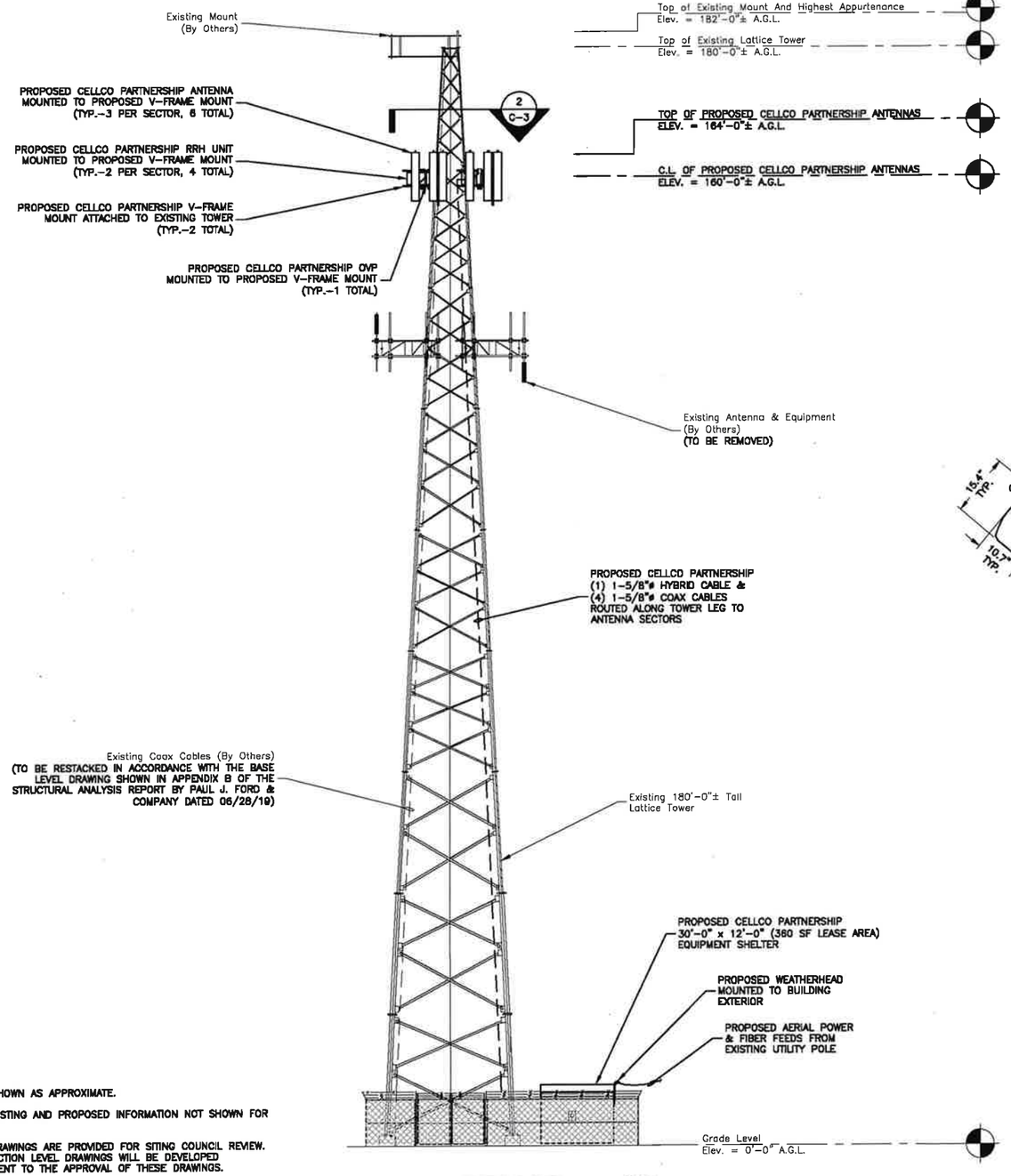
204 BURWELL ROAD
WEST HAVEN, CT 06516

SHEET TITLE

PARTIAL SITE PLAN

SHEET NUMBER

C-2



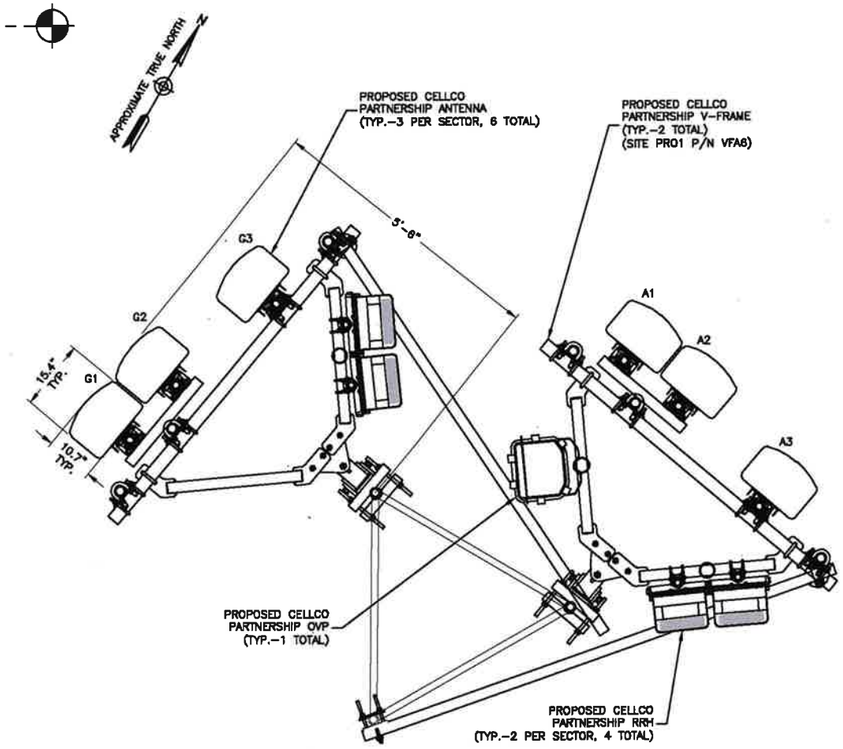
SOUTH ELEVATION (1)

SCALE: 3/64"=1' FOR 11"x17"
3/32"=1' FOR 22"x34"

0' 8' 16' 24'

NOTE:

1. ALL THREE LATTICE TOWER LEGS HAVE CLIMBING PEGS ATTACHED.



MOUNTING DETAIL (2)

SCALE: 3/8"=1' FOR 11"x17"
3/4"=1' FOR 22"x34"

0' 1' 2' 3'

NOTES:

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5. GROUND WILL BE TO PROPOSED GROUND RING AT EQUIPMENT AREA.
6. SITE PLAN & ELEVATION BASED ON SITE VISIT BY DEWBERRY ENGINEERS INC. ON 02/27/17.

CELLCO PARTNERSHIP
d/b/a verizon WIRELESS
20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

WEST HAVEN 3
RELO CT

CSC DRAWINGS		
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STATE OF CONNECTICUT
BENJAMIN E. MYETTE
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DRAWN BY:	JC
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SITE ADDRESS

204 BURWELL ROAD
WEST HAVEN, CT 06516

SHEET TITLE

SOUTH ELEVATION &
MOUNTING DETAIL

SHEET NUMBER

C-3

ATTACHMENT 3

JMA WIRELESS

MX06FRO860-03

NWAV™ X-Pol Hex-Port Antenna

X-Pol Hex-Port 8 ft 60° Fast Roll Off antenna with independent tilt on 700 & 850 MHz:

2 ports 698-798, 824-894 MHz and 4 ports 1695-2180 MHz

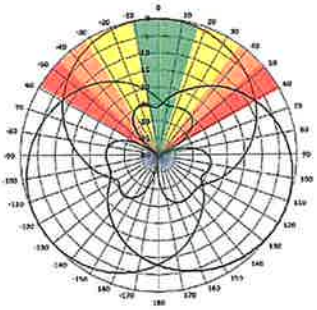
- Fast Roll Off (FRO™) azimuth beam pattern improves Intra- and Inter-cell SINR
- Compatible with dual band 700/850 MHz radios with independent low band EDT without external diplexers
- Fully integrated (iRETs) with independent RET control for low and high bands for ease of network optimization
- SON-Ready array spacing supports beamforming capabilities
- Suitable for LTE/CDMA/PCS/UMTS/GSM air interface technologies
- Integrated Smart Bias-Ts reduce leasing costs

nWAV

Fast Roll-Off antennas increase data throughput without compromising coverage

The horizontal beam produced by Fast Roll-Off (FRO) technology increases the Signal to Interference & Noise Ratio (SINR) by eliminating overlap between sectors.

Non-FRO antenna



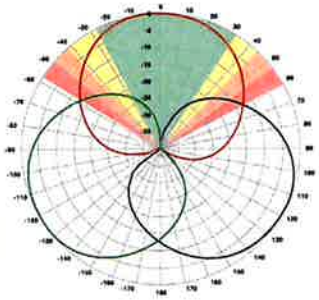
Large traditional antenna pattern overlap creates harmful interference.

JMA's FRO antenna pattern minimizes overlap, thereby minimizing interference.

LTE throughput	SINR	Speed (bps/Hz)	Speed increase	CQI
Excellent	>18	>4.5	333+%	8-10
Good	15-18	3.3-4.5	277%	6-7
Fair	10-15	2-3.3	160%	4-6
Poor	<10	<2	0%	1-3

The LTE radio automatically selects the best throughput based on measured SINR.

