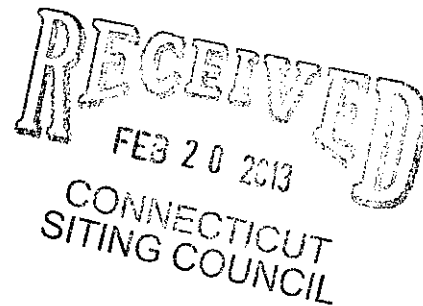


280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

February 20, 2013

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051



Re: **Notice of Exempt Modification – Antenna Swap**
68 Groton Long Point Road, Groton, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the top of the existing 140-foot tower at the above-referenced address. The tower and underlying property are owned by the Town of Groton. The Council approved Cellco's shared use of this tower in 1993. Cellco now intends to replace six (6) of its antennas with three (3) model BXA-80080-4CF cellular antennas and three (3) model BXA-171063-8CF AWS antennas, at the same level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its antennas and one (1) HYBRIFLEX™ fiber cable. Attached behind Tab 1 are the specifications for the replacement antennas, RRHs and HYBRIFLEX™ cable.



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Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Mark R. Oefinger, Town Manager for the Town of Groton.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located at the top of the 140-foot tower.

ROBINSON & COLE_{LLP}

Linda Roberts
February 20, 2013
Page 2

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for Cellco's modified facility is included behind Tab 2.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See Detailed Structural Analysis attached behind Tab 3*).

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

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

Mark R. Oefinger, Town Manager
Sandy M. Carter



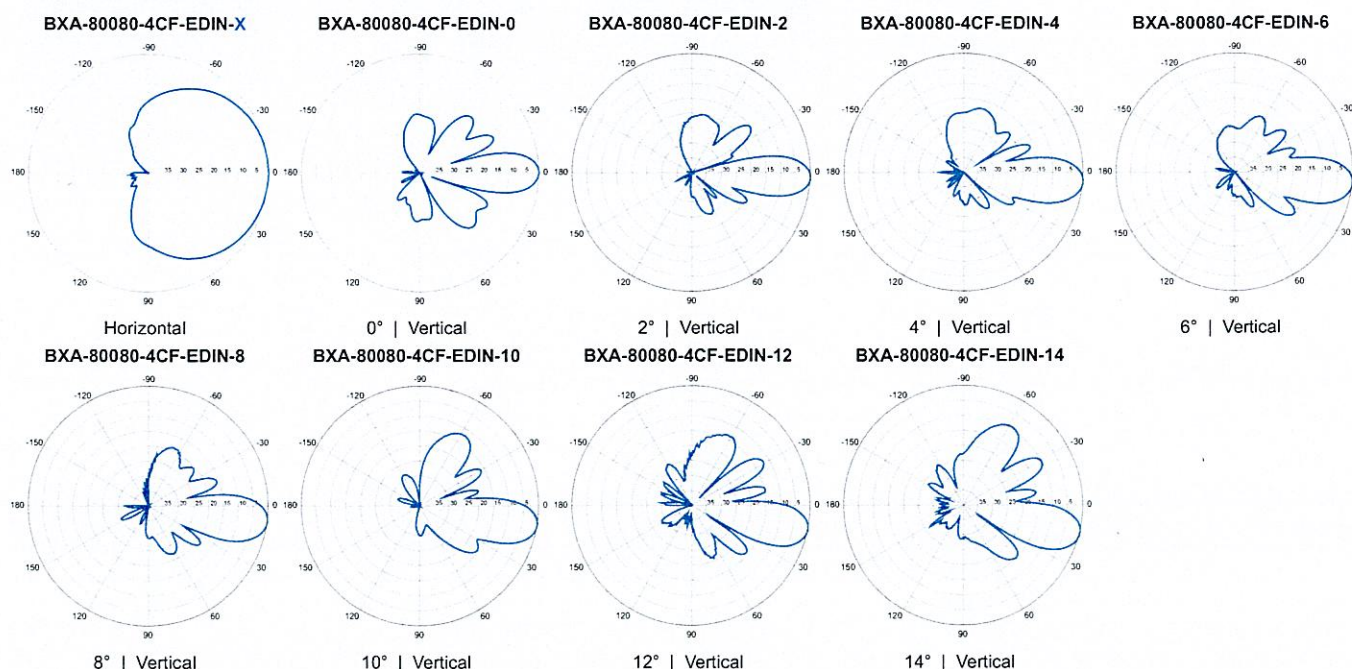
BXA-80080-4CF-EDIN-X

X-Pol | FET Panel | 80° | 12.0 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	
Frequency bands	806-900 MHz*
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)
Polarization	±45°
Horizontal beamwidth	80°
Vertical beamwidth	15°
Gain	12.0 dBd (14.1 dBi)
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14
Impedance	50Ω
VSWR	≤1.4:1
Upper sidelobe suppression (0°)	-13.1 dB
Front-to-back ratio (+/-30°)	-36.7 dB
Null fill	5% (-26.02 dB)
Isolation between ports	< -30 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	1206 x 204 x 151 mm 47.5 x 8.0 x 5.9 in
Depth with z-brackets	196 mm 7.7 in
Weight without mounting brackets	5.4 kg 12 lbs
Survival wind speed	> 201 km/hr > 125 mph
Wind area	Front: 0.25 m ² Side: 0.18 m ² Front: 2.6 ft ² Side: 1.9 ft ²
Wind load @ 161 km/hr (100 mph)	Front: 351 N Side: 280 N Front: 79 lbf Side: 61 lbf
Mounting Options	
2-Point Mounting Bracket Kit	Part Number 36210002 Fits Pipe Diameter 50-160 mm 2.0-6.3 in Weight 4.5 kg 10 lbs
2-Point Downtilt Bracket Kit (0-20°)	Part Number 36114003 Fits Pipe Diameter 50-160 mm 2.0-6.3 in Weight 4.9 kg 11 lbs
Downtilt Mounting Applications	A mounting bracket and downtilt bracket kit must be ordered for downtilt applications
Concealment Configurations	For concealment configurations, order BXA-80080-4CF-EDIN-X-FP



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-171063-8CF-EDIN-X

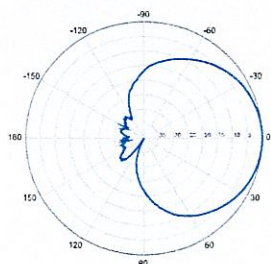
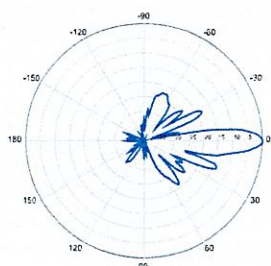
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 17.4 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	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 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	1232 x 154 x 105 mm	48.5 x 6.1 x 4.1 in	
Depth with t-brackets	133 mm	5.2 in	
Weight without mounting brackets	4.8 kg	10.5 lbs	
Survival wind speed	296 km/hr	184 mph	
Wind area	Front: 0.19 m ² Side: 0.14 m ²	Front: 2.0 ft ² Side: 1.5 ft ²	
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 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-171063-8CF-EDIN-X-FP		

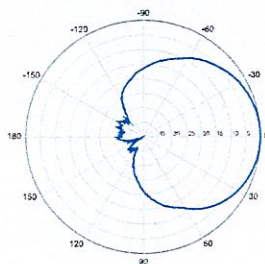
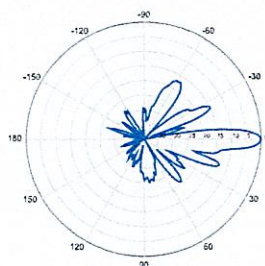


BXA-171063-8CF-EDIN-X

Horizontal | 1710-1880 MHz
BXA-171063-8CF-EDIN-0

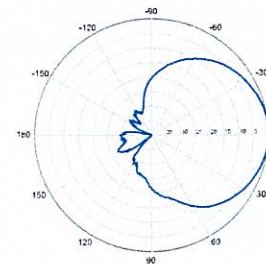
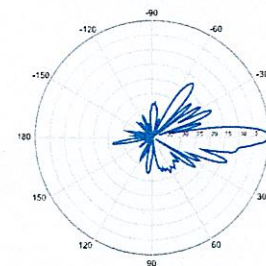
0° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-X

Horizontal | 1850-1990 MHz
BXA-171063-8CF-EDIN-0

0° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-X

Horizontal | 1920-2170 MHz
BXA-171063-8CF-EDIN-0

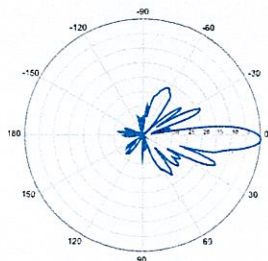
0° | Vertical | 1920-2170 MHz

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BXA-171063-8CF-EDIN-X

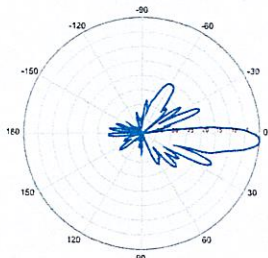
X-Pol | FET Panel | 63° | 17.4 dBi

BXA-171063-8CF-EDIN-2



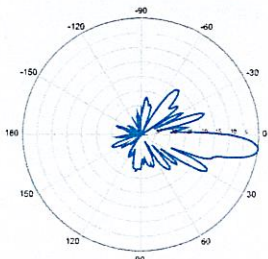
2° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-4



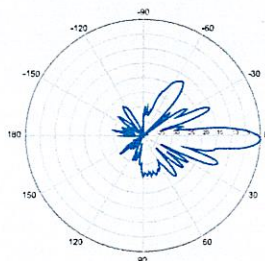
4° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-8



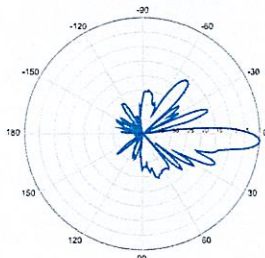
8° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-2



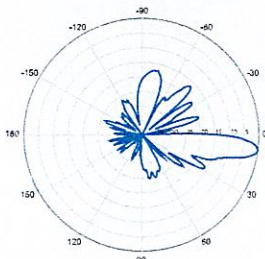
2° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-4



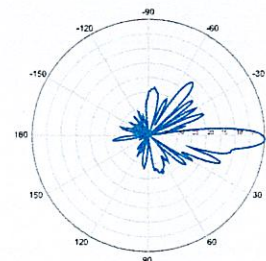
4° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-8



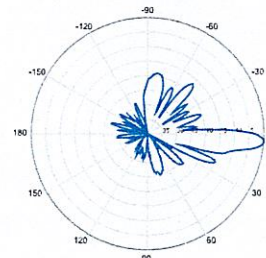
8° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-2



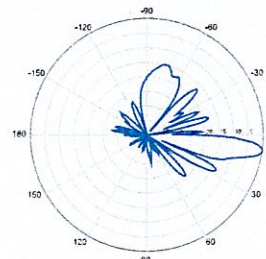
2° | Vertical | 1920-2170 MHz

BXA-171063-8CF-EDIN-4



4° | Vertical | 1920-2170 MHz

BXA-171063-8CF-EDIN-8



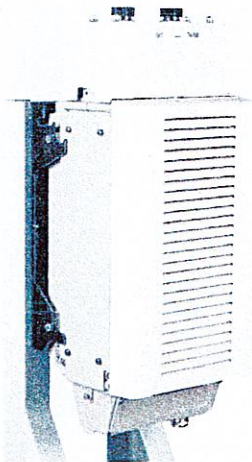
8° | Vertical | 1920-2170 MHz

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.

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

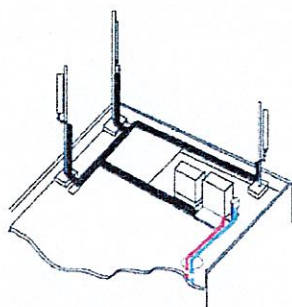
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent 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

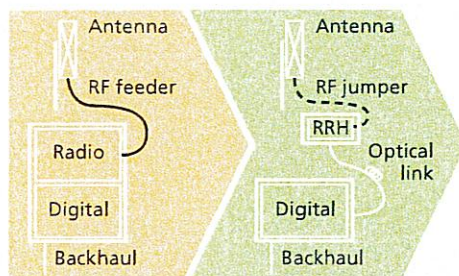
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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.



Macro

Features

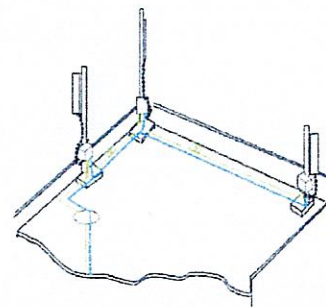
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption



RRH for space-constrained cell sites

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



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170mm (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

www.alcatel-lucent.com Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein. Copyright © 2010 Alcatel-Lucent. All rights reserved. CPG2809100912 (09)

Product Data Sheet HB158-1-08U8-S8J18**RFS****HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber****Product Description**

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

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

Features/Benefits

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

Technical Specifications**Structure**

Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes

Mechanical Properties

Weight, Approximate	[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending	[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending	[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing	[m (ft)]	1.0 / 1.2 (3.25 / 4.0)

Electrical Properties

DC-Resistance Outer Conductor Armor	[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)	[Ω/km (Ω/1000ft)]	2.1 (0.307)

Fiber Optic Properties

Version	Single-mode OM3	
Quantity, Fiber Count	16 (8 pairs)	
Core/Clad	[μm]	50/125
Primary Coating (Acrylate)	[μm]	245
Buffer Diameter, Nominal	[μm]	900
Secondary Protection, Jacket, Nominal	[mm (in.)]	2.0 (0.08)
Minimum Bending Radius	[mm (in.)]	104 (4.1)
Insertion Loss @ wavelength 850nm	dB/km	3.0
Insertion Loss @ wavelength 1310nm	dB/km	1.0
Standards (Meets or exceeds)	UL94-V0, UL1666 RoHS Compliant	

DC Power Cable Properties

Size (Power)	[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)		16 (8 pairs)
Size (Alarm)	[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)		4 (2 pairs)
Type		UV protected
Strands		19
Primary Jacket Diameter, Nominal	[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)		NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant

Environment

Installation Temperature	[°C (°F)]	-40 to +65 (-40 to 149)
Operation Temperature	[°C (°F)]	-40 to +65 (-40 to 149)

* This data is provisional and subject to change.

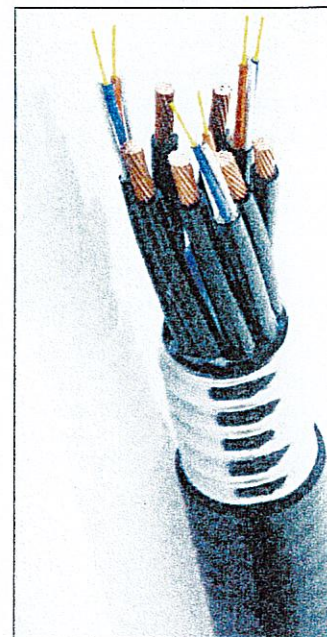


Figure 1: HYBRIFLEX Series

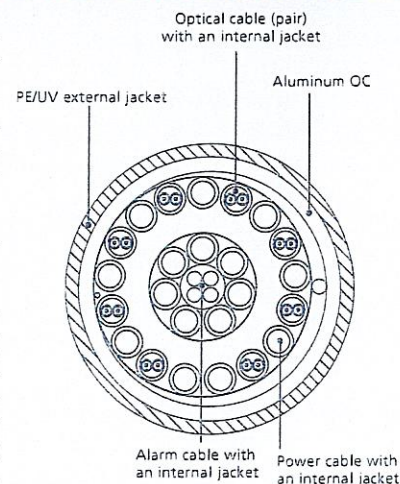


Figure 2: Construction Detail

RFS The Clear Choice®

HB158-1-08U8-S8J18

Rev: P1

Print Date: 27.6.2012

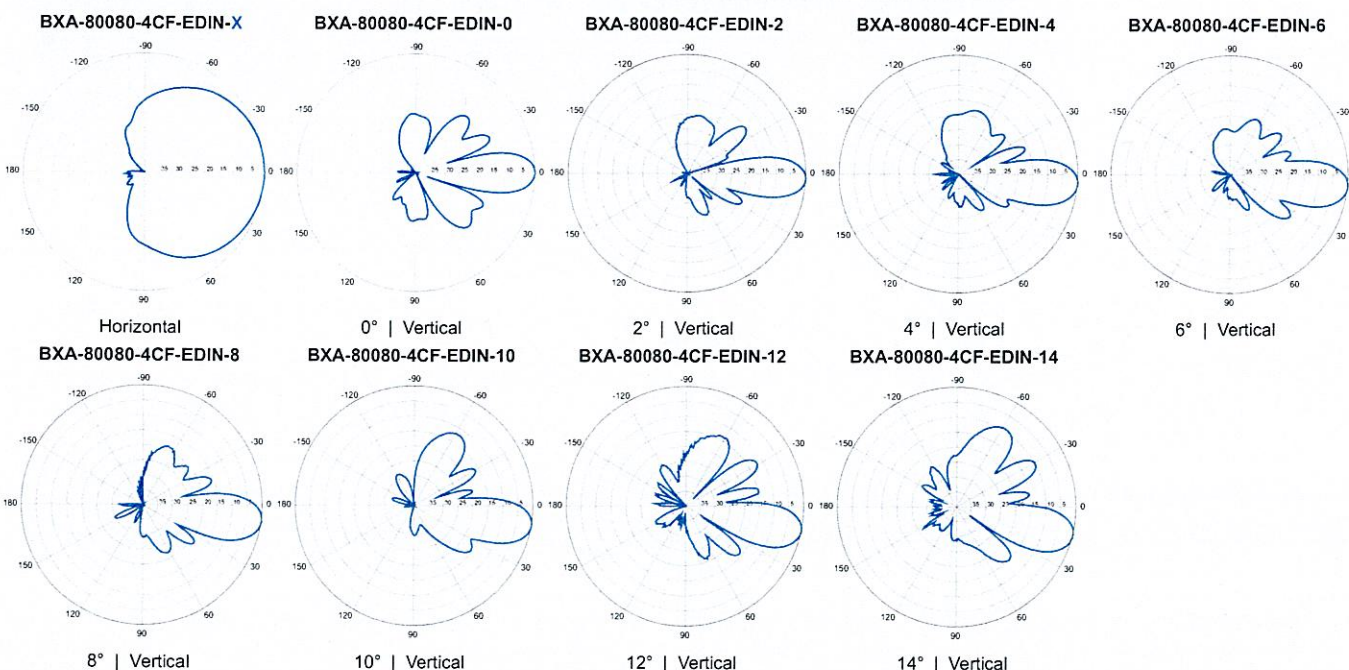
BXA-80080-4CF-EDIN-X

X-Pol | FET Panel | 80° | 12.0 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		
Frequency bands	806-900 MHz*	
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)	
Polarization	±45°	
Horizontal beamwidth	80°	
Vertical beamwidth	15°	
Gain	12.0 dBd (14.1 dBi)	
Electrical downtilt (X)	0, 2, 4, 6, 8, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.4:1	
Upper sidelobe suppression (0°)	-13.1 dB	
Front-to-back ratio (+/-30°)	-36.7 dB	
Null fill	5% (-26.02 dB)	
Isolation between ports	< -30 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	1206 x 204 x 151 mm 47.5 x 8.0 x 5.9 in	
Depth with z-brackets	196 mm 7.7 in	
Weight without mounting brackets	5.4 kg 12 lbs	
Survival wind speed	> 201 km/hr > 125 mph	
Wind area	Front: 0.25 m² Side: 0.18 m² Front: 2.6 ft² Side: 1.9 ft²	
Wind load @ 161 km/hr (100 mph)	Front: 351 N Side: 280 N Front: 79 lbf Side: 61 lbf	
Mounting Options		
Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	36210002 50-160 mm 2.0-6.3 in	4.5 kg 10 lbs
2-Point Downtilt Bracket Kit (0-20°)	36114003 50-160 mm 2.0-6.3 in	4.9 kg 11 lbs
Downtilt Mounting Applications	A mounting bracket and downtilt bracket kit must be ordered for downtilt applications	
Concealment Configurations	For concealment configurations, order BXA-80080-4CF-EDIN-X-FP	



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BXA-171063-8CF-EDIN-X

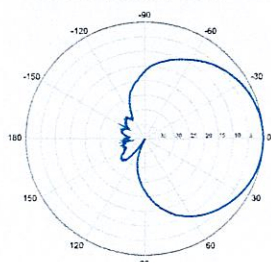
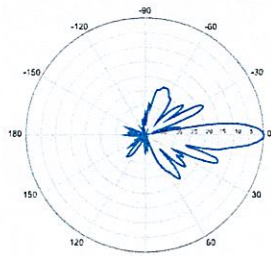
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 17.4 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	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 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	1232 x 154 x 105 mm		48.5 x 6.1 x 4.1 in
Depth with t-brackets	133 mm		5.2 in
Weight without mounting brackets	4.8 kg		10.5 lbs
Survival wind speed	296 km/hr		184 mph
Wind area	Front: 0.19 m ² Side: 0.14 m ²	Front: 2.0 ft ² Side: 1.5 ft ²	
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 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-171063-8CF-EDIN-X-FP		

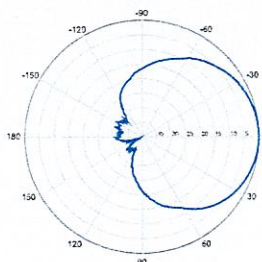
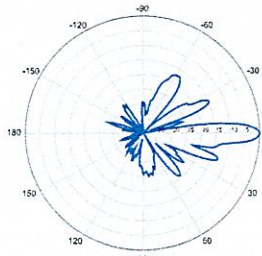


BXA-171063-8CF-EDIN-X

Horizontal | 1710-1880 MHz
BXA-171063-8CF-EDIN-0

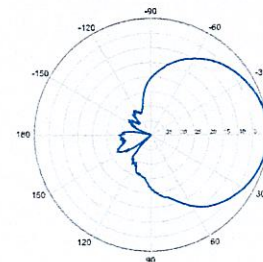
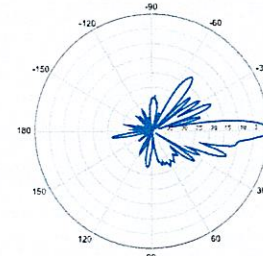
0° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-X

Horizontal | 1850-1990 MHz
BXA-171063-8CF-EDIN-0

0° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-X

Horizontal | 1920-2170 MHz
BXA-171063-8CF-EDIN-0

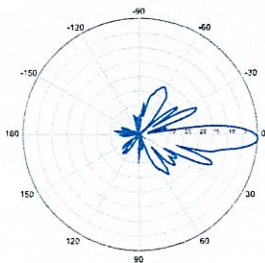
0° | Vertical | 1920-2170 MHz

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.

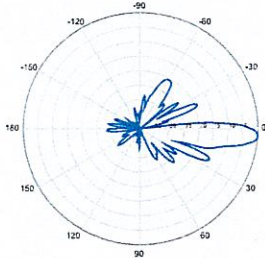
BXA-171063-8CF-EDIN-X

X-Pol | FET Panel | 63° | 17.4 dBi

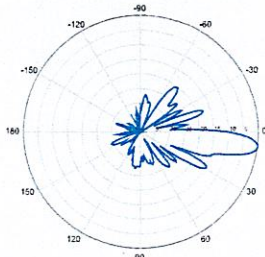
BXA-171063-8CF-EDIN-2



2° | Vertical | 1710-1880 MHz
BXA-171063-8CF-EDIN-4

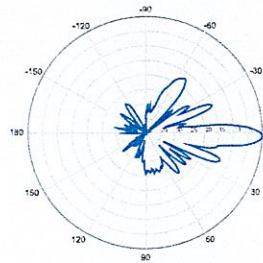


4° | Vertical | 1710-1880 MHz
BXA-171063-8CF-EDIN-8

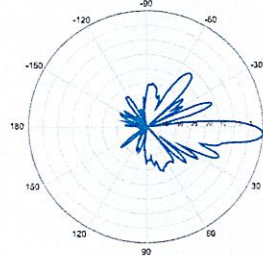


8° | Vertical | 1710-1880 MHz

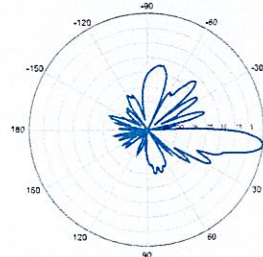
BXA-171063-8CF-EDIN-2



2° | Vertical | 1850-1990 MHz
BXA-171063-8CF-EDIN-4

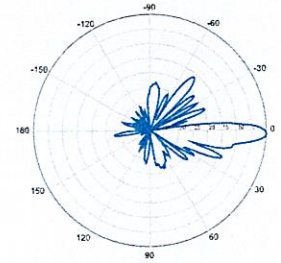


4° | Vertical | 1850-1990 MHz
BXA-171063-8CF-EDIN-8

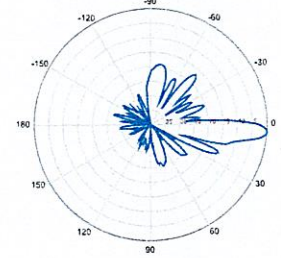


8° | Vertical | 1850-1990 MHz

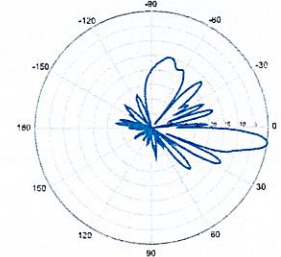
BXA-171063-8CF-EDIN-2



2° | Vertical | 1920-2170 MHz
BXA-171063-8CF-EDIN-4



4° | Vertical | 1920-2170 MHz
BXA-171063-8CF-EDIN-8



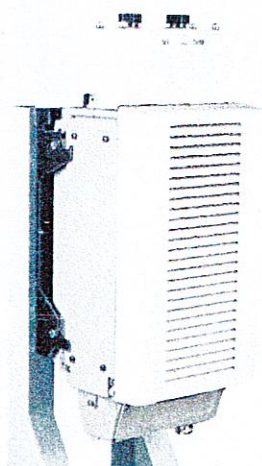
8° | Vertical | 1920-2170 MHz

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.

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

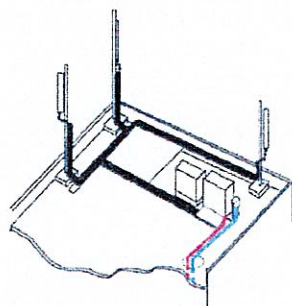
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent 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

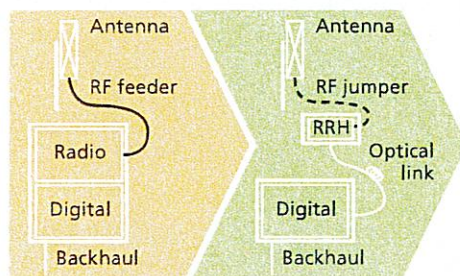
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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.



Macro

Features

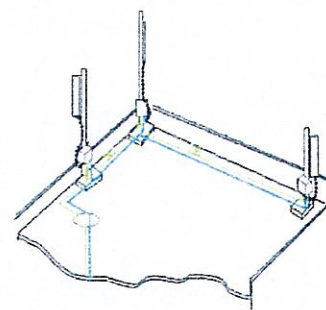
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption



RRH for space-constrained cell sites

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



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170 mm (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

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Product Data Sheet HB158-1-08U8-S8J18



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

Product Description

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

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

Features/Benefits

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

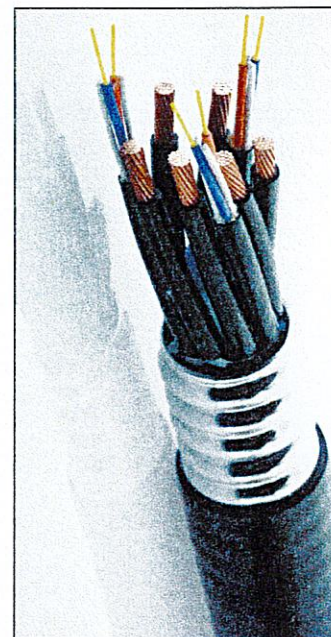


Figure 1: HYBRIFLEX Series

Technical Specifications

Structure

Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes

Mechanical Properties

Weight, Approximate	[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending	[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending	[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing	[m (ft)]	1.0 / 1.2 (3.25 / 4.0)

Electrical Properties

DC-Resistance Outer Conductor Armor	[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm ² (8AWG)	[Ω/km (Ω/1000ft)]	2.1 (0.307)

Fiber Optic Properties

Version		Single-mode OM3
Quantity, Fiber Count		16 (8 pairs)
Core/Clad	[μm]	50/125
Primary Coating (Acrylate)	[μm]	245
Buffer Diameter, Nominal	[μm]	900
Secondary Protection, Jacket, Nominal	[mm (in)]	2.0 (0.08)
Minimum Bending Radius	[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm	dB/km	3.0
Insertion Loss @ wavelength 1310nm	dB/km	1.0
Standards (Meets or exceeds)		UL94-V0, UL1666 RoHS Compliant

DC Power Cable Properties

Size (Power)	[mm ² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)		16 (8 pairs)
Size (Alarm)	[mm ² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)		4 (2 pairs)
Type		UV protected
Strands		19
Primary Jacket Diameter, Nominal	[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)		NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant

Environment

Installation Temperature	[°C (°F)]	-40 to +65 (-40 to 149)
Operation Temperature	[°C (°F)]	-40 to +65 (-40 to 149)

* This data is provisional and subject to change.