JMA FRO antenna



Electrical specification (minimum/maximum)	Ports 1, 2		Ports 3, 4, 5, 6		
Frequency bands, MHz	698-798	824-894	1695-1880	1850-1990	1920-2180
Polarization	± 45°		± 45°		
Average gain over all tilts, dBi	15.3	14.5	17.6	17.9	18.2
Horizontal beamwidth (HBW), degrees	60.0	53.5	55.0	55.0	55.5
Front-to-back ratio, co-polar power @180°± 30°, dB	>22.0	>21.0	>25.0	>25.0	>25.0
X-Pol discrimination (CPR) at boresight, dB	>18.0	>15.0	>18	>18	>15
Sector power ratio, percent	<4.5	<3.5	<3.7	<3.8	<3.6
Vertical beamwidth (VBW), degrees[1]	9.0	8.3	6.0	5.5	5.5
Electrical downtilt (EDT) range, degrees	2-12	2-12	0-9		
First upper side lobe (USLS) suppression, dB[1]	≤-15.0	≤-15.0	≤-16.0	≤-16.0	≤-16.0
Cross-polar isolation, port-to-port, dB[1]	25	25	25	25	25
Max VSWR / return loss, dB	1.5:1 / -14.0		1.5:1 / -14.0		
Max passive intermodulation (PIM), 2x20W carrier, dBc	-153		-153		
Max input power per any port, watts	300		250		
Total composite power all ports, watts	1500				

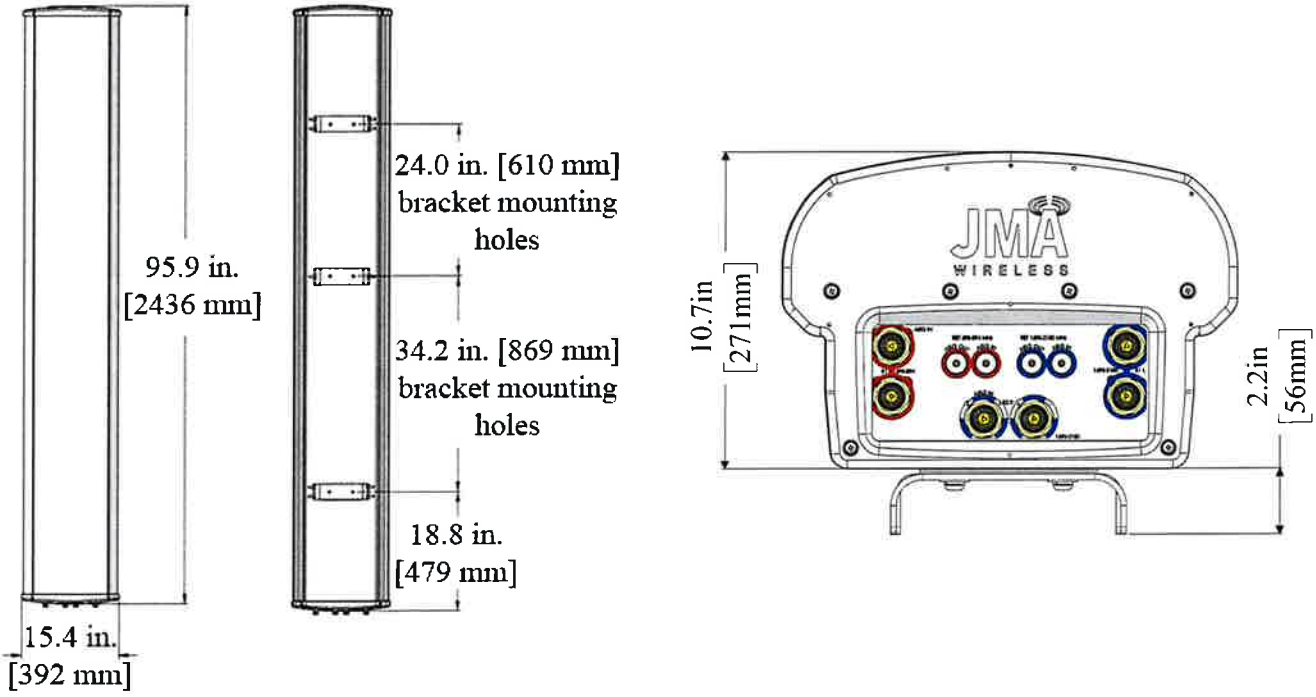
[1] Typical value over frequency and tilt

MX06FRO860-03

NWAV™ X-Pol Hex-Port Antenna

Mechanical specifications	
Dimensions height/width/depth, inches (mm)	95.9/ 15.4/ 10.7 (2436/ 392/ 273)
Shipping dimensions length/width/height, inches (mm)	106/ 20/ 15 (2692/ 508/ 381)
No. of RF input ports, connector type, and location	6 x 4.3-10 female, bottom
RF connector torque	96 lbf·in (10.85 N·m or 8 lbf·ft)
Net antenna weight, lb (kg)	65 (29.5)
Shipping weight, lb (kg)	95 (43.1)
Antenna mounting and downtilt kit included with antenna	91900318, 91900319 (middle bracket)
Net weight of the mounting and downtilt kit, lb (kg)	26 (11.82)
Range of mechanical up/down tilt	-2° to 12°
Rated wind survival speed, mph (km/h)	150 (241)
Frontal, lateral, and rear wind loading @ 150 km/h, lbf (N)	208 (925), 98 (435), 212 (943)
Equivalent flat plate @ 100 mph and Cd=2, sq ft	3.46

Front view **Back view** **Bottom view**



Ordering information	
Antenna model	**Description**
MX06FRO860-03	8F X-Pol HEX FRO 60° independent tilt 700/850 RET, 4.3-10 & SBT
Optional accessories	
AISG cables	M/F cables for AISG connections
PCU-1000 RET controller	Stand-alone controller for RET control and configurations

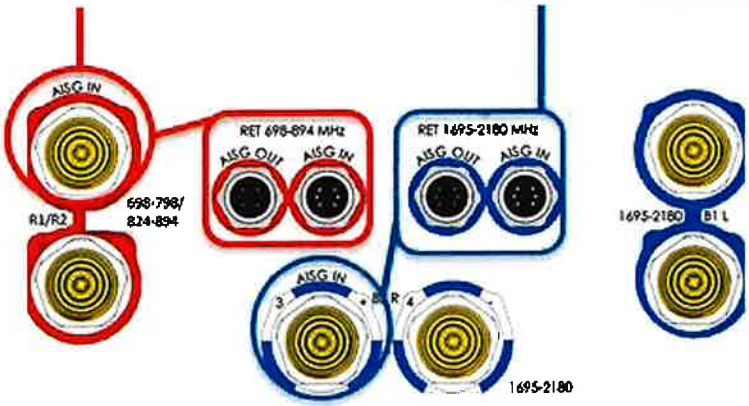
Remote electrical tilt (RET 1000) information	
RET location	Integrated into antenna
RET interface connector type	8-pin AISG connector per IEC 60130-9
RET connector torque	Min 0.5 N·m to max 1.0 N·m (hand pressure & finger tight)
RET interface connector quantity	2 pairs of AISG male/female connectors
RET interface connector location	Bottom of the antenna
Total no. of internal RETs (low bands)	2
Total no. of internal RETs (high bands)	1
RET input operating voltage, vdc	10-30
RET max power consumption, idle state, W	≤ 2.0
RET max power consumption, normal operating conditions, W	≤ 13.0
RET communication protocol	AISG 2.0 / 3GPP

RET and RF connector topology

Each RET device can be controlled either via the designated external AISG connector or RF port as shown below:

RET device	Band	RF port
R1	698-798	1-2
R2	824-894	1-2

RET device	Band	RF port
B1/B2	1695-2180	3-6

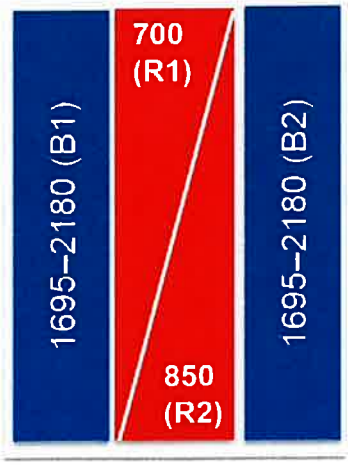


Array topology

3 sets of radiating arrays

R1/R2: 698-894 MHz
B1: 1695-2180 MHz
B2: 1695-2180 MHz

Band	RF port
1695-2180	3-4
698-894	1-2
1695-2180	5-6



SAMSUNG

Dual-Band Radio Unit
700/850MHz (B13/B5)

RFV01U-D2A

Samsung's RFV01U-D2A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.

The RFV01U-D2A RU targets dual-band support across Band 13 (700MHz) and Band 5 (850MHz), making it an ideal product for broad coverage footprints across multiple common low-end, long-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung's CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation

Key Technical Specifications

Duplex Type: FDD
Operating Frequencies:
B13: DL(746-756MHz)/UL(777-787MHz)
B5: DL(869-894MHz)/UL(824-849MHz)
Instantaneous Bandwidth: 10MHz(B13) + 25MHz(B5)
RF Chain: 4T4R/2T4R/2T2R
Output Power: Total 320W
DU-RU Interface: CPRI (10Gbps)
Dimensions: 380 x 380 x 207mm (29.9L)
Weight: 31.9kg
Input Power: -48V DC
Operating Temp.: -40 - 55°(w/o solar load)
Cooling: Natural convection

SAMSUNG

Dual-Band Radio Unit
AWS/PCS (B66/B2)
RFV01U-D1A

Samsung's RFV01U-D1A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.

The RFV01U-D1A RU targets dual-band support across Band 66 (AWS) and Band 2 (PCS), making it an ideal product for broad coverage footprints across multiple common mid-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung's CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation
- Built-in Broadcast Auxiliary Services (BAS) filter ensures compliant AWS operation without impacting footprint

Key Technical Specifications

Duplex Type: FDD
Operating Frequencies:
B66: DL(2,110-2,180MHz)/UL(1,710-1,780MHz)
B2: DL(1,930-1,990MHz)/UL(1,850-1,910MHz)
Instantaneous Bandwidth:
70MHz(B66) + 60MHz(B2)
RF Chain: 4T4R/2T4R/2T2R
Output Power: Total 320W
DU-RU Interface: CPRI (10Gbps)
Dimensions: 380 x 380 x 255mm (36.8L)
Weight: 38.3kg
Input Power: -48V DC
Operating Temp.: -40 - 55°(w/o solar load)
Cooling: Natural convection

SD030 | 2.4L | 30 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC | INDUSTRIAL POWER

STANDBY POWER RATING

30 kW, 38 kVA, 60 Hz

PRIME POWER RATING*

27 kW, 34 kVA, 60 Hz

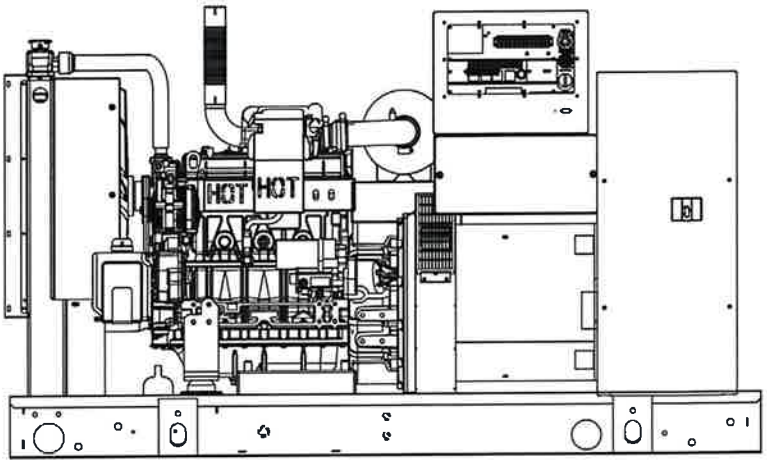


Image used for illustration purposes only

*Built in the USA using domestic and foreign parts

*EPA Certified Prime ratings are not available in the U.S. or its Territories.

**Certain options or customization may not hold certification valid.

CODES AND STANDARDS

Generac products are designed to the following standards:

UL2200, UL508, UL142, UL498

NFPA70, 99, 110, 37

NEC700, 701, 702, 708

ISO9001, 8528, 3046, 7637, Pluses #2b, 4

NEMA ICS10, MG1, 250, ICS6, AB1

ANSI C62.41

POWERING AHEAD

For over 50 years, Generac has led the industry with innovative design and superior manufacturing.