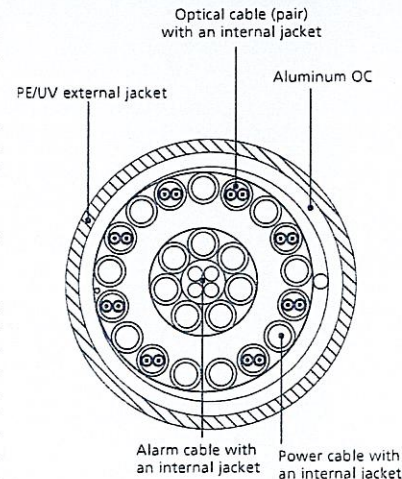


Figure 2: Construction Detail

RFS The Clear Choice®

HB158-1-08U8-S8J18

Rev: P1

Print Date: 27.6.2012

Site Name: Groton	General	Power	Density			
Tower Height: Verizon @ 143ft						
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.
*AT&T UMTS	1	500	133	0.0102	880	0.5867
*AT&T GSM	6	296	133	0.0361	880	0.5867
*AT&T GSM	3	427	133	0.0260	1900	1.0000
*AT&T LTE	1	500	133	0.0102	740	0.4933
*Municipal				0.0146		0.2000
*Municipal				0.0022	460	0.3067
Verizon PCS	11	252	143	0.0487	1970	1.0000
Verizon Cellular	9	258	143	0.0408	869	0.5793
Verizon AWS	1	1750	143	0.0308	2145	1.0000
Verizon 700	1	1050	143	0.0185	698	0.4653
						39.53%
* Source: Siting Council						

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF AN EXISTING 140' SELF SUPPORTING LATTICE TOWER AND ITS FOUNDATION FOR NEW ANTENNA ARRANGEMENT

Site I.D: Groton CT
Address: 68 Groton Long Point Road
Groton, CT

prepared for



Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

prepared by



URS CORPORATION
500 ENTERPRISE DRIVE, SUITE 3B
ROCKY HILL, CT 06067
TEL. 860-529-8882

36917393.00000
VZ5-145

December 6, 2012

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- 2. INTRODUCTION**
- 3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS**
- 4. FINDINGS AND EVALUATION**
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- 6. DRAWINGS AND DATA**
 - **TNX TOWER INPUT / OUTPUT SUMMARY**
 - **TNX TOWER FEEDLINE DISTRIBUTION CHART**
 - **TNX TOWER FEEDLINE PLAN**
 - **TNX TOWER DETAILED OUTPUT**
 - **ANCHOR BOLT ANALYSIS**
 - **FOUNDATION ANALYSIS**

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 140' self-supporting lattice tower structure located at 68 Groton Long Point Road in Groton, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code and the TIA/EIA-222-F standard for a wind velocity of 100 mph (fastest mile) and 87 mph (fastest mile) concurrent with 0.5" ice. The antenna loading considered in this analysis consists of all existing and proposed antennas, transmission lines, and ancillary items as outlined in the Introduction Section of this report. The proposed Verizon Wireless modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
<u>On the existing Verizon antenna platform:</u> <u>Remove:</u> (6) LPA-80080-4CF panel antennas <u>Install:</u> (3) BXA-171063-8CF panel antennas (3) BXA-80080/4CF panel antennas (3) ALU RRU (1) Distribution Box (1) HB158-1-08-U8-S8J18 Fiber Cable	Verizon (existing) Verizon (Proposed)	@ 143' @ 143'

The results of the analysis indicate that the tower superstructure steel stresses are within the allowable limits. Additionally, the tower foundation meets the minimum safety factor of two required to resist overturning as stipulated by Chapter 31, Section 3108.4.2 of the 2003 International Building Code (IBC). Therefore, the overall tower structure is deemed structurally adequate with the wind load classification specified above and the proposed antenna loading.

1. EXECUTIVE SUMMARY - *continued*

This analysis is based on:

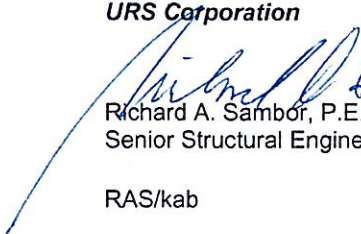
- 1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
- 2) Tower geometry and structural member sizes obtained from manufacturer's erection drawing prepared by ROHN Industries, dated April 01, 1997.
- 3) Foundation geometry obtained from manufacturer's foundation design drawings prepared by Paul J. Ford (File no. 35131AE, PJF No. 20598-09) on behalf of ROHN Industries, dated June 02, 1998.
- 4) Previous structural analysis report prepared by All-Points Technology Corporation, P.C., on behalf of Verizon Wireless, dated November 22, 2004.
- 5) Previous structural letter prepared by All-Points Technology Corporation, P.C., on behalf of AT&T, dated June 29, 2007.
- 6) Previous structural analysis report prepared by URS Corporation, on behalf of Verizon Wireless, job number VZ4-051, signed and sealed February 19, 2008 which included a code modification regarding the required factor of safety against overturning moment for the towers foundation.
- 7) Previous structural analysis report prepared by All-Points Technology Corporation, P.C., on behalf of AT&T, job number CT1981220, signed and sealed February 10, 2011.
- 8) Previous structural analysis report prepared by URS Corporation, on behalf of Verizon Wireless, job number VZ5-081, signed and sealed March 11, 2011.
- 9) Antenna and mount configuration as specified within Section 2 and 6 of this report.
- 10) Coax cable orientation as specified in section 6 of this report.

This report is only valid as per the assumptions and data utilized in this report for antenna inventory, mounts and associated cables. The user of this report shall field verify the assumption of the antenna and mount configuration as well as the physical condition of the tower. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

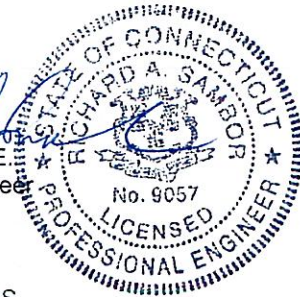
Sincerely,

URS Corporation


Richard A. Sambor, P.E.
Senior Structural Engineer

RAS/kab

cc: MJE, ICA – URS
CF/Book



2. INTRODUCTION

The subject tower is located at 68 Groton Long Point Road in Groton, Connecticut. The structure is an existing 140' self supporting steel tapered lattice tower, designed and manufactured by ROHN Industries. The inventory is summarized in the table below:

<i>Antenna Type</i>	<i>Carrier</i>	<i>Mount</i>	<i>Antenna Centerline Elevation</i>	<i>Cable</i>
(1) Beacon and (1) Lightning Rod	(existing)	Top of Tower	145'	(1) 1/2"
(3) LNX-6512DS-T4M (3) BXA-185090-8CF (6) Diplexers	Verizon (existing)	Rotatable Platform	143'	(12) 1 5/8"
(3) BXA-171063-8CF (3) BXA-80080/4CF (3) ALU RRU (1) Distribution Box	Verizon (proposed)	Shared with Above	143'	(1) HB158-1-08-U8-S8J18 Fiber Cable (See drawing E-7 in Section 6 for location)
(3) Powerwave 7770, (6) AM-X-CD-14-65, (6) TMA's (6) RRU & (1) Surge Suppressor	AT&T (existing)	(3) 12' Boom Gates	129/130'	(12) 1 1/4"
(1) DB212 Dipole	(existing)	Leg	121'	(1) 7/8"
(1) DB212 Dipole	(existing)	Leg	119'	(same coax as 121')
(1) DB540K-E Omni Whip	(existing)	(1) 6' Side Arm	112'	(1) 1 1/4"
(1) PD220 Omni Whip	(existing)	(1) 6' Side Arm	111'	(1) 1 1/4"
(1) DB810T3 Omni Whip (up)	(existing)	(1) 6' Side Arm	108'	(1) 1 5/8"
(1) DB212 Dipole	(existing)	Leg	104'	(1) 7/8"
(1) PD1121 Dipole	(existing)	(1) 6' Side Arm	101'	(1) 1 1/4"
(1) PD1121 Dipole	(existing)	(1) 6' Side Arm	97'	(same coax as 101')
(1) DB212 Dipole	(existing)	Leg	96'	(same coax as 104')
(1) DB810T3 Omni Whip (down)	(existing)	(1) 6' Side Arm	94'	(1) 1 5/8"
(1) PD340 4-bay Dipole	(existing)	(1) 6' Side Arm	90'	(1) 1 1/4"
(1) DB212 Dipole	(existing)	Leg	90'	(1) 7/8"
(1) DB212 Dipole	(existing)	Leg	68'	(same coax as 90')
(2) Obstruction Lights	(existing)	Leg	67'	(1) 1/2"
(1) CCTV camera	(existing)	Leg	66'	(2) 3/4" Rigid Conduits
(3) PD220 Omni Whips	(existing)	(3) 6' Side Arms	65'	(3) 7/8"
(1) 2"x 20' Omni Whip	(existing)	(1) 6' Side Arm	43'	(1) 7/8"
(1) 2' Dish, (1) Filter and (1) Panel	(existing)	(1) 4' Side Arm	43'/41.5'	(4) 1/4" est.
(1) 2' Dish and (1) Filter	(existing)	(1) 4' Side Arm	35'/37'	(same coax as above)

Note: Omni-whip antenna centerline elevations based on antenna size and respective mount height.

This structural analysis of the communications tower was performed by URS Corporation (URS) for Verizon Wireless. The purpose of this analysis was to investigate the structural integrity of the existing tower with its existing and proposed antenna loads. This analysis was conducted to evaluate stress on the tower and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

The structural analysis was done in accordance with the 2005 Connecticut State Building Code, TIA/EIA-222-F - Structural Standard for Steel Antenna Towers and Antenna Supporting Structures, and the American Institute of Steel Construction (AISC) Manual of Steel Construction - Allowable Stress Design (ASD).

The analysis was conducted using TNX Tower 6.0. Two load conditions were evaluated as shown below which were compared to allowable stresses according to AISC and TIA/EIA.

Load Condition 1 = 100 mph (fastest mile) Wind Load + Tower Dead Load

Load Condition 2 = 87 mph (fastest mile) Wind Load (with ice) + Ice Load + Tower Dead Load

The TIA/EIA standard permits a one-third increase in allowable stresses for towers and monopoles less than 700 feet tall. For the purposes of this analysis, in computing the load capacity the allowable stresses of the tower members were increased by one-third.

4. FINDINGS AND EVALUATION

Stresses on the tower structure were evaluated to compare with allowable stresses in accordance with AISC. The results of the analysis indicate that the calculated stresses under the proposed loading were within the allowable stresses for the tower superstructure (see table below). Additionally, the tower foundation meets the minimum safety factor of two required to resist overturning as stipulated by Chapter 31, Section 3108.4.2 of the 2003 International Building Code (IBC). Detailed analysis and calculations for the proposed load condition are provided in section 6 of this report. The tower anchor bolts were found to be structurally adequate.

Tower Base reactions:

For detailed proposed tower reactions, see drawing no. E-1 in section 6 of this report.

Tower Base Reactions:

Base Reactions	Original Tower Reactions	Proposed Tower Reactions
Axial Load (kips)	43	40
Shear per Leg (kips)	-	24
Total Shear (kips)	44.5	38
Uplift per Leg (kips)	247.6	202
Comp.per Leg (kips)	280.7	231
O.T. Moment (ft-kips)	3813.1	3179

Tower Component Stress vs. Capacity Summary:

Component / (Section No.)	Controlling Component/ Elevation	Stress (% capacity)	Pass/Fail	Comments:
Tower Leg (T2)	Compression/100'-120'	74.0%	Pass	
Diagonal (T6)	Bolt Shear/20'-40'	93.8%	Pass	
Top Girt (T1)	Compression/120'-140'	8.4%	Pass	
Anchor Bolts	Tension	48%	Pass	

Foundation Summary:

Foundation	Component	Stress (% capacity/FOS)	Pass/Fail	Comments:
Reinf. Concrete Pad	OTM	100.0%/2.00	Pass	Min. F.O.S of 2.0 req'd per IBC 2003 Section 3108.4.2

Note: Factor of safety is greater than 2.0. Foundation is at capacity.

5. CONCLUSIONS AND RECOMMENDATIONS

The results of the analysis indicate that the tower superstructure steel stresses are within the allowable limits. Additionally, the tower foundation meets the minimum safety factor of two required to resist overturning as stipulated by Chapter 31, Section 3108.4.2 of the 2003 International Building Code (IBC). Therefore, the overall tower structure is deemed structurally adequate with the wind load classification specified above and the proposed antenna loading.

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report.
2. Tower is properly installed and maintained.
3. All members are as specified in the original design documents and are in good condition.
4. All required members are in place.
5. All bolts are in place and are properly tightened.
6. Tower is in plumb condition.
7. All member protective coatings are in good condition.
8. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9. Foundations were properly constructed to support original design loads as specified in the original design documents.

URS is not responsible for any modifications completed prior to or hereafter in which URS is not or was not directly involved. Modifications include but are not limited to:

- A. Adding antennas
- B. Removing/replacing antennas
- C. Adding coaxial cables

URS hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact URS. URS disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire tower structural system be performed at least yearly and more frequently as conditions warrant. According to TIA/EIA-222-F section 14.1, Note 1: It is recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading condition.

6. DRAWINGS AND DATA

TNX TOWER INPUT / OUTPUT SUMMARY

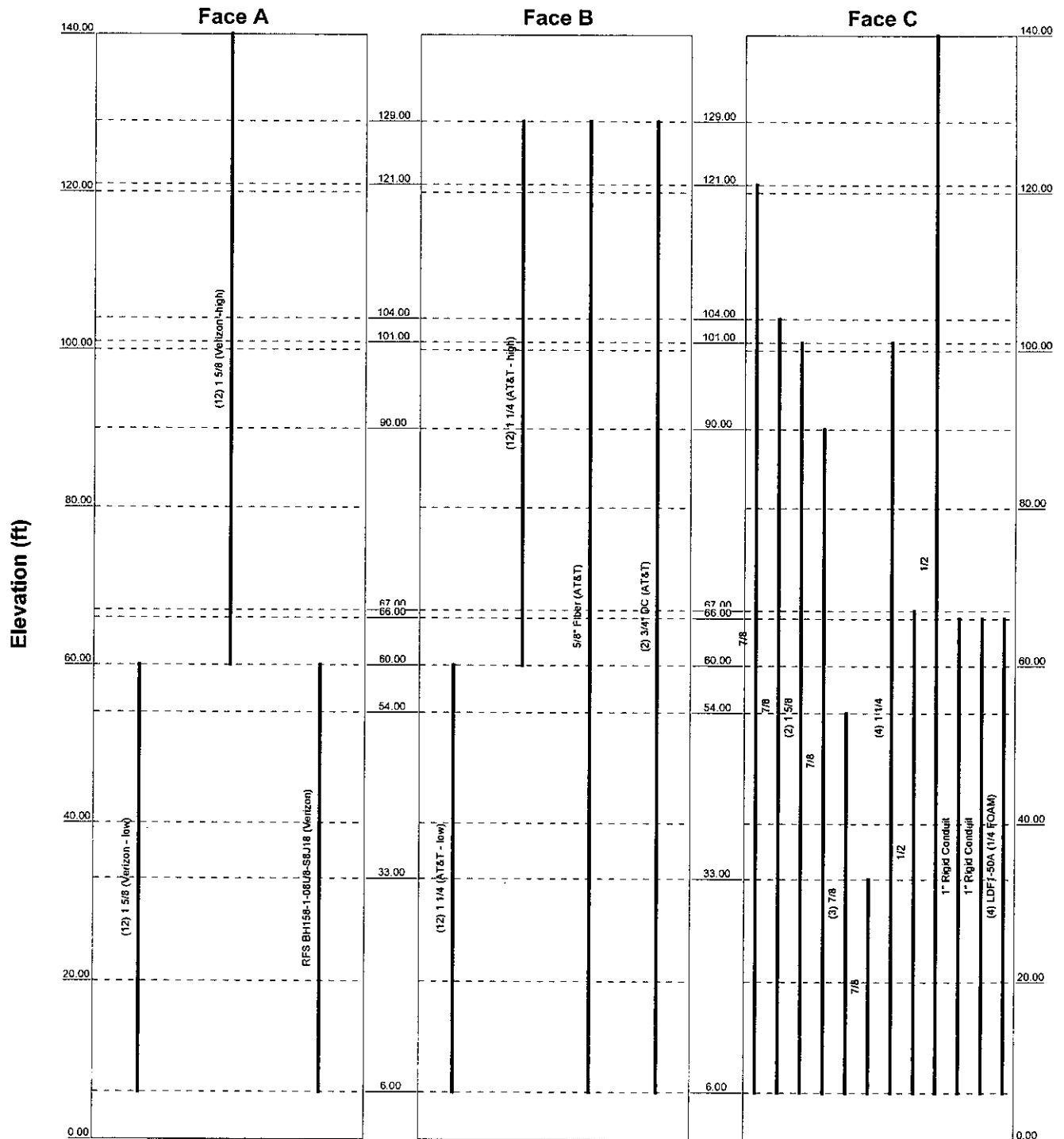
Section	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	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TNX TOWER FEEDLINE DISTRIBUTION CHART

Feedline Distribution Chart

0' - 140'

Round Flat App In Face App Out Face Truss Leg



URS Corporation		Job: 140' ROHN SSV Tower	
500 Enterprise Drive, Suite 3B		Project: 68 Groton Long Point Road, Groton, CT	
Rocky Hill, CT 06067		Client: Verizon Wireless - Groton	Drawn by: Kevin Barker
Phone: (860) 529-8882		Code: TIA/EIA-222-F	Date: 12/06/12
FAX: (860) 529-3991		Path: P:\03\ERI Files\140 Rohn SSV Lattice on	Scale: NTS
			Dwg No. E-7

TNX TOWER FEEDLINE PLAN

URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job: 140' ROHN SSV Tower
	Project: 68 Groton Long Point Road, Groton, CT
	Client: Verizon Wireless - Groton Drawn by: Kevin Barker App'd:
	Code: TIA/EIA-222-F Date: 12/06/12 Scale: NTS
	Path: P:\08\ERI Files\140 Rohn SSV Lattice.en Dwg No.: E-7

TNX TOWER DETAILED OUTPUT

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	1 of 32
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	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 140.00 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 2.63 ft at the top and 16.85 ft at the base.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in New London County, Connecticut.

Basic wind speed of 100 mph.

Nominal ice thickness of 0.5000 in.

Ice density of 56 pcf.

A wind speed of 87 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

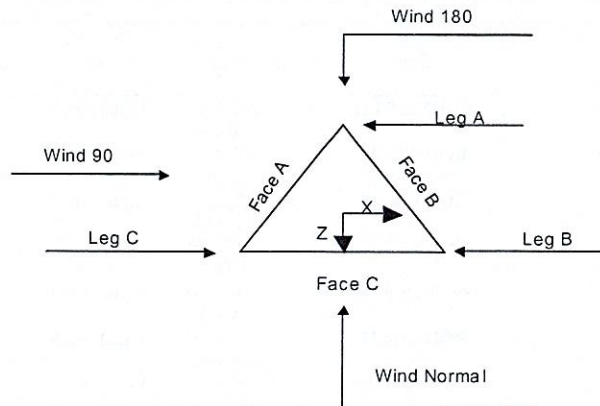
Stress ratio used in tower member design is 1.333.

Local bending stresses due to climbing loads, 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		

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Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	140.00-120.00			2.63	1	20.00
T2	120.00-100.00			4.66	1	20.00
T3	100.00-80.00			6.69	1	20.00
T4	80.00-60.00			8.72	1	20.00
T5	60.00-40.00			10.75	1	20.00
T6	40.00-20.00			12.79	1	20.00
T7	20.00-0.00			14.82	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
	<i>ft</i>	<i>ft</i>				<i>in</i>	<i>in</i>
T1	140.00-120.00	3.98	X Brace	No	Yes	0.0000	1.0000
T2	120.00-100.00	3.97	X Brace	No	No	1.0000	1.0000
T3	100.00-80.00	4.96	X Brace	No	No	1.0000	1.0000
T4	80.00-60.00	6.61	X Brace	No	No	1.0000	1.0000
T5	60.00-40.00	6.61	X Brace	No	No	1.0000	1.0000
T6	40.00-20.00	6.61	X Brace	No	No	1.0000	1.0000
T7	20.00-0.00	9.96	X Brace	No	No	1.0000	0.0000

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Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 140.00-120.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T2 120.00-100.00	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T3 100.00-80.00	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T4 80.00-60.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T5 60.00-40.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T6 40.00-20.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A572-50 (50 ksi)
T7 20.00-0.00	Pipe	ROHN 8 EHS	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 140.00-120.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Flat Bar		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 Horizontal in
T1 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T2 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T3 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T4 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T5 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T6 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T7 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000

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Tower Section Geometry (cont'd)

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors ¹						
				X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
				X Y	X Y	X Y	X Y	X Y	X Y	X Y
T1	Yes	No	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1
T3	Yes	No	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1
T4	Yes	No	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1
T5	Yes	No	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1
T6	Yes	No	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1
T7 20.00-0.00	Yes	No	1	1	1	1	1	1	1	1

¹Note: 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	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
140.00-120.00														
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
120.00-100.00														
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
100.00-80.00														
T4 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
T5 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
T6 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
T7 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)

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	5 of 32
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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 140.00-120.00	Flange	0.7500 A325N	0	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 120.00-100.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 100.00-80.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 80.00-60.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 60.00-40.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 20.00-0.00	Flange	1.0000 A325N	8	0.7500 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 1/4 (AT&T - low)	B	Yes	Ar(CfAe)	60.00 - 6.00	3.0000	-0.3	12	12	1.5500	1.5500		0.66
1 1/4 (AT&T - high)	B	Yes	Ar(CfAe)	129.00 - 60.00	3.0000	0	12	12	1.5500	1.5500		0.66
1 5/8 (Verizon - low)	A	Yes	Ar(CfAe)	60.00 - 6.00	3.0000	-0.3	12	6	1.9800	1.9800		1.04
1 5/8 (Verizon - high)	A	Yes	Ar(CfAe)	140.00 - 60.00	3.0000	0	12	6	1.9800	1.9800		1.04
7/8	C	Yes	Ar(CfAe)	121.00 - 6.00	3.0000	-0.34	1	1	1.1100	1.1100		0.54
7/8	C	Yes	Ar(CfAe)	104.00 - 6.00	3.0000	-0.355	1	1	1.1100	1.1100		0.54
1 5/8	C	Yes	Ar(CfAe)	101.00 - 6.00	3.0000	-0.38	2	2	1.9800	1.9800		1.04
7/8	C	Yes	Ar(CfAe)	90.00 - 6.00	3.0000	-0.325	1	1	1.1100	1.1100		0.54
7/8	C	Yes	Ar(CfAe)	54.00 - 6.00	3.0000	-0.415	3	3	1.1100	1.1100		0.54
7/8	C	Yes	Ar(CfAe)	33.00 - 6.00	3.0000	-0.44	1	1	1.1100	1.1100		0.54
1 1/4	C	Yes	Ar(CfAe)	101.00 - 6.00	3.0000	-0.28	4	4	1.5500	1.5500		0.66
1/2	C	Yes	Ar(CfAe)	67.00 - 6.00	3.0000	-0.24	1	1	0.5800	0.5800		0.25
1/2	C	Yes	Ar(CfAe)	140.00 - 6.00	3.0000	-0.23	1	1	0.5800	0.5800		0.25
1" Rigid Conduit	C	Yes	Ar(CfAe)	66.00 - 6.00	-3.0000	-0.3	1	1	1.0000	1.0000		0.70
1" Rigid Conduit	C	Yes	Ar(CfAe)	66.00 - 6.00	-3.0000	-0.36	1	1	1.0000	1.0000		0.70
LDF1-50A (1/4 FOAM)	C	Yes	Ar(CfAe)	66.00 - 6.00	-3.0000	-0.305	4	4	0.3500	0.3500		0.06
5/8" Fiber (AT&T)	B	Yes	Ar(CfAe)	129.00 - 6.00	3.0000	-0.4	1	1	0.5000	0.5000		0.40
3/4" DC (AT&T)	B	Yes	Ar(CfAe)	129.00 - 6.00	3.0000	-0.42	2	2	0.7500	0.7500		0.40
RFS BH158-1-08U 8-S8J18 (Verizon)	A	Yes	Ar(CfAe)	60.00 - 6.00	3.0000	-0.375	1	1	1.9800	1.9800		1.30

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Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
T1	140.00-120.00	A	19.800	0.000	0.000	0.000	0.25
		B	15.450	0.000	0.000	0.000	0.08
		C	1.059	0.000	0.000	0.000	0.01
T2	120.00-100.00	A	19.800	0.000	0.000	0.000	0.25
		B	34.333	0.000	0.000	0.000	0.18
		C	4.033	0.000	0.000	0.000	0.02
T3	100.00-80.00	A	19.800	0.000	0.000	0.000	0.25
		B	34.333	0.000	0.000	0.000	0.18
		C	22.525	0.000	0.000	0.000	0.13
T4	80.00-60.00	A	19.800	0.000	0.000	0.000	0.25
		B	34.333	0.000	0.000	0.000	0.18
		C	25.488	0.000	0.000	0.000	0.14
T5	60.00-40.00	A	23.100	0.000	0.000	0.000	0.28
		B	34.333	0.000	0.000	0.000	0.18
		C	33.968	0.000	0.000	0.000	0.19
T6	40.00-20.00	A	23.100	0.000	0.000	0.000	0.28
		B	34.333	0.000	0.000	0.000	0.18
		C	36.836	0.000	0.000	0.000	0.21
T7	20.00-0.00	A	16.170	0.000	0.000	0.000	0.19
		B	24.033	0.000	0.000	0.000	0.13
		C	26.238	0.000	0.000	0.000	0.15

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	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
T1	140.00-120.00	A	0.500	29.800	0.000	0.000	0.000	0.61
		B		25.387	1.125	0.000	0.000	0.24
		C		2.809	0.000	0.000	0.000	0.02
T2	120.00-100.00	A	0.500	29.800	0.000	0.000	0.000	0.61
		B		56.417	2.500	0.000	0.000	0.53
		C		8.200	0.000	0.000	0.000	0.07
T3	100.00-80.00	A	0.500	29.800	0.000	0.000	0.000	0.61
		B		56.417	2.500	0.000	0.000	0.53
		C		38.358	0.000	0.000	0.000	0.35
T4	80.00-60.00	A	0.500	29.800	0.000	0.000	0.000	0.61
		B		56.417	2.500	0.000	0.000	0.53
		C		43.713	1.050	0.000	0.000	0.40
T5	60.00-40.00	A	0.500	34.767	0.000	0.000	0.000	0.67
		B		56.417	2.500	0.000	0.000	0.53
		C		59.052	3.500	0.000	0.000	0.55
T6	40.00-20.00	A	0.500	34.767	0.000	0.000	0.000	0.67
		B		56.417	2.500	0.000	0.000	0.53
		C		64.502	3.500	0.000	0.000	0.59
T7	20.00-0.00	A	0.500	24.337	0.000	0.000	0.000	0.47
		B		39.492	1.750	0.000	0.000	0.37
		C		46.013	2.450	0.000	0.000	0.42

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Feed Line Shielding

Section	Elevation	Face	A_R	$A_{R_{Ice}}$	A_F	$A_{F_{Ice}}$
	ft		ft ²	ft ²	ft ²	ft ²
T1	140.00-120.00	A	0.000	1.996	2.652	3.992
		B	0.000	1.776	2.070	3.551
		C	0.000	0.188	0.142	0.376
T2	120.00-100.00	A	0.000	1.522	2.022	3.043
		B	0.000	3.008	3.506	6.017
		C	0.000	0.419	0.412	0.837
T3	100.00-80.00	A	0.000	1.184	1.573	2.367
		B	0.000	2.340	2.728	4.681
		C	0.000	1.524	1.789	3.047
T4	80.00-60.00	A	0.000	0.902	1.498	2.254
		B	0.000	1.783	2.597	4.457
		C	0.000	1.354	1.928	3.386
T5	60.00-40.00	A	0.000	0.998	1.657	2.494
		B	0.000	1.691	2.463	4.226
		C	0.000	1.795	2.437	4.487
T6	40.00-20.00	A	0.000	0.964	1.922	2.892
		B	0.000	1.634	2.856	4.901
		C	0.000	1.886	3.064	5.657
T7	20.00-0.00	A	0.000	0.479	1.115	1.677
		B	0.000	0.812	1.657	2.843
		C	0.000	0.954	1.809	3.340

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	$CP_{X_{Ice}}$	$CP_{Z_{Ice}}$
	ft	in	in	in	in
T1	140.00-120.00	-0.7826	-3.3503	-0.4815	-3.1361
T2	120.00-100.00	2.2318	-4.7775	2.7660	-4.5209
T3	100.00-80.00	5.8040	-1.6425	6.6764	-1.2562
T4	80.00-60.00	7.0548	-1.2285	8.4444	-0.6967
T5	60.00-40.00	3.3303	-1.1829	4.9022	-0.7060
T6	40.00-20.00	4.3438	-0.6140	6.3161	0.0654
T7	20.00-0.00	3.7655	-0.3874	5.8252	0.2099

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement	$C_A A_A$ Front	$C_S A_A$ Side	Weight
			ft ft ft	°	ft	ft ²	ft ²	K
Lightning Rod 5/8x4'	C	None		0.0000	145.00	No Ice	0.25	0.03
(-)						1/2" Ice	0.66	0.03
Flash Beacon Lighting	C	None		0.0000	145.00	No Ice	2.70	0.05
(-)						1/2" Ice	3.10	0.07
Rohn 14' Rotable Platform	C	None		0.0000	142.00	No Ice	41.00	2.50