Generac ensures superior quality by designing and manufacturing most of its generator components, including alternators, enclosures and base tanks, control systems and communications software.

Generac's gensets utilize a wide variety of options, configurations and arrangements, allowing us to meet the standby power needs of practically every application.

Generac searched globally to ensure the most reliable engines power our generators. We choose only engines that have already been proven in heavy-duty industrial application under adverse conditions.

Generac is committed to ensuring our customers' service support continues after their generator purchase.

SD030 | 2.4L | 30 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC | INDUSTRIAL POWER

STANDARD FEATURES

ENGINE SYSTEM

General

- Oil Drain Extension
- Air Cleaner
- Fan Guard
- Stainless Steel flexible exhaust connection
- Critical Exhaust Silencer (enclosed only)
- Factory Filled Oil
- Radiator Duct Adapter (open set only)

Fuel System

- Fuel lockoff solenoid
- Primary fuel filter

Cooling System

- Closed Coolant Recovery System
- UV/Ozone resistant hoses
- Factory-Installed Radiator
- Radiator Drain Extension
- 50/50 Ethylene glycol antifreeze
- 120 VAC Coolant Heater

Engine Electrical System

- Battery charging alternator
- Battery cables
- Battery tray
- Solenoid activated starter motor
- Rubber-booted engine electrical connections

ALTERNATOR SYSTEM

- UL2200 GENprotect™
- 12 leads (3-phase, non 600 V)
- Class H insulation material
- Vented rotor
- 2/3 pitch
- Skewed stator
- Auxiliary voltage regulator power winding
- Amortisseur winding
- Brushless Excitation
- Sealed Bearings
- Automated manufacturing (winding, insertion, lacing, varnishing)
- Rotor dynamically spin balanced
- Full load capacity alternator
- Protective thermal switch

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of circuits - high/low voltage
- Separation of circuits - multiple breakers
- Silencer Heat Shield
- Wrapped Exhaust Piping
- Silencer housed in discharge hood (enclosed only)
- Standard Factory Testing
- 2 Year Limited Warranty (Standby rated Units)
- 1 Year Limited Warranty (Prime rated Units)
- Silencer mounted in the discharge hood (enclosed only)

ENCLOSURE (IF SELECTED)

- Rust-proof fasteners with nylon washers to protect finish
- High performance sound-absorbing material
- Gasketed doors
- Stamped air-intake louvers
- Air discharge hoods for radiator-upward pointing
- Stainless steel lift off door hinges
- Stainless steel lockable handles
- Rhino Coat™- Textured polyester powder coat

TANKS (IF SELECTED)

- UL 142
- Double wall
- Vents
- Sloped top
- Sloped bottom
- Factory pressure tested (2 psi)
- Rupture basin alarm
- Fuel level
- Check valve in supply and return lines
- Rhino Coat™- Textured polyester powder coat
- Stainless hardware

CONTROL SYSTEM

Control Panel

- Digital H Control Panel - Dual 4x20 Display
- Programmable Crank Limiter
- 7-Day Programmable Exerciser
- Special Applications Programmable PLC
- RS-232/485
- All-Phase Sensing DVR
- Full System Status
- Utility Monitoring
- Low Fuel Pressure Indication
- 2-Wire Start Compatible
- Power Output (kW)
- Power Factor
- kW Hours, Total & Last Run
- Real/Reactive/Apparent Power
- All Phase AC Voltage
- All Phase Currents
- Oil Pressure
- Coolant Temperature
- Coolant Level
- Engine Speed
- Battery Voltage
- Frequency
- Date/Time Fault History (Event Log)
- Isochronous Governor Control
- Waterproof/sealed Connectors
- Audible Alarms and Shutdowns
- Not in Auto (Flashing Light)
- Auto/Off/Manual Switch
- E-Stop (Red Mushroom-Type)
- NFPA110 Level I and II (Programmable)
- Customizable Alarms, Warnings, and Events
- Modbus protocol
- Predictive Maintenance algorithm
- Sealed Boards
- Password parameter adjustment protection
- Single point ground
- 15 channel data logging
- 0.2 msec high speed data logging
- Alarm information automatically comes up on the display

Alarms

- Oil Pressure (Pre-programmable Low Pressure Shutdown)
- Coolant Temperature (Pre-programmed High Temp Shutdown)
- Coolant Level (Pre-programmed Low Level Shutdown)
- Low Fuel Pressure Alarm
- Engine Speed (Pre-programmed Over speed Shutdown)
- Battery Voltage Warning
- Alarms & warnings time and date stamped
- Alarms & warnings for transient and steady state conditions
- Snap shots of key operation parameters during alarms & warnings
- Alarms and warnings spelled out (no alarm codes)

SD030 | 2.4L | 30 kW

INDUSTRIAL DIESEL GENERATOR SET

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CONFIGURABLE OPTIONS

ENGINE SYSTEM

General

- O Oil Heater
- O Industrial Exhaust Silencer

Fuel System

- O Flexible fuel lines
- O Primary fuel filter

Engine Electrical System

- O 10A UL battery charger
- O 2.5A UL battery charger
- O Battery Warmer

ALTERNATOR SYSTEM

- O Alternator Upsizing
- O Anti-Condensation Heater
- O Tropical coating
- O Permanent Magnet Excitation

CIRCUIT BREAKER OPTIONS

- O Main Line Circuit Breaker
- O 2nd Main Line Circuit Breaker
- O Shunt Trip and Auxiliary Contact
- O Electronic Trip Breaker

GENERATOR SET

- O Gen-Link Communications Software (English Only)
- O 8 Position Load Center
- O 2 Year Extended Warranty
- O 5 Year Warranty
- O 5 Year Extended Warranty

ENCLOSURE

- O Weather Protected
- O Level 1 Sound Attenuation
- O Level 2 Sound Attenuation
- O Steel Enclosure
- O Aluminum Enclosure
- O 150 MPH Wind Kit
- O 12 VDC Enclosure Lighting Kit
- O 120 VAC Enclosure Lighting Kit
- O AC/DC Enclosure Lighting Kit
- O Door Alarm Switch

TANKS (Size on last page)

- O Electrical Fuel Level
- O Mechanical Fuel Level
- O 54 Gal (204.4 L) Usable Capacity
- O 132 Gal (499.7 L) Usable Capacity
- O 211 Gal (798.7 L) Usable Capacity
- O 300 Gal (1135.6 L) Usable Capacity
- O 8" Fill Extension
- O 13" Fill Extension
- O 19" Fill Extension

CONTROL SYSTEM

- O 21-Light Remote Annunciator
- O Remote Relay Panel (8 or 16)
- O Oil Temperature Sender with Indication Alarm
- O Remote E-Stop (Break Glass-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Surface Mount)
- O Remote E-Stop (Red Mushroom-Type, Flush Mount)
- O Remote Communication - Modem
- O Remote Communication - Ethernet
- O 10A Run Relay
- O Ground Fault Indication and Protection Functions

ENGINEERED OPTIONS

ENGINE SYSTEM

- O Coolant heater ball valves
- O Block Heaters
- O Fluid containment pans

ALTERNATOR SYSTEM

- O 3rd Breaker Systems

CONTROL SYSTEM

- O Spare inputs (x4) / outputs (x4) - H Panel Only
- O Battery Disconnect Switch

GENERATOR SET

- O Special Testing
- O IBC Seismic Certification

ENCLOSURE

- O Motorized Dampers
- O Door switched for intrusion alert
- O Enclosure ambient heaters

TANKS

- O Overfill Protection Valve
- O UL2085 Tank
- O ULC S-601 Tank
- O Stainless Steel Tank
- O Special Fuel Tanks (MIDEQ and FL DEP/DERM, etc.)
- O Vent Extensions

RATING DEFINITIONS

Standby - Applicable for a varying emergency load for the duration of a utility power outage with no overload capability.

Prime - Applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running time. A 10% overload capacity is available for 1 out of every 12 hours. The Prime Power option is only available on International applications. Power ratings in accordance with ISO 8528-1, Second Edition

SD030 | 2.4L | 30 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC | INDUSTRIAL POWER

APPLICATION AND ENGINEERING DATA

ENGINE SPECIFICATIONS

General

Make	Generac
EPA Emissions Compliance	Stationary Emergency
EPA Emissions Reference	See Emissions Data Sheet
Cylinder #	4
Type	In-Line
Displacement - L (cu In)	2.4 (146.46)
Bore - mm (in)	90 (3.54)
Stroke - mm (in)	94 (3.70)
Compression Ratio	21.3:1
Intake Air Method	Turbocharged
Cylinder Head Type	Cast Iron
Piston Type	Aluminium

Engine Governing

Governor	Electronic Isochronous
Frequency Regulation (Steady State)	+/- 0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full Flow
Crankcase Capacity - L (qts)	6.2 (6.52)

Cooling System

Cooling System Type	Closed Recovery
Water Pump	Pre-Lubed, Self Sealing
Fan Type	Pusher
Fan Speed (rpm)	2698
Fan Diameter mm (in)	560 (22)
Coolant Standard Wattage	1500
Coolant Heater Standard Voltage	120 VAC

Fuel System

Fuel Type	Ultra Low Sulfur Diesel Fuel
Fuel Specifications	ASTM
Fuel Filtering (microns)	5
Fuel Injection	Distribution Injection Pump
Fuel Pump Type	Engine Driven Gear
Injector Type	Mechanical
Fuel Supply Line mm (in)	7.94 (0.31)
Fuel Return Line mm (in)	7.94 (0.31)

Engine Electrical System

System Voltage	12 VDC
Battery Charging Alternator	Std
Battery Size	See Battery Index 0161970SBY
Battery Voltage	12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	390
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	<50
Standard Excitation	Synchronous
Bearings	Single Sealed Cartridge
Coupling	Direct, Flexible Disc
Load Capacity - Standby	100%
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	±0.25%

SD030 | 2.4L | 30 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

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OPERATING DATA

POWER RATINGS

		Standby
Single-Phase 120/240 VAC @1.0pf	30 kW	Amps: 125
Three-Phase 120/208 VAC @0.8pf	30 kW	Amps: 104
Three-Phase 120/240 VAC @0.8pf	30 kW	Amps: 90
Three-Phase 277/480 VAC @0.8pf	30 kW	Amps: 46
Three-Phase 346/600 VAC @0.8pf	30 kW	Amps: 36

STARTING CAPABILITIES (sKVA)

sKVA vs. Voltage Dip

		480 VAC						208/240 VAC					
Alternator	kW	10%	15%	20%	25%	30%	35%	10%	15%	20%	25%	30%	35%
Standard	35	24	36	48	60	72	84	18	27	36	45	54	63
Upsize 1	40	27	41	54	68	81	95	20	31	41	51	61	71
Upsize 2	50	34	52	69	86	103	120	26	39	52	65	77	90

FUEL CONSUMPTION RATES*

Fuel Pump Lift - ft (m)
3 (1)

Total Fuel Pump Flow (Combustion + Return)
4.5 gph

Diesel - gph (lph)

Percent Load	gph (lph)
25%	0.92 (3.5)
50%	1.45 (5.5)
75%	1.96 (7.4)
100%	2.74 (10.4)

* Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby
Coolant Flow per Minute	gpm (lpm)	10 (38)
Coolant System Capacity	gal (L)	2.8 (10.95)
Heat Rejection to Coolant	BTU/hr	111,000
Inlet Air	cfm (m3/hr)	4,500 (7647)
Max. Operating Radiator Air Temp	F° (C°)	122 (50)
Max. Ambient Temperature (before derate)	F° (C°)	104 (40)
Maximum Radiator Backpressure	in H_2O	0.5

COMBUSTION AIR REQUIREMENTS

		Standby
Flow at Rated Power	cfm (m3/min)	90 (2.55)

ENGINE

		Standby
Rated Engine Speed	rpm	1800
Horsepower at Rated kW**	hp	49
Piston Speed	ft/min (m/min)	1110 (338)
BMEP	psi	153

** Refer to "Emissions Data Sheet" for maximum bHP for EPA and SCAQMD permitting purposes.

EXHAUST

		Standby
Exhaust Flow (Rated Output)	cfm (m^3/min)	230 (391)
Max. Backpressure (Post Silencer)	inHg (Kpa)	1.5 (5.1)
Exhaust Temp (Rated Output)	°F (°C)	850 (454)
Exhaust Outlet Size (Open Set)	mm (in)	63.5 (2.5)

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

SD030 | 2.4L | 30 kW

INDUSTRIAL DIESEL GENERATOR SET

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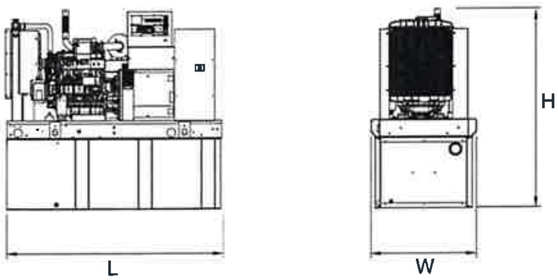
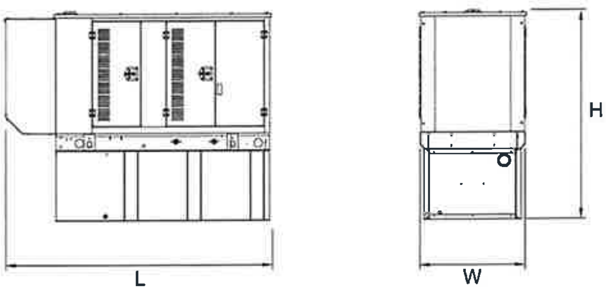
DIMENSIONS AND WEIGHTS*



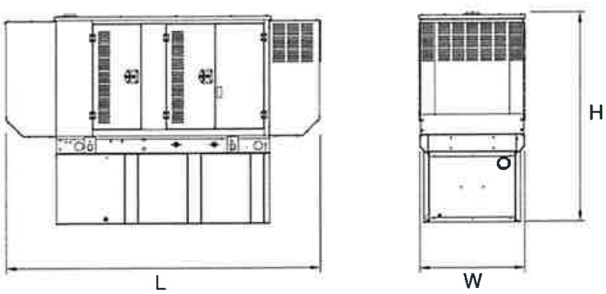
OPEN SET

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Tank & Open Set
NO TANK	-	76 (1930.4) x 37.4 (949.9) x 42.2 (1072.1)	2060 (934)
19	54 (204.4)	76 (1930.4) x 37.4 (949.9) x 55.2 (1402.1)	2540 (1152)
48	132 (499.7)	76 (1930.4) x 37.4 (949.9) x 67.2 (1706.9)	2770 (1257)
77	211 (798.7)	76 (1930.4) x 37.4 (949.9) x 79.2 (2011.7)	2979 (1351)
109	300 (1135.6)	92.9 (2360) x 37.4 (949.9) x 82.7 (2100.6)	3042 (1380)



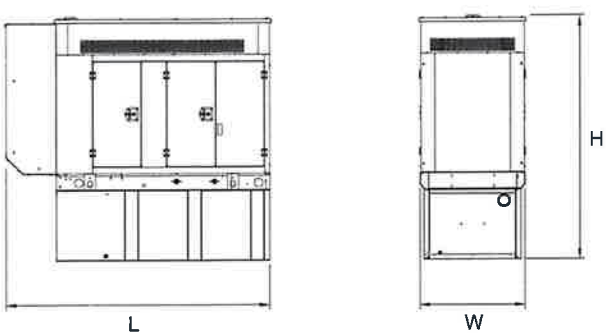
STANDARD ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	94.8 (2408.9) x 38 (965.2) x 49.5 (1258.1)		
19	54 (204.4)	94.8 (2408.9) x 38 (965.2) x 62.5 (1587.5)		
48	132 (499.7)	94.8 (2408.9) x 38 (965.2) x 74.5 (1892.3)	302 (137)	191 (87)
77	211 (798.7)	94.8 (2408.9) x 38 (965.2) x 86.5 (2197.1)		
109	300 (1135.6)	94.8 (2408.9) x 38 (965.2) x 90 (2286)		



LEVEL 1 ACOUSTIC ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	112.5 (2857.1) x 38 (965.2) x 49.5 (1258.1)		
19	54 (204.4)	112.5 (2857.1) x 38 (965.2) x 62.5 (1587.5)		
48	132 (499.7)	112.5 (2857.1) x 38 (965.2) x 74.5 (1892.3)	455 (206)	288 (131)
77	211 (798.7)	112.5 (2857.1) x 38 (965.2) x 86.5 (2197.1)		
109	300 (1135.6)	112.5 (2857.1) x 38 (965.2) x 90 (2286)		



LEVEL 2 ACOUSTIC ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY GAL (L)	L x W x H in (mm)	WT lbs (kg) - Enclosure Only	
			Steel	Aluminum
NO TANK	-	94.8 (2408.9) x 38 (965.2) x 62 (1573.9)		
19	54 (204.4)	94.8 (2408.9) x 38 (965.2) x 75 (1905)		
48	132 (499.7)	94.8 (2408.9) x 38 (965.2) x 87 (2209.8)	460 (209)	291 (132)
77	211 (798.7)	94.8 (2408.9) x 38 (965.2) x 99 (2514.6)		
109	300 (1135.6)	94.8 (2408.9) x 38 (965.2) x 102.5 (2603.5)		

*All measurements are approximate and for estimation purposes only. Sound dBA can be found on the sound data sheet. Enclosure Only weight is added to Tank & Open Set weight to determine total weight.

YOUR FACTORY RECOGNIZED GENERAC INDUSTRIAL DEALER

Specification characteristics may change without notice. Dimensions and weights are for preliminary purposes only. Please consult a Generac Power Systems Industrial Dealer for detailed installation drawings.

ATTACHMENT 4

PAUL J. FORD & COMPANY

Date: **June 28, 2019**

Denice Nicholson
Crown Castle
3 Corporate Dr
Clifton Park, NY 12065

Paul J. Ford and Company
250 East Broad St., Suite 600
Columbus, OH 43215
(614) 221-6679

Subject:	**Structural Analysis Report**	
Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	West Haven 3 CT RELO
Crown Castle Designation:	**Crown Castle BU Number:**	870694
	Crown Castle Site Name:	West Haven (Burwell Hill)
	Crown Castle JDE Job Number:	580093
	Crown Castle Work Order Number:	1756334
	Crown Castle Order Number:	491875 Rev. 2
Engineering Firm Designation:	**Paul J. Ford and Company Project Number:**	37519-0217.002.8700_R1
Site Data:	**2014 and 240 Burwell Road, West Haven, New Haven County, CT** **Latitude *41° 17' 45.4"*, Longitude *-72° 58' 23.6"*** **180 Foot - Self Support Tower**	

Dear Denice Nicholson,

Paul J. Ford and Company is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC7: Proposed Equipment Configuration	**99.5%**	**Sufficient Capacity**

This report is only valid if the loading changes described in the Recommendations section are met.

This analysis utilizes an ultimate 3-second gust wind speed of 125 mph as required by the 2018 Connecticut State Building Code and Appendix N. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Respectfully submitted by:

Anthony Pelino

Anthony Pelino, E.I.
Structural Designer
apelino@pauljford.com

SFM

06/28/2019

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 180 ft Self Support tower designed by Rohn, and mapped by GPD in January of 2008. The original design standard and wind speed are unavailable.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	125 mph
Exposure Category:	B
Topographic Factor:	1
Ice Thickness:	1.5 in
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
160.0	160.0	2	samsung telecommunications	RFV01U-D1A	5	1-5/8
		2	samsung telecommunications	RFV01U-D2A		
		1	raycap	RVZDC-6627-PF-48		
		6	jma wireless	MX06FRO860-03 w/ Mount Pipe		
		2	tower mounts	Sector Mount [SM 703-1]		

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
180.0	180.0	1	tower mounts	Pipe Mount [PM 601-1]	-	-
175.0	175.0	4	janteq corporation	500-0024223 w/ Mount Pipe	8	1/2
		4	tower mounts	5' x 3" Mount Pipe		
120.0	120.0	2	commscope	HP4-7.7	4	1/2
		2	cambium networks	PTP 820G		
		2	tower mounts	5' x 3" Mount Pipe		
100.0	100.0	2	commscope	DB222-A	2	1/2
		2	tower mounts	5' x 3" Mount Pipe		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH, 07-11240G, 02/15/2008	2207330	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	TEP, 49709-13255, 09/18/2013	1301528	CCISITES
4-TOWER MANUFACTURER DRAWINGS	GPD, 2007295.34, 01/18/2008	1301402	CCISITES