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	8 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
(Verizon)								
LNx-6512DS-T4M	A	From Leg	2.50	0.0000	143.00	1/2" Ice 56.00	56.00	3.00
(Verizon)			0.00			No Ice 5.61	3.35	0.03
			0.00			1/2" Ice 6.01	3.71	0.06
LNx-6512DS-T4M	B	From Leg	2.50	0.0000	143.00	No Ice 5.61	3.35	0.03
(Verizon)			0.00			1/2" Ice 6.01	3.71	0.06
			0.00					
LNx-6512DS-T4M	C	From Leg	2.50	0.0000	143.00	No Ice 5.61	3.35	0.03
(Verizon)			0.00			1/2" Ice 6.01	3.71	0.06
			0.00					
BXA-80080/4CF	A	From Leg	2.50	0.0000	143.00	No Ice 5.25	2.84	0.01
(Verizon)			-6.00			1/2" Ice 5.64	3.15	0.05
			0.00					
BXA-171063/8CF	A	From Leg	2.50	0.0000	143.00	No Ice 2.90	2.31	0.01
(Verizon)			6.00			1/2" Ice 3.22	2.62	0.03
			0.00					
BXA-80080/4CF	B	From Leg	2.50	0.0000	143.00	No Ice 5.25	2.84	0.01
(Verizon)			-6.00			1/2" Ice 5.64	3.15	0.05
			0.00					
BXA-171063/8CF	B	From Leg	2.50	0.0000	143.00	No Ice 2.90	2.31	0.01
(Verizon)			6.00			1/2" Ice 3.22	2.62	0.03
			0.00					
BXA-80080/4CF	C	From Leg	2.50	0.0000	143.00	No Ice 5.25	2.84	0.01
(Verizon)			-6.00			1/2" Ice 5.64	3.15	0.05
			0.00					
BXA-171063/8CF	C	From Leg	2.50	0.0000	143.00	No Ice 2.90	2.31	0.01
(Verizon)			6.00			1/2" Ice 3.22	2.62	0.03
			0.00					
BXA-185090/8CF	A	From Leg	2.50	0.0000	143.00	No Ice 3.06	1.87	0.01
(Verizon)			4.00			1/2" Ice 3.38	2.18	0.03
			0.00					
BXA-185090/8CF	B	From Leg	2.50	0.0000	143.00	No Ice 3.06	1.87	0.01
(Verizon)			4.00			1/2" Ice 3.38	2.18	0.03
			0.00					
BXA-185090/8CF	C	From Leg	2.50	0.0000	143.00	No Ice 3.06	1.87	0.01
(Verizon)			4.00			1/2" Ice 3.38	2.18	0.03
			0.00					
(2) Diplexer	A	From Leg	2.50	0.0000	143.00	No Ice 0.23	0.17	0.01
(Verizon)			0.00			1/2" Ice 0.30	0.24	0.01
			0.00					
(2) Diplexer	B	From Leg	2.50	0.0000	143.00	No Ice 0.23	0.17	0.01
(Verizon)			0.00			1/2" Ice 0.30	0.24	0.01
			0.00					
(2) Diplexer	C	From Leg	2.50	0.0000	143.00	No Ice 0.23	0.17	0.01
(Verizon)			0.00			1/2" Ice 0.30	0.24	0.01
			0.00					
ALU RRH	A	From Leg	2.50	0.0000	143.00	No Ice 2.25	1.23	0.05
(Verizon)			0.00			1/2" Ice 2.45	1.39	0.07
			0.00					
ALU RRH	B	From Leg	2.50	0.0000	143.00	No Ice 2.25	1.23	0.05
(Verizon)			0.00			1/2" Ice 2.45	1.39	0.07
			0.00					
ALU RRH	C	From Leg	2.50	0.0000	143.00	No Ice 2.25	1.23	0.05
(Verizon)			0.00			1/2" Ice 2.45	1.39	0.07
			0.00					
DB-T1 Series Distribution Box	A	From Leg	2.50	0.0000	143.00	No Ice 5.60	2.33	0.04
			0.00			1/2" Ice 5.92	2.56	0.08

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	9 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
(Verizon)			0.00						
KMW AM-X-CD-14-65 (AT&T)	A	From Leg	5.00 6.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.51 5.90	2.83 3.14	0.05 0.08
7770.00 (AT&T)	A	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
KMW AM-X-CD-14-65 (AT&T)	A	From Leg	5.00 -6.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.51 5.90	2.83 3.14	0.05 0.08
KMW AM-X-CD-14-65 (AT&T)	B	From Leg	5.00 6.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.51 5.90	2.83 3.14	0.05 0.08
7770.00 (AT&T)	B	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
KMW AM-X-CD-14-65 (AT&T)	B	From Leg	5.00 -6.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.51 5.90	2.83 3.14	0.05 0.08
KMW AM-X-CD-14-65 (AT&T)	C	From Leg	5.00 6.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.51 5.90	2.83 3.14	0.05 0.08
7770.00 (AT&T)	C	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
KMW AM-X-CD-14-65 (AT&T)	C	From Leg	5.00 -6.00 0.00	0.0000	129.00	No Ice 1/2" Ice	5.51 5.90	2.83 3.14	0.05 0.08
(2) RRU (AT&T)	A	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	1.40 1.56	0.70 0.82	0.01 0.02
(2) RRU (AT&T)	B	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	1.40 1.56	0.70 0.82	0.01 0.02
(2) RRU (AT&T)	C	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	1.40 1.56	0.70 0.82	0.01 0.02
(2) TMA (AT&T)	A	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	0.78 0.90	0.39 0.48	0.02 0.02
(2) TMA (AT&T)	B	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	0.78 0.90	0.39 0.48	0.02 0.02
(2) TMA (AT&T)	C	From Leg	5.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	0.78 0.90	0.39 0.48	0.02 0.02
Surge Suppressor (AT&T)	A	From Leg	2.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	0.53 0.65	0.53 0.65	0.05 0.06
Rohn 6'x12' Boom Gate (3) (AT&T)	B	From Leg	2.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice	49.80 59.30	49.80 59.30	1.68 2.10
DB212-2-A (-)	A	From Leg	1.00 0.00 0.00	0.0000	121.00	No Ice 1/2" Ice	4.40 8.42	4.40 8.42	0.03 0.07
DB212-2-A (-)	C	From Leg	1.00 0.00	0.0000	119.00	No Ice 1/2" Ice	4.40 8.42	4.40 8.42	0.03 0.07

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	10 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
DB540K-E	C	From Leg	0.00	0.0000	112.00	No Ice	4.50	4.50	0.07
(-)			6.00			1/2" Ice	6.33	6.33	0.10
PD220	A	From Leg	0.00	0.0000	111.00	No Ice	3.08	3.08	0.02
(-)			0.00			1/2" Ice	5.30	5.30	0.05
DB810T3E-XT	B	From Leg	0.00	0.0000	108.00	No Ice	4.53	4.53	0.05
(-)			6.00			1/2" Ice	6.07	6.07	0.08
DB212-2-A	C	From Leg	0.00	0.0000	104.00	No Ice	4.40	4.40	0.03
(-)			1.00			1/2" Ice	8.42	8.42	0.07
PD1121-6	C	From Leg	0.00	0.0000	101.00	No Ice	0.23	0.23	0.00
(-)			6.00			1/2" Ice	0.41	0.41	0.00
Rohn 6' Side-Arm(1)	A	From Leg	0.00	0.0000	101.00	No Ice	10.60	10.60	0.14
(-)			3.00			1/2" Ice	15.40	15.40	0.21
Rohn 6' Side-Arm(1)	B	From Leg	0.00	0.0000	101.00	No Ice	10.60	10.60	0.14
(-)			3.00			1/2" Ice	15.40	15.40	0.21
Rohn 6' Side-Arm(1)	C	From Leg	0.00	0.0000	101.00	No Ice	10.60	10.60	0.14
(-)			3.00			1/2" Ice	15.40	15.40	0.21
10'x2 1/2" Pipe Mount	C	From Leg	0.00	0.0000	97.00	No Ice	2.88	2.88	0.04
(-)			6.00			1/2" Ice	3.91	3.91	0.06
PD1121-6	C	From Leg	0.00	0.0000	97.00	No Ice	0.23	0.23	0.00
(-)			6.00			1/2" Ice	0.41	0.41	0.00
DB212-2-A	A	From Leg	0.00	0.0000	96.00	No Ice	4.40	4.40	0.03
(-)			1.00			1/2" Ice	8.42	8.42	0.07
DB810T3E-XT	B	From Leg	0.00	0.0000	94.00	No Ice	4.53	4.53	0.05
(-)			6.00			1/2" Ice	6.07	6.07	0.08
PD340-1	A	From Leg	0.00	0.0000	90.00	No Ice	3.30	3.30	0.04
(-)			6.00			1/2" Ice	5.94	5.94	0.05
DB212-2-A	C	From Leg	0.00	0.0000	90.00	No Ice	4.40	4.40	0.03
(-)			1.00			1/2" Ice	8.42	8.42	0.07
DB212-2-A	C	From Leg	0.00	0.0000	68.00	No Ice	4.40	4.40	0.03
(-)			1.00			1/2" Ice	8.42	8.42	0.07
Obstruction Light	C	From Leg	0.00	0.0000	67.00	No Ice	1.00	1.00	0.01
(-)			1.50			1/2" Ice	1.50	1.50	0.01
Stand-off Arm	C	From Leg	0.00	0.0000	67.00	No Ice	0.30	0.30	0.01
(-)			0.75			1/2" Ice	0.38	0.38	0.05
Obstruction Light	B	From Leg	0.00	0.0000	67.00	No Ice	1.00	1.00	0.01
(-)			1.50			1/2" Ice	1.50	1.50	0.01
Stand-off Arm	B	From Leg	0.00	0.0000	67.00	No Ice	0.30	0.30	0.01
(-)			0.75			1/2" Ice	0.38	0.38	0.05

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	Page
	140' ROHN SSV Tower	11 of 32
	Project	Date
	68 Groton Long Point Road, Groton, CT	12:41:37 12/06/12
	Client	Designed by
	Verizon Wireless - Groton	Kevin_Barker

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{4A} Front ft ²	C _{4A} Side ft ²	Weight K
			0.00						
CCTV camera	B	From Leg	1.00	0.0000	66.00	No Ice	1.00	1.00	0.01
(-)			0.00			1/2" Ice	1.50	1.50	0.01
			0.00						
PD220	A	From Leg	6.00	0.0000	65.00	No Ice	3.08	3.08	0.02
(-)			0.00			1/2" Ice	5.30	5.30	0.05
			0.00						
PD220	B	From Leg	6.00	0.0000	65.00	No Ice	3.08	3.08	0.02
(-)			0.00			1/2" Ice	5.30	5.30	0.05
			0.00						
PD220	C	From Leg	6.00	0.0000	65.00	No Ice	3.08	3.08	0.02
(-)			0.00			1/2" Ice	5.30	5.30	0.05
			0.00						
Rohn 6' Side-Arm(1)	A	From Leg	3.00	0.0000	54.00	No Ice	10.60	10.60	0.14
(-)			0.00			1/2" Ice	15.40	15.40	0.21
			0.00						
Rohn 6' Side-Arm(1)	B	From Leg	3.00	0.0000	54.00	No Ice	10.60	10.60	0.14
(-)			0.00			1/2" Ice	15.40	15.40	0.21
			0.00						
Rohn 6' Side-Arm(1)	C	From Leg	3.00	0.0000	54.00	No Ice	10.60	10.60	0.14
(-)			0.00			1/2" Ice	15.40	15.40	0.21
			0.00						
20' x 2" Dia Omni	A	From Leg	6.00	0.0000	43.00	No Ice	4.00	4.00	0.02
(-)			0.00			1/2" Ice	6.03	6.03	0.05
			0.00						
4' Side Mount Standoff (1)	B	From Leg	2.00	0.0000	43.00	No Ice	2.72	2.72	0.05
(-)			0.00			1/2" Ice	4.91	4.91	0.09
			0.00						
Misc - Dish Filter/TMA	B	From Leg	2.00	0.0000	43.00	No Ice	0.78	0.29	0.02
(-)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
Misc - Dish Filter/TMA	B	From Leg	2.00	0.0000	41.50	No Ice	2.10	2.10	0.01
(-)			0.00			1/2" Ice	2.30	2.30	0.03
			0.00						
Misc - Dish Filter/TMA	B	From Leg	2.00	0.0000	37.00	No Ice	0.78	0.29	0.02
(-)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
4' Side Mount Standoff (1)	B	From Leg	2.00	0.0000	37.00	No Ice	2.72	2.72	0.05
(-)			0.00			1/2" Ice	4.91	4.91	0.09
			0.00						
Rohn 6' Side-Arm(1)	A	From Leg	3.00	0.0000	33.00	No Ice	10.60	10.60	0.14
(-)			0.00			1/2" Ice	15.40	15.40	0.21
			0.00						

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight K
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tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	12 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft²	Weight K
2' DISH (-)	B	Paraboloid w/o Radome	From Leg	4.00 0.00 0.00	Worst		43.00	2.00	No Ice 1/2" Ice	3.14 3.41 0.03 0.05
2' DISH (-)	B	Paraboloid w/o Radome	From Leg	4.00 0.00 0.00	Worst		35.00	2.00	No Ice 1/2" Ice	3.14 3.41 0.03 0.05

Tower Pressures - No Ice

$$G_H = 1.138$$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft²	C _A A _A Out Face ft²
ft	ft		psf	ft²		ft²	ft²	ft²			
T1 140.00-120.00	130.00	1.48	38	77.698	A	6.168	29.400	9.600	26.99	0.000	0.000
					B	6.751	25.050		30.19	0.000	0.000
					C	8.679	10.659		49.64	0.000	0.000
T2 120.00-100.00	110.00	1.411	36	119.341	A	8.937	31.487	11.687	28.91	0.000	0.000
					B	7.452	46.020		21.86	0.000	0.000
					C	10.547	15.720		44.49	0.000	0.000
T3 100.00-80.00	90.00	1.332	34	161.610	A	10.056	34.826	15.026	33.48	0.000	0.000
					B	8.902	49.359		25.79	0.000	0.000
					C	9.840	37.551		31.71	0.000	0.000
T4 80.00-60.00	70.00	1.24	32	203.984	A	12.517	38.375	18.575	36.50	0.000	0.000
					B	11.418	52.908		28.88	0.000	0.000
					C	12.087	44.063		33.08	0.000	0.000
T5 60.00-40.00	50.00	1.126	29	246.456	A	14.431	45.222	22.122	37.08	0.000	0.000
					B	13.625	56.455		31.57	0.000	0.000
					C	13.651	56.090		31.72	0.000	0.000
T6 40.00-20.00	30.00	1	26	287.156	A	20.124	45.221	22.121	33.85	0.000	0.000
					B	19.189	56.455		29.24	0.000	0.000
					C	18.981	58.957		28.38	0.000	0.000
T7 20.00-0.00	10.00	1	26	331.093	A	19.727	44.969	28.799	44.51	0.000	0.000
					B	19.185	52.833		39.99	0.000	0.000
					C	19.033	55.038		38.88	0.000	0.000