3.1) Analysis Method

tnxTower (version 8.0.5.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) Base plate grout was not installed at the time of the analysis and has not been considered.
5) The foundation (structural) capacity was unable to be determined due to the lack of existing reinforcing steel information. Therefore, it was assumed that the foundation was properly designed to meet the minimum amount of steel per ACI requirements. The minimum steel values were then used for the foundation analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	180 - 160	Leg	Pipe 2.375" x 0.154" (2 STD)	2	-5.12	38.65	13.3	Pass
T2	160 - 140	Leg	Pipe 2.375" x 0.154" (2 STD)	37	-21.26	38.65	55.0	Pass
T3	140 - 120	Leg	Pipe 2.875" x 0.276" (2.5 XS)	70	-34.68	78.15	44.4	Pass
T4	120 - 100	Leg	Pipe 2.875" x 0.276" (2.5 XS)	97	-49.05	61.44	79.8	Pass
T5	100 - 80	Leg	Pipe 3.5" x 0.300" (3 XS)	118	-64.06	99.06	64.7	Pass
T6	80 - 60	Leg	Pipe 3.5" x 0.300" (3 XS)	139	-79.07	99.06	79.8	Pass
T7	60 - 40	Leg	Pipe 4" x 0.318" (3.5 XS)	160	-93.18	93.61	99.5	Pass
T8	40 - 20	Leg	Pipe 4.5" x 0.337" (4 XS)	175	-108.46	128.28	84.5	Pass
T9	20 - 0	Leg	Pipe 4.5" x 0.337" (4 XS)	190	-123.43	128.28	96.2	Pass
T1	180 - 160	Diagonal	L 1.5 x 1.5 x 1/8	8	-0.68	7.79	8.7 17.3 (b)	Pass
T2	160 - 140	Diagonal	L 1.5 x 1.5 x 1/8	45	-2.04	4.92	41.4 61.8 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T3	140 - 120	Diagonal	L 1.5 x 1.5 x 1/8	78	-2.15	2.90	74.2	Pass
T4	120 - 100	Diagonal	L 2 x 2 x 1/8	105	-2.96	4.32	68.5	Pass
T5	100 - 80	Diagonal	L 2 x 2 x 1/8	126	-3.12	3.33	93.6	Pass
T6	80 - 60	Diagonal	L 3 x 3 x 3/16	147	-3.53	13.23	26.7 37.1 (b)	Pass
T7	60 - 40	Diagonal	L 3 x 3 x 3/8	168	-4.24	16.79	25.2 29.2 (b)	Pass
T8	40 - 20	Diagonal	L 3 x 3 x 3/8	183	-4.54	14.14	32.1	Pass
T9	20 - 0	Diagonal	L 3.5 x 3.5 x 1/4	195	-5.01	13.40	37.4	Pass
T1	180 - 160	Top Girt	L 1.5 x 1.5 x 1/8	5	-0.07	9.10	0.8 2.1 (b)	Pass
							Summary	
						Leg (T7)	99.5	Pass
						Diagonal (T5)	93.6	Pass
						Top Girt (T1)	2.1	Pass
						Bolt Checks	71.4	Pass
						Rating =	99.5	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	87.9	Pass
1	Base Foundation Structural	0	60.7	Pass
1	Base Foundation Soil Interaction	0	75.8	Pass

Structure Rating (max from all components) =	99.5%

Notes:
- All structural ratings are per TIA-222-H Section 15.5

1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
2) See assumption #5

4.1) Recommendations

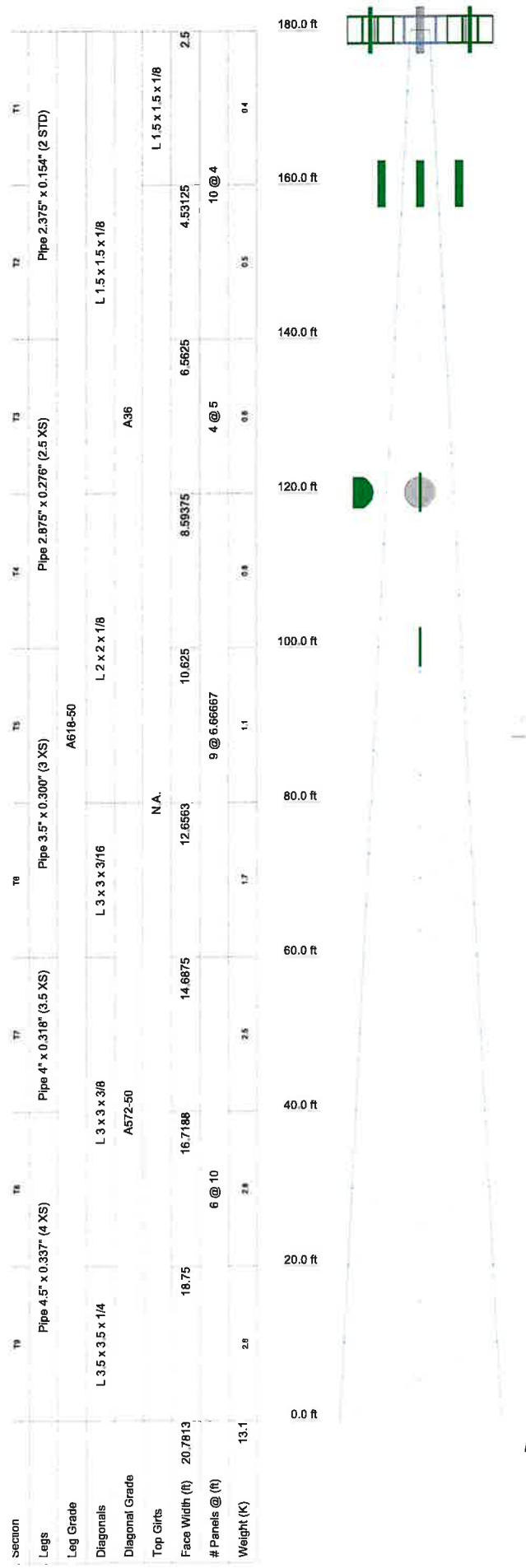
The tower and its foundation have sufficient capacity to carry the proposed load configuration. In order for the results of this analysis to be considered valid, the loading modification(s), as follows, must be completed.

- The existing feed lines to the 100, 120, and 175-ft level are restacked in accordance with the base level drawing shown in Appendix B.

No structural modifications are required at this time provided that the above-listed changes are completed.

APPENDIX A

TNXTOWER OUTPUT



MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A618-50	50 ksi	70 ksi	A572-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 125 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TIA-222-H Annex S
9. TOWER RATING: 99.5%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 127 K
SHEAR: 14 K

UPLIFT: -108 K
SHEAR: 12 K

AXIAL
56 K

SHEAR *6 K* → *MOMENT* *585 kip-ft*

TORQUE 5 kip-ft
50 mph WIND - 1.5000 in ICE

AXIAL
21 K

SHEAR *23 K* → *MOMENT* *2164 kip-ft*

TORQUE 21 kip-ft
REACTIONS - 125 mph WIND

Paul J. Ford and Company
250 East Broad St., Suite 600
Columbus, OH 43215
Phone: (614) 221-6679
FAX:

Job:	180-ft SST / West Haven, CT		
Project:	BU 870694 / PJF 37519-0217		
Client:	Crown Castle	Drawn by: apelino	App'd:
Code:	TIA-222-H	Date: 06/26/19	Scale: N
Path:			Dwg No.

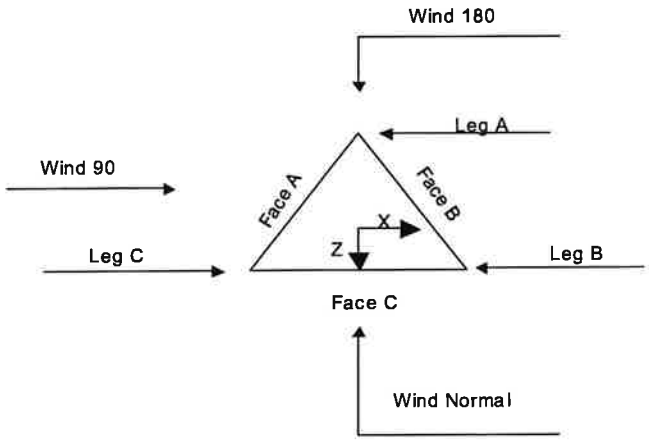
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 2.50 ft at the top and 20.78 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

1) Tower is located in New Haven County, Connecticut.
2) Tower base elevation above sea level: 276.00 ft.
3) Basic wind speed of 125 mph.
4) Risk Category II.
5) Exposure Category B.
6) Simplified Topographic Factor Procedure for wind speed-up calculations is used.
7) Topographic Category: 1.
8) Crest Height: 0.00 ft.
9) Nominal ice thickness of 1.5000 in.
10) Ice thickness is considered to increase with height.
11) Ice density of 56 pcf.
12) A wind speed of 50 mph is used in combination with ice.
13) Deflections calculated using a wind speed of 60 mph.
14) TIA-222-H Annex S.
15) Pressures are calculated at each section.
16) Tower analysis based on target reliabilities in accordance with Annex S.
17) Load Modification Factors used: $K_{es}(F_w) = 0.95$, $K_{es}(t_i) = 0.85$.
18) Stress ratio used in tower member design is 1.05.
19) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Horizontals	Assume Legs Pinned	√ Calculate Redundant Bracing Forces
Consider Moments - Diagonals	Assume Rigid Index Plate	Ignore Redundant Members in FEA
Use Moment Magnification	√ Use Clear Spans For Wind Area	SR Leg Bolts Resist Compression
Use Code Stress Ratios	√ Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
Use Code Safety Factors - Guys	Retension Guys To Initial Tension	Offset Girt At Foundation
Escalate Ice	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Include Angle Block Shear Check
Use Special Wind Profile	√ Project Wind Area of Appurt.	Use TIA-222-H Bracing Resist. Exemption
√ Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Use TIA-222-H Tension Splice Exemption
Leg Bolts Are At Top Of Section	Add IBC .6D+W Combination	Poles
√ Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Include Shear-Torsion Interaction
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Always Use Sub-Critical Flow
√ SR Members Have Cut Ends	Treat Feed Line Bundles As Cylinder	Use Top Mounted Sockets
SR Members Are Concentric	Ignore KL/ry For 60 Deg. Angle Legs	Pole Without Linear Attachments
		Pole With Shroud Or No Appurtenances
		Outside and Inside Corner Radii Are Known