Tower Pressure - With Ice

$$G_H = 1.138$$

Section Elevation	z	K _Z	q _z	t _Z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft²	C _A A _A Out Face ft²
ft	ft		psf	in	ft²		ft²	ft²	ft²			
T1 140.00-120.00	130.00	1.48	28	0.5000	79.367	A	4.829	45.153	12.939	25.89	0.000	0.000
						B	6.394	40.961		27.32	0.000	0.000
						C	8.444	19.970		45.54	0.000	0.000
T2 120.00-100.00	110.00	1.411	27	0.5000	121.010	A	7.915	48.783	15.026	26.50	0.000	0.000
						B	7.442	73.913		18.47	0.000	0.000
						C	10.121	28.286		39.12	0.000	0.000
T3 100.00-80.00	90.00	1.332	26	0.5000	163.278	A	9.262	52.796	18.365	29.59	0.000	0.000

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	13 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
T4 80.00-60.00	70.00	1.24	24	0.5000	205.652	B	9.449	78.256		20.94	0.000	0.000
						C	8.582	61.014		26.39	0.000	0.000
						A	11.761	56.419	21.914	32.14	0.000	0.000
T5 60.00-40.00	50.00	1.126	22	0.5000	248.125	B	12.058	82.154		23.26	0.000	0.000
						C	11.679	69.879		26.87	0.000	0.000
						A	13.594	65.665	25.461	32.12	0.000	0.000
T6 40.00-20.00	30.00	1	19	0.5000	288.825	B	14.361	86.622		25.21	0.000	0.000
						C	15.100	89.153		24.42	0.000	0.000
						A	19.153	66.611	25.460	29.69	0.000	0.000
T7 20.00-0.00	10.00	1	19	0.5000	332.762	B	19.644	87.592		23.74	0.000	0.000
						C	19.888	95.426		22.08	0.000	0.000
						A	19.164	61.951	32.138	39.62	0.000	0.000
						B	19.749	76.773		33.30	0.000	0.000
						C	19.951	83.152		31.17	0.000	0.000

Tower Pressure - Service

$$G_H = 1.138$$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
T1 140.00-120.00	130.00	1.48	14	77.698	A	6.168	29.400		26.99	0.000	0.000
					B	6.751	25.050		30.19	0.000	0.000
					C	8.679	10.659		49.64	0.000	0.000
T2 120.00-100.00	110.00	1.411	13	119.341	A	8.937	31.487	11.687	28.91	0.000	0.000
					B	7.452	46.020		21.86	0.000	0.000
					C	10.547	15.720		44.49	0.000	0.000
T3 100.00-80.00	90.00	1.332	12	161.610	A	10.056	34.826	15.026	33.48	0.000	0.000
					B	8.902	49.359		25.79	0.000	0.000
					C	9.840	37.551		31.71	0.000	0.000
T4 80.00-60.00	70.00	1.24	11	203.984	A	12.517	38.375	18.575	36.50	0.000	0.000
					B	11.418	52.908		28.88	0.000	0.000
					C	12.087	44.063		33.08	0.000	0.000
T5 60.00-40.00	50.00	1.126	10	246.456	A	14.431	45.222	22.122	37.08	0.000	0.000
					B	13.625	56.455		31.57	0.000	0.000
					C	13.651	56.090		31.72	0.000	0.000
T6 40.00-20.00	30.00	1	9	287.156	A	20.124	45.221	22.121	33.85	0.000	0.000
					B	19.189	56.455		29.24	0.000	0.000
					C	18.981	58.957		28.38	0.000	0.000
T7 20.00-0.00	10.00	1	9	331.093	A	19.727	44.969	28.799	44.51	0.000	0.000
					B	19.185	52.833		39.99	0.000	0.000
					C	19.033	55.038		38.88	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e ft ²	e	C _F	R _R	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1	0.34	1.02	A	0.458	1.961	0.677	1	1	26.068	2.20	110.18	A

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	14 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
140.00-120.00			B	0.409	2.046	0.655	1	1	23.169			
			C	0.249	2.441	0.602	1	1	15.091			
T2	0.45	1.31	A	0.339	2.198	0.629	1	1	28.726	3.12	155.95	B
120.00-100.00			B	0.448	1.977	0.672	1	1	38.396			
			C	0.22	2.53	0.595	1	1	19.895			
T3	0.56	1.64	A	0.278	2.357	0.609	1	1	31.277	3.36	167.96	B
100.00-80.00			B	0.361	2.148	0.636	1	1	40.308			
			C	0.293	2.314	0.614	1	1	32.890			
T4	0.58	2.15	A	0.249	2.439	0.602	1	1	35.609	3.61	180.31	B
80.00-60.00			B	0.315	2.256	0.621	1	1	44.259			
			C	0.275	2.364	0.609	1	1	38.906			
T5	0.65	2.40	A	0.242	2.462	0.6	1	1	41.558	3.69	184.63	B
60.00-40.00			B	0.284	2.338	0.611	1	1	48.132			
			C	0.283	2.342	0.611	1	1	47.913			
T6	0.67	3.13	A	0.228	2.507	0.596	1	1	47.094	3.79	189.59	C
40.00-20.00			B	0.263	2.398	0.605	1	1	53.366			
			C	0.271	2.375	0.608	1	1	54.802			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	1	1	46.236	3.80	190.09	C
			B	0.218	2.539	0.594	1	1	50.575			
			C	0.224	2.519	0.596	1	1	51.810			
Sum Weight:	3.71	15.00						OTM	1520.72 kip-ft	23.57		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1	0.34	1.02	A	0.458	1.961	0.677	0.825	1	24.989	2.11	105.61	A
140.00-120.00			B	0.409	2.046	0.655	0.825	1	21.988			
			C	0.249	2.441	0.602	0.825	1	13.572			
T2	0.45	1.31	A	0.339	2.198	0.629	0.825	1	27.162	3.01	150.66	B
120.00-100.00			B	0.448	1.977	0.672	0.825	1	37.092			
			C	0.22	2.53	0.595	0.825	1	18.050			
T3	0.56	1.64	A	0.278	2.357	0.609	0.825	1	29.517	3.23	161.47	B
100.00-80.00			B	0.361	2.148	0.636	0.825	1	38.750			
			C	0.293	2.314	0.614	0.825	1	31.168			
T4	0.58	2.15	A	0.249	2.439	0.602	0.825	1	33.419	3.44	172.17	B
80.00-60.00			B	0.315	2.256	0.621	0.825	1	42.261			
			C	0.275	2.364	0.609	0.825	1	36.791			
T5	0.65	2.40	A	0.242	2.462	0.6	0.825	1	39.033	3.51	175.49	B
60.00-40.00			B	0.284	2.338	0.611	0.825	1	45.748			
			C	0.283	2.342	0.611	0.825	1	45.524			
T6	0.67	3.13	A	0.228	2.507	0.596	0.825	1	43.573	3.56	178.10	C
40.00-20.00			B	0.263	2.398	0.605	0.825	1	50.008			
			C	0.271	2.375	0.608	0.825	1	51.480			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	0.825	1	42.783	3.56	177.87	C
			B	0.218	2.539	0.594	0.825	1	47.217			
			C	0.224	2.519	0.596	0.825	1	48.479			
Sum Weight:	3.71	15.00						OTM	1455.64 kip-ft	22.43		

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	15 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	R _R	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 140.00-120.00	0.34	1.02	A	0.458	1.961	0.677	0.8	1	24.835	2.10	104.96	A
			B	0.409	2.046	0.655	0.8	1	21.819			
			C	0.249	2.441	0.602	0.8	1	13.355			
T2 120.00-100.00	0.45	1.31	A	0.339	2.198	0.629	0.8	1	26.939	3.00	149.90	B
			B	0.448	1.977	0.672	0.8	1	36.905			
			C	0.22	2.53	0.595	0.8	1	17.786			
T3 100.00-80.00	0.56	1.64	A	0.278	2.357	0.609	0.8	1	29.266	3.21	160.54	B
			B	0.361	2.148	0.636	0.8	1	38.528			
			C	0.293	2.314	0.614	0.8	1	30.923			
T4 80.00-60.00	0.58	2.15	A	0.249	2.439	0.602	0.8	1	33.106	3.42	171.01	B
			B	0.315	2.256	0.621	0.8	1	41.976			
			C	0.275	2.364	0.609	0.8	1	36.489			
T5 60.00-40.00	0.65	2.40	A	0.242	2.462	0.6	0.8	1	38.672	3.48	174.18	B
			B	0.284	2.338	0.611	0.8	1	45.407			
			C	0.283	2.342	0.611	0.8	1	45.183			
T6 40.00-20.00	0.67	3.13	A	0.228	2.507	0.596	0.8	1	43.069	3.53	176.45	C
			B	0.263	2.398	0.605	0.8	1	49.529			
			C	0.271	2.375	0.608	0.8	1	51.005			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	0.8	1	42.290	3.52	176.13	C
			B	0.218	2.539	0.594	0.8	1	46.738			
			C	0.224	2.519	0.596	0.8	1	48.003			
Sum Weight:	3.71	15.00						OTM	1446.34 kip-ft	22.26		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	R _R	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 140.00-120.00	0.34	1.02	A	0.458	1.961	0.677	0.85	1	25.143	2.13	106.26	A
			B	0.409	2.046	0.655	0.85	1	22.157			
			C	0.249	2.441	0.602	0.85	1	13.789			
T2 120.00-100.00	0.45	1.31	A	0.339	2.198	0.629	0.85	1	27.386	3.03	151.41	B
			B	0.448	1.977	0.672	0.85	1	37.278			
			C	0.22	2.53	0.595	0.85	1	18.313			
T3 100.00-80.00	0.56	1.64	A	0.278	2.357	0.609	0.85	1	29.768	3.25	162.39	B
			B	0.361	2.148	0.636	0.85	1	38.973			
			C	0.293	2.314	0.614	0.85	1	31.414			
T4 80.00-60.00	0.58	2.15	A	0.249	2.439	0.602	0.85	1	33.732	3.47	173.34	B
			B	0.315	2.256	0.621	0.85	1	42.547			
			C	0.275	2.364	0.609	0.85	1	37.093			
T5 60.00-40.00	0.65	2.40	A	0.242	2.462	0.6	0.85	1	39.393	3.54	176.79	B
			B	0.284	2.338	0.611	0.85	1	46.088			
			C	0.283	2.342	0.611	0.85	1	45.865			
T6 40.00-20.00	0.67	3.13	A	0.228	2.507	0.596	0.85	1	44.076	3.59	179.74	C
			B	0.263	2.398	0.605	0.85	1	50.488			
			C	0.271	2.375	0.608	0.85	1	51.955			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	0.85	1	43.276	3.59	179.62	C
			B	0.218	2.539	0.594	0.85	1	47.697			
			C	0.224	2.519	0.596	0.85	1	48.955			
Sum Weight:	3.71	15.00						OTM	1464.94	22.59		

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	16 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
									kip-ft			

Tower Forces - With Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1 140.00-120.00	0.87	1.48	A	0.63	1.789	0.772	1	1	39.699	2.30	114.78	A
			B	0.597	1.806	0.752	1	1	37.179			
			C	0.358	2.153	0.635	1	1	21.132			
T2 120.00-100.00	1.21	1.86	A	0.469	1.944	0.682	1	1	41.184	3.65	182.41	B
			B	0.672	1.777	0.801	1	1	66.611			
			C	0.317	2.251	0.621	1	1	27.698			
T3 100.00-80.00	1.49	2.25	A	0.38	2.105	0.644	1	1	43.245	3.54	177.14	B
			B	0.537	1.856	0.717	1	1	65.570			
			C	0.426	2.014	0.663	1	1	49.013			
T4 80.00-60.00	1.54	2.87	A	0.332	2.216	0.626	1	1	47.082	3.59	179.70	B
			B	0.458	1.96	0.677	1	1	67.679			
			C	0.397	2.071	0.65	1	1	57.115			
T5 60.00-40.00	1.74	3.23	A	0.319	2.246	0.622	1	1	54.440	3.69	184.26	C
			B	0.407	2.05	0.654	1	1	71.053			
			C	0.42	2.025	0.66	1	1	73.944			
T6 40.00-20.00	1.79	4.14	A	0.297	2.304	0.615	1	1	60.117	3.70	185.13	C
			B	0.371	2.124	0.64	1	1	75.730			
			C	0.399	2.065	0.651	1	1	82.039			
T7 20.00-0.00	1.26	4.38	A	0.244	2.456	0.6	1	1	56.354	3.54	177.14	C
			B	0.29	2.323	0.613	1	1	66.804			
			C	0.31	2.27	0.619	1	1	71.419			
Sum Weight:	9.91	20.19						OTM	1600.93 kip-ft	24.01		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1 140.00-120.00	0.87	1.48	A	0.63	1.789	0.772	0.825	1	38.854	2.25	112.33	A
			B	0.597	1.806	0.752	0.825	1	36.060			
			C	0.358	2.153	0.635	0.825	1	19.655			
T2 120.00-100.00	1.21	1.86	A	0.469	1.944	0.682	0.825	1	39.799	3.58	178.85	B
			B	0.672	1.777	0.801	0.825	1	65.308			
			C	0.317	2.251	0.621	0.825	1	25.926			
T3 100.00-80.00	1.49	2.25	A	0.38	2.105	0.644	0.825	1	41.624	3.45	172.67	B
			B	0.537	1.856	0.717	0.825	1	63.916			
			C	0.426	2.014	0.663	0.825	1	47.512			
T4 80.00-60.00	1.54	2.87	A	0.332	2.216	0.626	0.825	1	45.024	3.48	174.10	B
			B	0.458	1.96	0.677	0.825	1	65.569			
			C	0.397	2.071	0.65	0.825	1	55.071			
T5	1.74	3.23	A	0.319	2.246	0.622	0.825	1	52.061	3.55	177.67	C