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	180.00-160.00		06N	2.50	1	20.00
T2	160.00-140.00		07KDH	4.53	1	20.00
T3	140.00-120.00		08N422	6.56	1	20.00
T4	120.00-100.00		09N117	8.59	1	20.00
T5	100.00-80.00		10N083	10.63	1	20.00
T6	80.00-60.00		11N076	12.66	1	20.00
T7	60.00-40.00		12NH	14.69	1	20.00
T8	40.00-20.00		13NTB	16.72	1	20.00
T9	20.00-0.00		14NH	18.75	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	180.00-160.00	4.00	X Brace	No	No	0.0000	0.0000
T2	160.00-140.00	4.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	5.00	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T5	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T7	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	Pipe 2.375" x 0.154" (2 STD)	A618-50 (50 ksi)	Single Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)
T2 160.00-140.00	Pipe	Pipe 2.375" x 0.154" (2 STD)	A618-50 (50 ksi)	Single Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)
T3 140.00-120.00	Pipe	Pipe 2.875" x 0.276" (2.5 XS)	A618-50 (50 ksi)	Single Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)
T4 120.00-100.00	Pipe	Pipe 2.875" x 0.276" (2.5 XS)	A618-50 (50 ksi)	Single Angle	L 2 x 2 x 1/8	A36 (36 ksi)
T5 100.00-80.00	Pipe	Pipe 3.5" x 0.300" (3 XS)	A618-50 (50 ksi)	Single Angle	L 2 x 2 x 1/8	A36 (36 ksi)
T6 80.00-60.00	Pipe	Pipe 3.5" x 0.300" (3 XS)	A618-50 (50 ksi)	Single Angle	L 3 x 3 x 3/16	A572-50 (50 ksi)
T7 60.00-40.00	Pipe	Pipe 4" x 0.318" (3.5 XS)	A618-50 (50 ksi)	Single Angle	L 3 x 3 x 3/8	A572-50 (50 ksi)
T8 40.00-20.00	Pipe	Pipe 4.5" x 0.337" (4 XS)	A618-50 (50 ksi)	Single Angle	L 3 x 3 x 3/8	A572-50 (50 ksi)
T9 20.00-0.00	Pipe	Pipe 4.5" x 0.337" (4 XS)	A618-50 (50 ksi)	Single Angle	L 3.5 x 3.5 x 1/4	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.00-160.00	Equal Angle	L 1.5 x 1.5 x 1/8	A36 (36 ksi)	Single Angle		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	Double Angle Stitch Bolt Spacing Redundants in
T1 180.00-160.00	0.00	0.1875	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T2 160.00-140.00	0.00	0.1875	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T3 140.00-120.00	0.00	0.1875	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T4 120.00-100.00	0.00	0.1875	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T5 100.00-80.00	0.00	0.1875	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T6 80.00-60.00	0.00	0.2500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T7 60.00-40.00	0.00	0.2500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T8 40.00-20.00	0.00	0.2500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T9 20.00-0.00	0.00	0.2500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt

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 180.00-160.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 160.00-140.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 140.00-120.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 120.00-100.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 100.00-80.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 80.00-60.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 60.00-40.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 40.00-20.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T9 20.00-0.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-160.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0

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.
T2 160.00-140.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T3 140.00-120.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T4 120.00-100.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T5 100.00-80.00	Flange	0.8750 A325N	4	0.5000 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T6 80.00-60.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T7 60.00-40.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T8 40.00-20.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T9 20.00-0.00	Flange	1.0000 A354-BC	0	0.6250 A325N	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	160.00 - 0.00	0.0000	-0.45	5	3	1.0000 1.9800	1.9800		0.82
1.5" flat Cable Ladder Rail *****	B	No	No	Af (CaAa)	160.00 - 0.00	0.0000	-0.45	2	2	12.000 0 0.5000	1.5000		1.80
LDF4-50A(1/2")	B	No	No	Ar (CaAa)	175.00 - 120.00	0.0000	0.4	8	3	0.6250	0.6250		0.15
LDF4-50A(1/2")	B	No	No	Ar (CaAa)	120.00 - 100.00	0.0000	0.4	12	3	0.6250	0.6250		0.15
LDF4-50A(1/2")	B	No	No	Ar (CaAa)	100.00 - 0.00	0.0000	0.4	14	3	0.6250	0.6250		0.15
1.5" flat Cable Ladder Rail *****	B	No	No	Af (CaAa)	131.00 - 0.00	0.0000	0.4	2	2	10.000 0 0.5000	1.5000		1.80

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
Pipe Mount [PM 601-1]	B	From Leg	2.00 0.00 0.00	0.0000	180.00	No Ice	3.00	0.90	0.07
						1/2" Ice	3.74	1.12	0.08
						1" Ice	4.48	1.34	0.09
						2" Ice	5.96	1.78	0.12
*****									
500-0024223 w/ Mount Pipe	A	From Leg	1.00 0.00 0.00	0.0000	175.00	No Ice	5.28	4.74	0.06
						1/2" Ice	5.69	5.42	0.11
						1" Ice	6.09	6.07	0.16
							6.93	7.42	0.30

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" Ice			
500-0024223 w/ Mount Pipe	B	From Leg	1.00 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 5.69 6.09 6.93	4.74 5.42 6.07 7.42	0.06 0.11 0.16 0.30
(2) 500-0024223 w/ Mount Pipe	C	From Leg	1.00 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 5.69 6.09 6.93	4.74 5.42 6.07 7.42	0.06 0.11 0.16 0.30
5' x 3" Mount Pipe	A	From Leg	0.50 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.36 1.67 1.98 2.64	1.36 1.67 1.98 2.64	0.04 0.05 0.06 0.10
5' x 3" Mount Pipe	B	From Leg	0.50 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.36 1.67 1.98 2.64	1.36 1.67 1.98 2.64	0.04 0.05 0.06 0.10
(2) 5' x 3" Mount Pipe	C	From Leg	0.50 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.36 1.67 1.98 2.64	1.36 1.67 1.98 2.64	0.04 0.05 0.06 0.10
*****									
(3) MX06FRO860-03 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.84 9.51 10.20 11.61	7.49 8.15 8.82 10.20	0.11 0.22 0.34 0.62
(3) MX06FRO860-03 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.84 9.51 10.20 11.61	7.49 8.15 8.82 10.20	0.11 0.22 0.34 0.62
(2) RFV01U-D1A	A	From Leg	4.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.88 2.05 2.22 2.60	1.25 1.39 1.54 1.86	0.08 0.10 0.12 0.18
(2) RFV01U-D2A	C	From Leg	4.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.88 2.05 2.22 2.60	1.01 1.14 1.28 1.59	0.07 0.09 0.11 0.15
RVZDC-6627-PF-48	C	From Leg	4.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.79 4.04 4.30 4.84	2.51 2.73 2.95 3.42	0.03 0.06 0.10 0.18
Sector Mount [SM 703-1]	A	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	12.30 17.20 22.10 31.90	10.20 14.30 18.40 26.60	0.35 0.49 0.63 0.90
Sector Mount [SM 703-1]	C	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	12.30 17.20 22.10 31.90	10.20 14.30 18.40 26.60	0.35 0.49 0.63 0.90
*****									
PTP 820G	A	From Leg	2.00 0.00	0.0000	120.00	No Ice 1/2"	0.52 0.61	0.22 0.29	0.01 0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				Ice	0.71	0.36	0.02
							1" Ice	0.93	0.53	0.04
							2" Ice			
PTP 820G	C	From Leg	2.00		0.0000	120.00	No Ice	0.52	0.22	0.01
			0.00				1/2"	0.61	0.29	0.01
			0.00				Ice	0.71	0.36	0.02
							1" Ice	0.93	0.53	0.04
							2" Ice			
5' x 3" Mount Pipe	A	None			0.0000	120.00	No Ice	1.36	1.36	0.04
							1/2"	1.67	1.67	0.05
							Ice	1.98	1.98	0.06
							1" Ice	2.64	2.64	0.10
							2" Ice			
5' x 3" Mount Pipe	C	None			0.0000	120.00	No Ice	1.36	1.36	0.04
							1/2"	1.67	1.67	0.05
							Ice	1.98	1.98	0.06
							1" Ice	2.64	2.64	0.10
							2" Ice			
*****										
DB222-A	A	From Leg	2.00		0.0000	100.00	No Ice	2.75	2.75	0.02
			0.00				1/2"	3.82	3.82	0.03
			0.00				Ice	4.90	4.90	0.06
							1" Ice	7.10	7.10	0.13
							2" Ice			
DB222-A	B	From Leg	2.00		0.0000	100.00	No Ice	2.75	2.75	0.02
			0.00				1/2"	3.82	3.82	0.03
			0.00				Ice	4.90	4.90	0.06
							1" Ice	7.10	7.10	0.13
							2" Ice			
5' x 3" Mount Pipe	A	None			0.0000	100.00	No Ice	1.36	1.36	0.04
							1/2"	1.67	1.67	0.05
							Ice	1.98	1.98	0.06
							1" Ice	2.64	2.64	0.10
							2" Ice			
5' x 3" Mount Pipe	B	None			0.0000	100.00	No Ice	1.36	1.36	0.04
							1/2"	1.67	1.67	0.05
							Ice	1.98	1.98	0.06
							1" Ice	2.64	2.64	0.10
							2" Ice			
*****										

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
HP4-7.7	A	Paraboloid w/Shroud (HP)	From Leg	2.00		29.0000		120.00	4.00	No Ice	13.64	0.09
				0.00						1/2" Ice	14.19	0.16
				0.00						1" Ice	14.74	0.23
										2" Ice	15.84	0.38
HP4-7.7	C	Paraboloid w/Shroud (HP)	From Leg	2.00		-8.0000		120.00	4.00	No Ice	13.64	0.09
				0.00						1/2" Ice	14.19	0.16
				0.00						1" Ice	14.74	0.23
										2" Ice	15.84	0.38
***												

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	4.357	39	0.2254	0.0533
T2	160 - 140	3.423	39	0.2176	0.0554
T3	140 - 120	2.567	39	0.1785	0.0361
T4	120 - 100	1.853	39	0.1519	0.0241
T5	100 - 80	1.261	39	0.1203	0.0154
T6	80 - 60	0.785	39	0.0946	0.0076
T7	60 - 40	0.433	39	0.0665	0.0043

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T8	40 - 20	0.198	39	0.0422	0.0029
T9	20 - 0	0.056	47	0.0213	0.0016

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	Pipe Mount [PM 601-1]	39	4.357	0.2254	0.0533	212544
175.00	500-0024223 w/ Mount Pipe	39	4.121	0.2257	0.0553	212544
160.00	(3) MX06FRO860-03 w/ Mount Pipe	39	3.423	0.2176	0.0554	53344
120.00	HP4-7.7	39	1.853	0.1519	0.0241	42276
100.00	DB222-A	39	1.261	0.1203	0.0154	41556

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	17.895	18	0.9140	0.2199
T2	160 - 140	14.089	19	0.8825	0.2286
T3	140 - 120	10.591	19	0.7314	0.1489
T4	120 - 100	7.658	19	0.6246	0.0993
T5	100 - 80	5.214	19	0.4961	0.0635
T6	80 - 60	3.246	19	0.3903	0.0312
T7	60 - 40	1.790	19	0.2746	0.0178
T8	40 - 20	0.818	19	0.1743	0.0120
T9	20 - 0	0.234	19	0.0880	0.0065

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	Pipe Mount [PM 601-1]	18	17.895	0.9140	0.2199	62471
175.00	500-0024223 w/ Mount Pipe	18	16.931	0.9145	0.2280	62471
160.00	(3) MX06FRO860-03 w/ Mount Pipe	19	14.089	0.8825	0.2286	15559
120.00	HP4-7.7	19	7.658	0.6246	0.0993	10421
100.00	DB222-A	19	5.214	0.4961	0.0635	10159

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Leg	A325N	0.6250	4	1.05	20.34	0.052	1.05	Bolt Tension
		Diagonal	A325N	0.5000	1	0.63	3.47	0.182	1.05	Member Block Shear
		Top Girt	A325N	0.5000	1	0.07	3.47	0.022	1.05	Member Block Shear