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	17 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
60.00-40.00			B	0.407	2.05	0.654	0.825	1	68.540			
			C	0.42	2.025	0.66	0.825	1	71.302			
T6	1.79	4.14	A	0.297	2.304	0.615	0.825	1	56.766	3.55	177.28	C
40.00-20.00			B	0.371	2.124	0.64	0.825	1	72.292			
			C	0.399	2.065	0.651	0.825	1	78.558			
T7 20.00-0.00	1.26	4.38	A	0.244	2.456	0.6	0.825	1	53.000	3.37	168.48	C
			B	0.29	2.323	0.613	0.825	1	63.348			
			C	0.31	2.27	0.619	0.825	1	67.928			
Sum Weight:	9.91	20.19						OTM	1557.82 kip-ft	23.23		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1	0.87	1.48	A	0.63	1.789	0.772	0.8	1	38.733	2.24	111.98	A
140.00-120.00			B	0.597	1.806	0.752	0.8	1	35.900			
			C	0.358	2.153	0.635	0.8	1	19.444			
T2	1.21	1.86	A	0.469	1.944	0.682	0.8	1	39.601	3.57	178.34	B
120.00-100.00			B	0.672	1.777	0.801	0.8	1	65.122			
			C	0.317	2.251	0.621	0.8	1	25.673			
T3	1.49	2.25	A	0.38	2.105	0.644	0.8	1	41.393	3.44	172.03	B
100.00-80.00			B	0.537	1.856	0.717	0.8	1	63.680			
			C	0.426	2.014	0.663	0.8	1	47.297			
T4	1.54	2.87	A	0.332	2.216	0.626	0.8	1	44.730	3.47	173.30	B
80.00-60.00			B	0.458	1.96	0.677	0.8	1	65.268			
			C	0.397	2.071	0.65	0.8	1	54.779			
T5	1.74	3.23	A	0.319	2.246	0.622	0.8	1	51.721	3.53	176.73	C
60.00-40.00			B	0.407	2.05	0.654	0.8	1	68.181			
			C	0.42	2.025	0.66	0.8	1	70.924			
T6	1.79	4.14	A	0.297	2.304	0.615	0.8	1	56.287	3.52	176.16	C
40.00-20.00			B	0.371	2.124	0.64	0.8	1	71.801			
			C	0.399	2.065	0.651	0.8	1	78.061			
T7 20.00-0.00	1.26	4.38	A	0.244	2.456	0.6	0.8	1	52.521	3.34	167.24	C
			B	0.29	2.323	0.613	0.8	1	62.854			
			C	0.31	2.27	0.619	0.8	1	67.429			
Sum Weight:	9.91	20.19						OTM	1551.66 kip-ft	23.12		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1	0.87	1.48	A	0.63	1.789	0.772	0.85	1	38.975	2.25	112.68	A
140.00-120.00			B	0.597	1.806	0.752	0.85	1	36.220			
			C	0.358	2.153	0.635	0.85	1	19.866			
T2	1.21	1.86	A	0.469	1.944	0.682	0.85	1	39.997	3.59	179.36	B

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	18 of 32
	Project	68 Groton Long Point Road, Groton, CT	Date	12:41:37 12/06/12
	Client	Verizon Wireless - Groton	Designed by	Kevin_Barker

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
120.00-100.00			B	0.672	1.777	0.801	0.85	1	65.494			
			C	0.317	2.251	0.621	0.85	1	26.179			
T3	1.49	2.25	A	0.38	2.105	0.644	0.85	1	41.856	3.47	173.31	B
100.00-80.00			B	0.537	1.856	0.717	0.85	1	64.152			
			C	0.426	2.014	0.663	0.85	1	47.726			
T4	1.54	2.87	A	0.332	2.216	0.626	0.85	1	45.318	3.50	174.90	B
80.00-60.00			B	0.458	1.96	0.677	0.85	1	65.871			
			C	0.397	2.071	0.65	0.85	1	55.363			
T5	1.74	3.23	A	0.319	2.246	0.622	0.85	1	52.401	3.57	178.62	C
60.00-40.00			B	0.407	2.05	0.654	0.85	1	68.899			
			C	0.42	2.025	0.66	0.85	1	71.679			
T6	1.79	4.14	A	0.297	2.304	0.615	0.85	1	57.244	3.57	178.40	C
40.00-20.00			B	0.371	2.124	0.64	0.85	1	72.783			
			C	0.399	2.065	0.651	0.85	1	79.055			
T7 20.00-0.00	1.26	4.38	A	0.244	2.456	0.6	0.85	1	53.479	3.39	169.72	C
			B	0.29	2.323	0.613	0.85	1	63.842			
			C	0.31	2.27	0.619	0.85	1	68.427			
Sum Weight:	9.91	20.19						OTM	1563.97 kip-ft	23.34		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1	0.34	1.02	A	0.458	1.961	0.677	1	1	26.068	0.79	39.66	A
140.00-120.00			B	0.409	2.046	0.655	1	1	23.169			
			C	0.249	2.441	0.602	1	1	15.091			
T2	0.45	1.31	A	0.339	2.198	0.629	1	1	28.726	1.12	56.14	B
120.00-100.00			B	0.448	1.977	0.672	1	1	38.396			
			C	0.22	2.53	0.595	1	1	19.895			
T3	0.56	1.64	A	0.278	2.357	0.609	1	1	31.277	1.21	60.47	B
100.00-80.00			B	0.361	2.148	0.636	1	1	40.308			
			C	0.293	2.314	0.614	1	1	32.890			
T4	0.58	2.15	A	0.249	2.439	0.602	1	1	35.609	1.30	64.91	B
80.00-60.00			B	0.315	2.256	0.621	1	1	44.259			
			C	0.275	2.364	0.609	1	1	38.906			
T5	0.65	2.40	A	0.242	2.462	0.6	1	1	41.558	1.33	66.47	B
60.00-40.00			B	0.284	2.338	0.611	1	1	48.132			
			C	0.283	2.342	0.611	1	1	47.913			
T6	0.67	3.13	A	0.228	2.507	0.596	1	1	47.094	1.37	68.25	C
40.00-20.00			B	0.263	2.398	0.605	1	1	53.366			
			C	0.271	2.375	0.608	1	1	54.802			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	1	1	46.236	1.37	68.43	C
			B	0.218	2.539	0.594	1	1	50.575			
			C	0.224	2.519	0.596	1	1	51.810			
Sum Weight:	3.71	15.00						OTM	547.46 kip-ft	8.49		

Tower Forces - Service - Wind 45 To Face

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	19 of 32
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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1 140.00-120.00	0.34	1.02	A	0.458	1.961	0.677	0.825	1	24.989	0.76	38.02	A
			B	0.409	2.046	0.655	0.825	1	21.988			
			C	0.249	2.441	0.602	0.825	1	13.572			
T2 120.00-100.00	0.45	1.31	A	0.339	2.198	0.629	0.825	1	27.162	1.08	54.24	B
			B	0.448	1.977	0.672	0.825	1	37.092			
			C	0.22	2.53	0.595	0.825	1	18.050			
T3 100.00-80.00	0.56	1.64	A	0.278	2.357	0.609	0.825	1	29.517	1.16	58.13	B
			B	0.361	2.148	0.636	0.825	1	38.750			
			C	0.293	2.314	0.614	0.825	1	31.168			
T4 80.00-60.00	0.58	2.15	A	0.249	2.439	0.602	0.825	1	33.419	1.24	61.98	B
			B	0.315	2.256	0.621	0.825	1	42.261			
			C	0.275	2.364	0.609	0.825	1	36.791			
T5 60.00-40.00	0.65	2.40	A	0.242	2.462	0.6	0.825	1	39.033	1.26	63.17	B
			B	0.284	2.338	0.611	0.825	1	45.748			
			C	0.283	2.342	0.611	0.825	1	45.524			
T6 40.00-20.00	0.67	3.13	A	0.228	2.507	0.596	0.825	1	43.573	1.28	64.11	C
			B	0.263	2.398	0.605	0.825	1	50.008			
			C	0.271	2.375	0.608	0.825	1	51.480			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	0.825	1	42.783	1.28	64.03	C
			B	0.218	2.539	0.594	0.825	1	47.217			
			C	0.224	2.519	0.596	0.825	1	48.479			
Sum Weight:	3.71	15.00						OTM	524.03 kip-ft	8.07		

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1 140.00-120.00	0.34	1.02	A	0.458	1.961	0.677	0.8	1	24.835	0.76	37.79	A
			B	0.409	2.046	0.655	0.8	1	21.819			
			C	0.249	2.441	0.602	0.8	1	13.355			
T2 120.00-100.00	0.45	1.31	A	0.339	2.198	0.629	0.8	1	26.939	1.08	53.96	B
			B	0.448	1.977	0.672	0.8	1	36.905			
			C	0.22	2.53	0.595	0.8	1	17.786			
T3 100.00-80.00	0.56	1.64	A	0.278	2.357	0.609	0.8	1	29.266	1.16	57.79	B
			B	0.361	2.148	0.636	0.8	1	38.528			
			C	0.293	2.314	0.614	0.8	1	30.923			
T4 80.00-60.00	0.58	2.15	A	0.249	2.439	0.602	0.8	1	33.106	1.23	61.56	B
			B	0.315	2.256	0.621	0.8	1	41.976			
			C	0.275	2.364	0.609	0.8	1	36.489			
T5 60.00-40.00	0.65	2.40	A	0.242	2.462	0.6	0.8	1	38.672	1.25	62.70	B
			B	0.284	2.338	0.611	0.8	1	45.407			
			C	0.283	2.342	0.611	0.8	1	45.183			
T6 40.00-20.00	0.67	3.13	A	0.228	2.507	0.596	0.8	1	43.069	1.27	63.52	C
			B	0.263	2.398	0.605	0.8	1	49.529			
			C	0.271	2.375	0.608	0.8	1	51.005			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	0.8	1	42.290	1.27	63.41	C
			B	0.218	2.539	0.594	0.8	1	46.738			
			C	0.224	2.519	0.596	0.8	1	48.003			
Sum Weight:	3.71	15.00						OTM	520.68 kip-ft	8.01		

tnxTower URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Job	140' ROHN SSV Tower	Page	20 of 32
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Tower Forces - Service - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1 140.00-120.00	0.34	1.02	A	0.458	1.961	0.677	0.85	1	25.143	0.77	38.26	A
			B	0.409	2.046	0.655	0.85	1	22.157			
			C	0.249	2.441	0.602	0.85	1	13.789			
T2 120.00-100.00	0.45	1.31	A	0.339	2.198	0.629	0.85	1	27.386	1.09	54.51	B
			B	0.448	1.977	0.672	0.85	1	37.278			
			C	0.22	2.53	0.595	0.85	1	18.313			
T3 100.00-80.00	0.56	1.64	A	0.278	2.357	0.609	0.85	1	29.768	1.17	58.46	B
			B	0.361	2.148	0.636	0.85	1	38.973			
			C	0.293	2.314	0.614	0.85	1	31.414			
T4 80.00-60.00	0.58	2.15	A	0.249	2.439	0.602	0.85	1	33.732	1.25	62.40	B
			B	0.315	2.256	0.621	0.85	1	42.547			
			C	0.275	2.364	0.609	0.85	1	37.093			
T5 60.00-40.00	0.65	2.40	A	0.242	2.462	0.6	0.85	1	39.393	1.27	63.65	B
			B	0.284	2.338	0.611	0.85	1	46.088			
			C	0.283	2.342	0.611	0.85	1	45.865			
T6 40.00-20.00	0.67	3.13	A	0.228	2.507	0.596	0.85	1	44.076	1.29	64.71	C
			B	0.263	2.398	0.605	0.85	1	50.488			
			C	0.271	2.375	0.608	0.85	1	51.955			
T7 20.00-0.00	0.47	3.34	A	0.195	2.611	0.589	0.85	1	43.276	1.29	64.66	C
			B	0.218	2.539	0.594	0.85	1	47.697			
			C	0.224	2.519	0.596	0.85	1	48.955			
Sum Weight:	3.71	15.00						OTM	527.38 kip-ft	8.13		

Force Totals

Load Case	Vertical Forces	Sum of Forces X	Sum of Forces Z	Sum of Overturning Moments, M _x	Sum of Overturning Moments, M _z	Sum of Torques
	K	K	K	kip-ft	kip-ft	kip-ft
Leg Weight	8.48					
Bracing Weight	6.52					
Total Member Self-Weight	15.00					
Total Weight	25.83			2.18	-6.15	
Wind 0 deg - No Ice		-0.01	-37.88	-3131.71	-5.63	18.31
Wind 30 deg - No Ice		18.37	-31.95	-2663.27	-1534.71	15.64
Wind 45 deg - No Ice		25.88	-25.97	-2167.42	-2161.55	12.78
Wind 60 deg - No Ice		31.55	-18.28	-1527.12	-2638.10	9.09
Wind 90 deg - No Ice		36.77	0.01	2.70	-3064.16	0.13
Wind 120 deg - No Ice		32.70	18.95	1569.58	-2703.04	-9.14
Wind 135 deg - No Ice		25.89	25.99	2172.53	-2162.28	-12.57
Wind 150 deg - No Ice		18.40	31.96	2668.16	-1535.61	-15.51
Wind 180 deg - No Ice		0.01	36.57	3061.70	-6.67	-17.87
Wind 210 deg - No Ice		-18.37	31.95	2667.64	1522.41	-15.64
Wind 225 deg - No Ice		-25.88	25.97	2171.79	2149.25	-12.78
Wind 240 deg - No Ice		-32.69	18.93	1568.68	2690.22	-9.17
Wind 270 deg - No Ice		-36.77	-0.01	1.67	3051.86	-0.13
Wind 300 deg - No Ice		-31.57	-18.30	-1528.02	2626.32	8.79
Wind 315 deg - No Ice		-25.89	-25.99	-2168.16	2149.99	12.57
Wind 330 deg - No Ice		-18.40	-31.96	-2663.79	1523.31	15.51
Member Ice	5.20					

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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
Total Weight Ice	40.17			1.01	-8.58	
Wind 0 deg - Ice		-0.01	-38.26	-3164.65	-8.16	18.50
Wind 30 deg - Ice		18.74	-32.55	-2708.32	-1564.84	15.32
Wind 45 deg - Ice		26.42	-26.50	-2206.67	-2205.92	12.22
Wind 60 deg - Ice		32.27	-18.68	-1556.82	-2693.84	8.31
Wind 90 deg - Ice		37.49	0.01	1.43	-3121.81	-0.87
Wind 120 deg - Ice		33.06	19.14	1584.20	-2736.93	-10.04
Wind 135 deg - Ice		26.44	26.51	2209.28	-2205.90	-13.43
Wind 150 deg - Ice		18.76	32.56	2710.76	-1565.55	-16.19
Wind 180 deg - Ice		0.01	37.37	3117.40	-8.99	-18.09
Wind 210 deg - Ice		-18.74	32.55	2710.34	1547.68	-15.32
Wind 225 deg - Ice		-26.42	26.50	2208.69	2188.16	-12.22
Wind 240 deg - Ice		-33.05	19.12	1583.48	2719.36	-8.46
Wind 270 deg - Ice		-37.49	-0.01	0.60	3104.66	0.87
Wind 300 deg - Ice		-32.28	-18.69	-1557.54	2677.10	9.78
Wind 315 deg - Ice		-26.44	-26.51	-2207.26	2188.75	13.43
Wind 330 deg - Ice		-18.76	-32.56	-2708.73	1548.40	16.19
Total Weight	25.83			2.18	-6.15	
Wind 0 deg - Service		-0.00	-13.64	-1125.12	-7.14	6.59
Wind 30 deg - Service		6.61	-11.50	-956.48	-557.61	5.63
Wind 45 deg - Service		9.32	-9.35	-777.98	-783.27	4.60
Wind 60 deg - Service		11.36	-6.58	-547.47	-954.83	3.27
Wind 90 deg - Service		13.24	0.00	3.27	-1108.21	0.05
Wind 120 deg - Service		11.77	6.82	567.34	-978.21	-3.29
Wind 135 deg - Service		9.32	9.35	784.40	-783.54	-4.52
Wind 150 deg - Service		6.62	11.51	962.83	-557.93	-5.58
Wind 180 deg - Service		0.00	13.17	1104.51	-7.52	-6.43
Wind 210 deg - Service		-6.61	11.50	962.65	542.95	-5.63
Wind 225 deg - Service		-9.32	9.35	784.14	768.61	-4.60
Wind 240 deg - Service		-11.77	6.81	567.02	963.36	-3.30
Wind 270 deg - Service		-13.24	-0.00	2.89	1093.56	-0.05
Wind 300 deg - Service		-11.36	-6.59	-547.79	940.36	3.16
Wind 315 deg - Service		-9.32	-9.35	-778.24	768.88	4.52
Wind 330 deg - Service		-6.62	-11.51	-956.67	543.27	5.58