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T2	160	Leg	A325N	0.6250	4	4.54	20.34	0.223	1.05	Bolt Tension
		Diagonal	A325N	0.5000	1	2.25	3.47	0.648	1.05	Member Block Shear
T3	140	Leg	A325N	0.6250	4	7.51	20.34	0.369	1.05	Bolt Tension
		Diagonal	A325N	0.5000	1	2.15	3.47	0.621	1.05	Member Block Shear
T4	120	Leg	A325N	0.6250	4	10.72	20.34	0.527	1.05	Bolt Tension
		Diagonal	A325N	0.5000	1	2.95	4.13	0.713	1.05	Member Bearing
T5	100	Leg	A325N	0.8750	4	14.06	41.56	0.338	1.05	Bolt Tension
		Diagonal	A325N	0.5000	1	3.10	4.13	0.750	1.05	Member Bearing
T6	80	Leg	A325N	0.8750	4	17.28	41.56	0.416	1.05	Bolt Tension
		Diagonal	A325N	0.6250	1	3.42	8.78	0.389	1.05	Member Bearing
T7	60	Leg	A325N	0.8750	4	20.15	41.56	0.485	1.05	Bolt Tension
		Diagonal	A325N	0.6250	1	4.24	13.81	0.307	1.05	Bolt Shear
T8	40	Leg	A325N	0.8750	4	23.18	41.56	0.558	1.05	Bolt Tension
		Diagonal	A325N	0.6250	1	4.54	13.81	0.329	1.05	Bolt Shear
T9	20	Diagonal	A325N	0.6250	1	4.53	11.70	0.387	1.05	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	Pipe 2.375" x 0.154" (2 STD)	20.03	4.01	61.1 K=1.00	1.0745	-5.12	36.81	0.139 [1]
T2	160 - 140	Pipe 2.375" x 0.154" (2 STD)	20.03	4.01	61.1 K=1.00	1.0745	-21.26	36.81	0.578 [1]
T3	140 - 120	Pipe 2.875" x 0.276" (2.5 XS)	20.03	5.01	65.0 K=1.00	2.2535	-34.68	74.43	0.466 [1]
T4	120 - 100	Pipe 2.875" x 0.276" (2.5 XS)	20.03	6.68	86.7 K=1.00	2.2535	-49.05	58.51	0.838 [1]
T5	100 - 80	Pipe 3.5" x 0.300" (3 XS)	20.03	6.68	70.5 K=1.00	3.0159	-64.06	94.34	0.679 [1]
T6	80 - 60	Pipe 3.5" x 0.300" (3 XS)	20.03	6.68	70.5 K=1.00	3.0159	-79.07	94.34	0.838 [1]
T7	60 - 40	Pipe 4" x 0.318" (3.5 XS)	20.03	10.02	92.0 K=1.00	3.6784	-93.18	89.15	1.045 [1]
T8	40 - 20	Pipe 4.5" x 0.337" (4 XS)	20.03	10.02	81.4 K=1.00	4.4074	-108.46	122.17	0.888 [1]
T9	20 - 0	Pipe 4.5" x 0.337" (4 XS)	20.03	10.02	81.4 K=1.00	4.4074	-123.43	122.17	1.010 [1]

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L 1.5 x 1.5 x 1/8	5.89	2.85	116.5	0.3594	-0.68	7.42	0.091 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T2	160 - 140	L 1.5 x 1.5 x 1/8	7.51	3.66	K=1.01 148.1	0.3594	-2.04	4.69	0.435 [1]
T3	140 - 120	L 1.5 x 1.5 x 1/8	9.72	4.77	K=1.00 193.1	0.3594	-2.15	2.76	0.779 [1]
T4	120 - 100	L 2 x 2 x 1/8	12.26	6.08	K=1.00 183.7	0.4844	-2.96	4.11	0.719 [1]
T5	100 - 80	L 2 x 2 x 1/8	14.01	6.93	K=1.00 209.1	0.4844	-3.12	3.17	0.983 [1]
T6	80 - 60	KL/R > 200 (C) - 126 L 3 x 3 x 3/16	15.82	7.82	K=1.00 157.3	1.0898	-3.53	12.60	0.280 [1]
T7	60 - 40	L 3 x 3 x 3/8	19.05	9.51	K=1.00 194.4	2.1100	-4.24	15.99	0.265 [1]
T8	40 - 20	L 3 x 3 x 3/8	20.81	10.36	K=1.00 211.8	2.1100	-4.54	13.47	0.337 [1]
T9	20 - 0	KL/R > 200 (C) - 183 L 3.5 x 3.5 x 1/4	22.61	11.26	K=1.00 194.7	1.6900	-5.01	12.76	0.393 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L 1.5 x 1.5 x 1/8	2.50	2.09	102.4 K=1.21	0.3594	-0.07	8.67	0.008 [1]

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	Pipe 2.375" x 0.154" (2 STD)	20.03	4.01	61.1	1.0745	4.20	48.35	0.087 [1]
T2	160 - 140	Pipe 2.375" x 0.154" (2 STD)	20.03	4.01	61.1	1.0745	18.15	48.35	0.375 [1]
T3	140 - 120	Pipe 2.875" x 0.276" (2.5 XS)	20.03	5.01	65.0	2.2535	30.02	101.41	0.296 [1]
T4	120 - 100	Pipe 2.875" x 0.276" (2.5 XS)	20.03	6.68	86.7	2.2535	42.88	101.41	0.423 [1]
T5	100 - 80	Pipe 3.5" x 0.300" (3 XS)	20.03	6.68	70.5	3.0159	56.24	135.72	0.414 [1]
T6	80 - 60	Pipe 3.5" x 0.300" (3 XS)	20.03	6.68	70.5	3.0159	69.13	135.72	0.509 [1]
T7	60 - 40	Pipe 4" x 0.318" (3.5 XS)	20.03	10.02	92.0	3.6784	80.61	165.53	0.487 [1]
T8	40 - 20	Pipe 4.5" x 0.337" (4 XS)	20.03	10.02	81.4	4.4074	92.73	198.34	0.468 [1]
T9	20 - 0	Pipe 4.5" x 0.337" (4 XS)	20.03	10.02	81.4	4.4074	104.59	198.34	0.527 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L 1.5 x 1.5 x 1/8	5.89	2.85	76.1	0.2109	0.63	9.18	0.069 [1]
T2	160 - 140	L 1.5 x 1.5 x 1/8	6.20	3.01	80.4	0.2109	2.25	9.18	0.245 [1]
T3	140 - 120	L 1.5 x 1.5 x 1/8	8.45	4.14	109.5	0.2109	2.15	9.18	0.235 [1]
T4	120 - 100	L 2 x 2 x 1/8	11.70	5.81	113.3	0.3047	2.95	13.25	0.222 [1]
T5	100 - 80	L 2 x 2 x 1/8	14.01	6.93	134.7	0.3047	3.10	13.25	0.234 [1]
T6	80 - 60	L 3 x 3 x 3/16	15.82	7.82	101.4	0.7119	3.42	34.71	0.098 [1]
T7	60 - 40	L 3 x 3 x 3/8	19.05	9.51	126.5	1.3716	4.05	66.86	0.061 [1]
T8	40 - 20	L 3 x 3 x 3/8	20.81	10.36	137.7	1.3716	4.24	66.86	0.063 [1]
T9	20 - 0	L 3.5 x 3.5 x 1/4	21.70	10.81	120.2	1.1269	4.53	54.94	0.082 [1]

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L 1.5 x 1.5 x 1/8	2.50	2.09	59.4	0.2109	0.07	9.18	0.008 [1]

[1] $P_u / \phi P_n$ controls

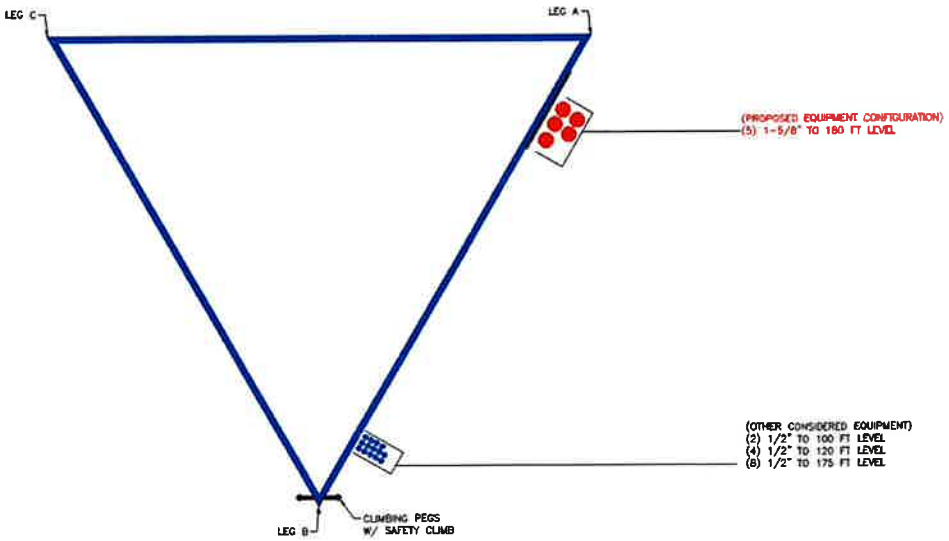
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	180 - 160	Leg	Pipe 2.375" x 0.154" (2 STD)	2	-5.12	38.65	13.3	Pass
T2	160 - 140	Leg	Pipe 2.375" x 0.154" (2 STD)	37	-21.26	38.65	55.0	Pass
T3	140 - 120	Leg	Pipe 2.875" x 0.276" (2.5 XS)	70	-34.68	78.15	44.4	Pass
T4	120 - 100	Leg	Pipe 2.875" x 0.276" (2.5 XS)	97	-49.05	61.44	79.8	Pass
T5	100 - 80	Leg	Pipe 3.5" x 0.300" (3 XS)	118	-64.06	99.06	64.7	Pass
T6	80 - 60	Leg	Pipe 3.5" x 0.300" (3 XS)	139	-79.07	99.06	79.8	Pass
T7	60 - 40	Leg	Pipe 4" x 0.318" (3.5 XS)	160	-93.18	93.61	99.5	Pass
T8	40 - 20	Leg	Pipe 4.5" x 0.337" (4 XS)	175	-108.46	128.28	84.5	Pass
T9	20 - 0	Leg	Pipe 4.5" x 0.337" (4 XS)	190	-123.43	128.28	96.2	Pass
T1	180 - 160	Diagonal	L 1.5 x 1.5 x 1/8	8	-0.68	7.79	8.7 17.3 (b)	Pass
T2	160 - 140	Diagonal	L 1.5 x 1.5 x 1/8	45	-2.04	4.92	41.4 61.8 (b)	Pass
T3	140 - 120	Diagonal	L 1.5 x 1.5 x 1/8	78	-2.15	2.90	74.2	Pass
T4	120 - 100	Diagonal	L 2 x 2 x 1/8	105	-2.96	4.32	68.5	Pass
T5	100 - 80	Diagonal	L 2 x 2 x 1/8	126	-3.12	3.33	93.6	Pass
T6	80 - 60	Diagonal	L 3 x 3 x 3/16	147	-3.53	13.23	26.7 37.1 (b)	Pass
T7	60 - 40	Diagonal	L 3 x 3 x 3/8	168	-4.24	16.79	25.2 29.2 (b)	Pass
T8	40 - 20	Diagonal	L 3 x 3 x 3/8	183	-4.54	14.14	32.1	Pass
T9	20 - 0	Diagonal	L 3.5 x 3.5 x 1/4	195	-5.01	13.40	37.4	Pass
T1	180 - 160	Top Girt	L 1.5 x 1.5 x 1/8	5	-0.07	9.10	0.8 2.1 (b)	Pass
							Summary	
						Leg (T7)	99.5	Pass
						Diagonal (T5)	93.6	Pass
						Top Girt (T1)	2.1	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						Bolt Checks	71.4	Pass
						RATING =	**99.5**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 870694 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

CCIplate

Project Information	
BU #	870694
Site Name	West Haven (Burwell Hill)
Order #	491875 Rev. 2

Tower Information	
Tower Type	Self Support
TIA-222 Rev	H

☑ Apply TIA-222-H Section 15.5

Applied Loads	Comp.	Uplift
Axial (k)	127.00	108.00
Shear (k)	14.00	12.00

Anchor Rod Data	
Quantity:	4
Diameter (in):	1
Material Grade:	A354-BC
Grout Considered:	No
l_{ar} (in):	2
Eta Factor, η:	
Thread Type:	N-Included
Configuration:	Symmetrical

Fy=109 ksi Fu=125 ksi

Anchor Rod Results	
Axial, Pu_c (kips)	31.75
Shear, Vu (kips)	3.50
Moment, Mu (kip-in)	4.55
Axial Cap., φPn_c (kips)	66.05
Shear Cap., ϕVn (kips)	19.82
Moment Cap., ϕMn (kip-in)	11.08
Stress Rating	87.9%

Pass

Pier and Pad Foundation

BU # :	870694
Site Name:	West Haven (Burw
App. Number:	491875 Rev. 2

TIA-222 Revision:	H
Tower Type:	Self Support

Top & Bot. Pad Rein. Different?:	
Block Foundation?:	

Superstructure Analysis Reactions		
Compression, P_{comp}:	127	kips
Compression Shear, Vu_comp:	14	kips
Uplift, P_{uplift}:	108	kips
Uplift Shear, V_{u_uplift}:	12	kips
Tower Height, **H**:	180	ft
Base Face Width, **BW**:	20.78	ft
BP Dist. Above Fdn, bp_{dist}:	0	in

Pier Properties		
Pier Shape:	Square	
Pier Diameter, **dpier**:	2.5	ft
Ext. Above Grade, **E**:	2.33	ft
Pier Rebar Size, **Sc**:	8	
Pier Rebar Quantity, **mc**:	6	
Pier Tie/Spiral Size, **St**:	3	
Pier Tie/Spiral Quantity, **mt**:	8	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier}:	3	in

Pad Properties		
Depth, **D**:	9	ft
Pad Width, **W**:	6	ft
Pad Thickness, **T**:	3	ft
Pad Rebar Size (Bottom), **Sp**:	6	
Pad Rebar Quantity (Bottom), **mp**:	7	
Pad Clear Cover, cc_{pad}:	3	in

Material Properties		
Rebar Grade, **Fy**:	60	ksi
Concrete Compressive Strength, **F'c**:	3	ksi
Dry Concrete Density, δ**c**:	150	pcf

Soil Properties		
Total Soil Unit Weight, γ:	120	pcf
Ultimate Gross Bearing, Qult:	30.000	ksf
Cohesion, **Cu**:	0.000	ksf
Friction Angle, φ:	35	degrees
SPT Blow Count, N_{blows}:	90	
Base Friction, μ:	0.4	
Neglected Depth, **N**:	3.30	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	none	ft

<--Toggle between Gross and Net

Foundation Analysis Checks				
	Capacity	**Demand**	**Rating***	**Check**
Uplift (kips)	135.75	108.00	**75.8%**	**Pass**
Lateral (Sliding) (kips)	55.26	12.00	**20.7%**	**Pass**
Bearing Pressure (ksf)	22.50	5.04	**21.3%**	**Pass**
*Pier Flexure (Comp.) (kip*ft)*	322.22	116.62	**34.5%**	**Pass**
*Pier Flexure (Tension) (kip*ft)*	156.78	99.96	**60.7%**	**Pass**
Pier Compression (kip)	1335.00	136.37	**9.7%**	**Pass**
*Pad Flexure (kip*ft)*	434.81	33.42	**7.3%**	**Pass**
Pad Shear - 1-way (kips)	188.55	0.00	**0.0%**	**Pass**
Pad Shear - 2-way (Comp) (ksi)	0.164	0.000	**0.0%**	**Pass**
*Flexural 2-way (Comp) (kip*ft)*	869.62	69.97	**7.7%**	**Pass**
Pad Shear - 2-way (Uplift) (ksi)	0.164	0.019	**10.9%**	**Pass**
*Flexural 2-way (Tension) (kip*ft)*	869.62	59.98	**6.6%**	**Pass**

**Rating per TIA-222-H Section 15.5*

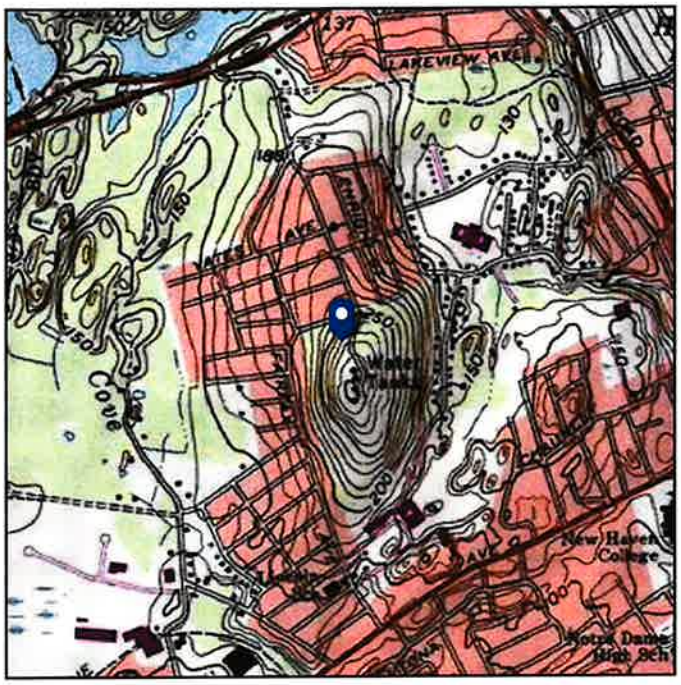
Soil Rating*:	**75.8%**
Structural Rating*:	**60.7%**

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 276.44 ft (NAVD 88)
Latitude: 41.295944
Longitude: -72.973222



Wind

Results:

Wind Speed:	125 Vmph
10-year MRI	77 Vmph
25-year MRI	87 Vmph
50-year MRI	94 Vmph
100-year MRI	101 Vmph
Data Source:	ASCE/SEI 7-10, Fig. 26.5-1A and Figs. CC-1–CC-4, incorporating errata of March 12, 2014
Date Accessed:	Wed Jan 16 2019

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.

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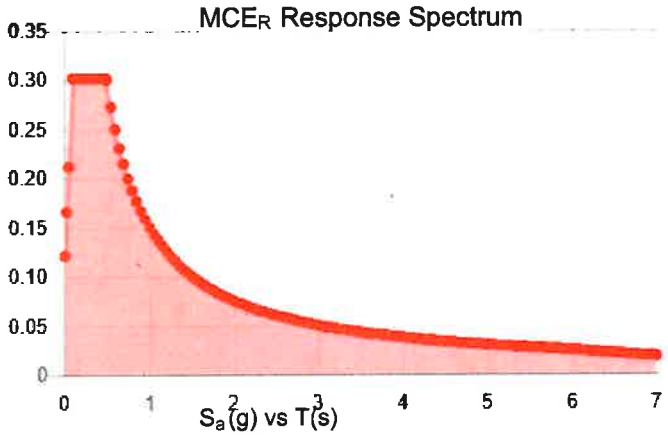
Seismic

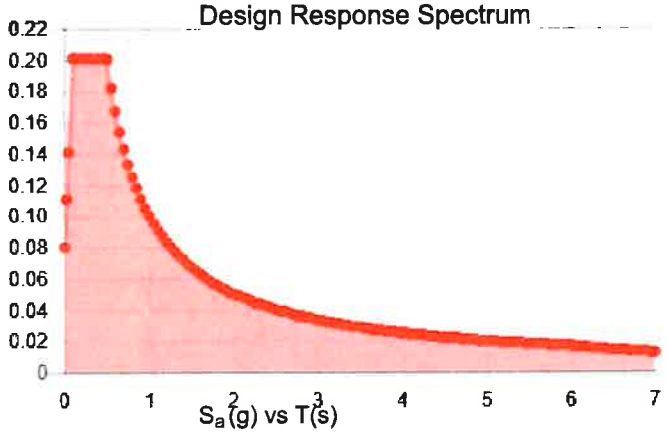
Site Soil Class: D - Stiff Soil

Results:

S_S :	0.189	S_{DS} :	0.201
S_1 :	0.063	S_{D1} :	0.1
F_a :	1.6	T_L :	6
F_v :	2.4	PGA :	0.099
S_{MS} :	0.302	PGA_M :	0.158
S_{M1} :	0.15	F_{PGA} :	1.6
		I_e :	1

Seismic Design Category B





Data Accessed: Wed Jan 16 2019

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

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Ice

Results:

Ice Thickness:	0.75 in.
Concurrent Temperature:	15 F
Gust Speed:	50 mph
Data Source:	Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8
Date Accessed:	Wed Jan 16 2019

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

ATTACHMENT 5

Site Name: West Haven 3 Relo CT
Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissible Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW 700	746	4	803	3212.6	160	0.0451	0.497333333	9.07%
VZW AWS	2145	4	1566	6264.08	160	0.0880	1.0	8.80%
VZW Cellular CDMA	869	2	377	753.5	160	0.0106	0.579333333	1.83%
VZW Cellular LTE	880	4	462	1848.64	160	0.0260	0.586666667	4.43%
VZW PCS	1970	4	1530	6121.52	160	0.0860	1.0	8.60%

Total Percentage of Maximum Permissible Exposure 32.73%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Section 1.13101 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case maximum values used, including the following assumptions:
1. closest accessible point is distance from antenna to base of pole;
2. continuous transmission from all available channels at full power for indefinite time period; and,
3. all RF energy is assumed to be directed solely to the base of the pole.