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 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice

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Comb. No.	Description
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	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	140 - 120	Leg	Max Tension	10	37.71	-0.01	-0.04
			Max. Compression	7	-42.64	0.31	0.03
			Max. Mx	15	14.34	0.71	-0.01
			Max. My	11	-4.21	-0.04	-1.37
			Max. Vy	2	-3.72	0.31	-0.04
			Max. Vx	11	-2.37	0.00	0.15
		Diagonal	Max Tension	10	5.03	0.00	0.00
			Max. Compression	2	-5.24	0.00	0.00
			Max. Mx	25	1.68	0.04	0.01
			Max. My	10	-4.73	-0.01	0.02
			Max. Vy	25	-0.02	0.04	0.01
			Max. Vx	10	-0.01	0.00	0.00
		Top Girt	Max Tension	2	0.67	0.00	0.00
			Max. Compression	10	-0.72	0.00	0.00
			Max. Mx	18	-0.00	-0.00	0.00
			Max. My	20	0.05	0.00	0.00
			Max. Vy	18	-0.01	0.00	0.00
			Max. Vx	20	0.00	0.00	0.00
T2	120 - 100	Leg	Max Tension	10	69.54	-0.11	-0.05
			Max. Compression	7	-75.98	0.50	-0.00

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T3	100 - 80	Diagonal	Max. Mx	2	-44.36	0.62	-0.13
			Max. My	26	-4.05	-0.01	-0.41
			Max. Vy	19	-5.13	0.51	0.01
			Max. Vx	11	-2.37	-0.00	0.35
			Max Tension	17	4.19	0.00	0.00
			Max. Compression	2	-4.33	0.00	0.00
			Max. Mx	24	2.85	0.03	0.00
			Max. My	10	-3.94	-0.01	0.01
			Max. Vy	24	-0.02	0.03	0.00
			Max. Vx	10	-0.00	0.00	0.00
		Leg	Max Tension	10	100.06	-0.13	0.00
			Max. Compression	24	-109.15	0.58	0.02
			Max. Mx	19	-73.44	0.94	-0.03
			Max. My	11	-4.59	-0.00	0.59
			Max. Vy	30	-5.90	0.58	0.02
			Max. Vx	28	-2.48	0.00	0.52
			Max Tension	34	4.97	0.00	0.00
			Max. Compression	34	-5.05	0.00	0.00
			Max. Mx	24	3.72	0.03	0.00
			Max. My	27	-4.24	-0.00	0.01
T4	80 - 60	Diagonal	Max. Vy	27	0.02	0.03	0.00
			Max. Vx	27	-0.00	0.00	0.00
			Max Tension	10	126.67	-0.25	-0.01
			Max. Compression	24	-140.45	0.73	0.02
			Max. Mx	19	-108.78	1.07	-0.08
			Max. My	20	-7.81	-0.04	-0.88
			Max. Vy	30	-6.90	0.72	0.01
			Max. Vx	28	-2.67	-0.04	0.88
			Max Tension	34	5.63	0.00	0.00
			Max. Compression	34	-5.76	0.00	0.00
		Leg	Max. Mx	24	4.29	0.06	0.00
			Max. My	27	-4.83	0.00	0.01
			Max. Vy	27	0.03	0.06	0.00
			Max. Vx	27	-0.00	0.00	0.00
			Max Tension	10	152.70	-0.42	0.07
			Max. Compression	24	-171.84	1.38	0.05
			Max. Mx	19	-171.75	1.39	-0.12
			Max. My	20	-7.82	-0.04	-1.10
			Max. Vy	30	-8.51	1.38	0.06
			Max. Vx	28	-3.16	0.31	0.97
T5	60 - 40	Diagonal	Max Tension	34	6.29	0.00	0.00
			Max. Compression	34	-6.66	0.00	0.00
			Max. Mx	19	4.45	0.06	-0.01
			Max. My	27	-5.33	0.02	0.01
			Max. Vy	27	0.03	0.06	0.01
			Max. Vx	27	-0.00	0.00	0.00
		Leg	Max Tension	10	178.30	-0.77	0.01
			Max. Compression	19	-202.84	-0.36	-0.07
			Max. Mx	27	177.57	-3.38	0.07
			Max. My	3	-6.05	-0.00	-1.24
			Max. Vy	32	10.57	-3.37	-0.03
			Max. Vx	28	-3.48	-1.87	0.66
T6	40 - 20	Diagonal	Max Tension	34	8.06	0.00	0.00
			Max. Compression	34	-7.64	0.00	0.00
			Max. Mx	27	4.22	0.09	0.01
			Max. My	27	-5.38	0.02	0.01
			Max. Vy	27	0.04	0.09	0.01
			Max. Vx	27	-0.00	0.00	0.00
		Leg	Max Tension	10	195.82	-1.24	0.00
			Max. Compression	19	-225.82	0.00	-0.00
			Max. Mx	27	185.12	-4.26	0.12

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Diagonal	Max. My	9	-8.10	-0.11	-3.11
			Max. Vy	32	10.58	-4.25	-0.06
			Max. Vx	28	-3.48	-2.01	0.95
			Max Tension	34	9.94	0.00	0.00
			Max. Compression	34	-9.60	0.00	0.00
			Max. Mx	21	3.75	0.18	0.01
			Max. My	26	-9.53	0.06	0.03
			Max. Vy	21	0.05	0.18	0.01
			Max. Vx	26	-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	30	230.00	18.37	-10.27
	Max. H _x	13	222.71	20.46	-11.44
	Max. H _z	21	-194.04	-20.70	12.14
	Min. Vert	5	-200.97	-18.74	10.46
	Min. H _x	22	-200.80	-21.54	12.10
	Min. H _z	13	222.71	20.46	-11.44
Leg B	Max. Vert	24	231.08	-18.08	-10.83
	Max. H _x	32	-199.82	21.22	12.64
	Max. H _z	33	-193.07	20.25	12.90
	Min. Vert	15	-200.29	18.43	10.99
	Min. H _x	7	223.51	-20.16	-12.00
	Min. H _z	7	223.51	-20.16	-12.00
Leg A	Max. Vert	19	231.24	0.64	21.11
	Max. H _x	31	13.35	2.30	-2.06
	Max. H _z	2	223.92	0.63	23.51
	Min. Vert	10	-201.89	-0.62	-21.53
	Min. H _x	7	-99.30	-2.36	-10.84
	Min. H _z	27	-201.22	-0.62	-24.75

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	25.83	0.00	0.00	2.20	-6.17	0.00
Dead+Wind 0 deg - No Ice	25.83	-0.01	-37.88	-3141.92	-5.74	18.39
Dead+Wind 30 deg - No Ice	25.83	18.37	-31.95	-2671.98	-1539.81	15.73
Dead+Wind 45 deg - No Ice	25.83	25.88	-25.97	-2174.50	-2168.70	12.87
Dead+Wind 60 deg - No Ice	25.83	31.55	-18.28	-1532.10	-2646.80	9.16
Dead+Wind 90 deg - No Ice	25.83	36.77	0.01	2.73	-3074.21	0.17
Dead+Wind 120 deg - No Ice	25.83	32.70	18.95	1574.70	-2711.86	-9.15
Dead+Wind 135 deg - No Ice	25.83	25.89	25.99	2179.66	-2169.40	-12.59
Dead+Wind 150 deg - No Ice	25.83	18.40	31.96	2676.91	-1540.68	-15.55
Dead+Wind 180 deg - No Ice	25.83	0.01	36.57	3071.79	-6.77	-17.96
Dead+Wind 210 deg - No Ice	25.83	-18.37	31.95	2676.45	1527.31	-15.74
Dead+Wind 225 deg - No Ice	25.83	-25.88	25.97	2178.98	2156.22	-12.88
Dead+Wind 240 deg - No Ice	25.83	-32.69	18.93	1573.86	2698.92	-9.24
Dead+Wind 270 deg - No Ice	25.83	-36.77	-0.01	1.70	3061.81	-0.17

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Load Combination	Vertical K	Shear _x K	Shear _y K	Overturning Moment, M _x kip-ft	Overturning Moment, M _y kip-ft	Torque kip-ft
Dead+Wind 300 deg - No Ice	25.83	-31.57	-18.30	-1533.04	2634.89	8.80
Dead+Wind 315 deg - No Ice	25.83	-25.89	-25.99	-2175.29	2156.97	12.60
Dead+Wind 330 deg - No Ice	25.83	-18.40	-31.96	-2672.54	1528.22	15.56
Dead+Ice+Temp	40.17	0.00	0.00	1.02	-8.63	0.00
Dead+Wind 0 deg+Ice+Temp	40.17	-0.01	-38.26	-3178.97	-8.31	18.60
Dead+Wind 30 deg+Ice+Temp	40.17	18.74	-32.55	-2720.60	-1572.04	15.42
Dead+Wind 45 deg+Ice+Temp	40.17	26.42	-26.50	-2216.67	-2215.42	12.31
Dead+Wind 60 deg+Ice+Temp	40.17	32.27	-18.68	-1563.88	-2706.15	8.38
Dead+Wind 90 deg+Ice+Temp	40.17	37.49	0.01	1.45	-3136.02	-0.84
Dead+Wind 120 deg+Ice+Temp	40.17	33.06	19.14	1591.38	-2749.35	-10.07
Dead+Wind 135 deg+Ice+Temp	40.17	26.44	26.51	2219.33	-2215.98	-13.48
Dead+Wind 150 deg+Ice+Temp	40.17	18.76	32.56	2723.09	-1572.73	-16.25
Dead+Wind 180 deg+Ice+Temp	40.17	0.01	37.37	3131.63	-9.13	-18.18
Dead+Wind 210 deg+Ice+Temp	40.17	-18.74	32.55	2722.73	1554.60	-15.43
Dead+Wind 225 deg+Ice+Temp	40.17	-26.42	26.50	2218.80	2198.01	-12.31
Dead+Wind 240 deg+Ice+Temp	40.17	-33.05	19.12	1590.71	2731.58	-8.53
Dead+Wind 270 deg+Ice+Temp	40.17	-37.49	-0.01	0.63	3118.68	0.84
Dead+Wind 300 deg+Ice+Temp	40.17	-32.28	-18.69	-1564.63	2689.20	9.80
Dead+Wind 315 deg+Ice+Temp	40.17	-26.44	-26.51	-2217.31	2198.61	13.47
Dead+Wind 330 deg+Ice+Temp	40.17	-18.76	-32.56	-2721.06	1555.33	16.25
Dead+Wind 0 deg - Service	25.83	-0.00	-13.64	-1129.71	-6.02	6.62
Dead+Wind 30 deg - Service	25.83	6.61	-11.50	-960.53	-558.30	5.66
Dead+Wind 45 deg - Service	25.83	9.32	-9.35	-781.43	-784.71	4.63
Dead+Wind 60 deg - Service	25.83	11.36	-6.58	-550.16	-956.83	3.30
Dead+Wind 90 deg - Service	25.83	13.24	0.00	2.39	-1110.71	0.06
Dead+Wind 120 deg - Service	25.83	11.77	6.82	568.32	-980.26	-3.30
Dead+Wind 135 deg - Service	25.83	9.32	9.35	786.11	-784.97	-4.54
Dead+Wind 150 deg - Service	25.83	6.62	11.51	965.13	-558.62	-5.61
Dead+Wind 180 deg - Service	25.83	0.00	13.17	1107.28	-6.39	-6.46
Dead+Wind 210 deg - Service	25.83	-6.61	11.50	964.95	545.89	-5.66
Dead+Wind 225 deg - Service	25.83	-9.32	9.35	785.86	772.30	-4.63
Dead+Wind 240 deg - Service	25.83	-11.77	6.81	568.01	967.67	-3.33
Dead+Wind 270 deg - Service	25.83	-13.24	-0.00	2.02	1098.31	-0.06
Dead+Wind 300 deg - Service	25.83	-11.36	-6.59	-550.49	944.61	3.17
Dead+Wind 315 deg - Service	25.83	-9.32	-9.35	-781.70	772.56	4.54
Dead+Wind 330 deg - Service	25.83	-6.62	-11.51	-960.72	546.21	5.61

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-25.83	0.00	0.00	25.83	0.00	0.000%
2	-0.01	-25.83	-37.88	0.01	25.83	37.88	0.000%
3	18.37	-25.83	-31.95	-18.37	25.83	31.95	0.000%
4	25.88	-25.83	-25.97	-25.88	25.83	25.97	0.000%
5	31.55	-25.83	-18.28	-31.55	25.83	18.28	0.000%
6	36.77	-25.83	0.01	-36.77	25.83	-0.01	0.002%
7	32.70	-25.83	18.95	-32.70	25.83	-18.95	0.000%
8	25.89	-25.83	25.99	-25.89	25.83	-25.99	0.000%
9	18.40	-25.83	31.96	-18.40	25.83	-31.96	0.000%
10	0.01	-25.83	36.57	-0.01	25.83	-36.57	0.000%
11	-18.37	-25.83	31.95	18.37	25.83	-31.95	0.000%
12	-25.88	-25.83	25.97	25.88	25.83	-25.97	0.000%
13	-32.69	-25.83	18.93	32.69	25.83	-18.93	0.000%
14	-36.77	-25.83	-0.01	36.77	25.83	0.01	0.000%
15	-31.57	-25.83	-18.30	31.57	25.83	18.30	0.000%
16	-25.89	-25.83	-25.99	25.89	25.83	25.99	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
17	-18.40	-25.83	-31.96	18.40	25.83	31.96	0.000%
18	0.00	-40.17	0.00	0.00	40.17	0.00	0.000%
19	-0.01	-40.17	-38.26	0.01	40.17	38.26	0.000%
20	18.74	-40.17	-32.55	-18.74	40.17	32.55	0.000%
21	26.42	-40.17	-26.50	-26.42	40.17	26.50	0.000%
22	32.27	-40.17	-18.68	-32.27	40.17	18.68	0.000%
23	37.49	-40.17	0.01	-37.49	40.17	-0.01	0.000%
24	33.06	-40.17	19.14	-33.06	40.17	-19.14	0.000%
25	26.44	-40.17	26.51	-26.44	40.17	-26.51	0.000%
26	18.76	-40.17	32.56	-18.76	40.17	-32.56	0.000%
27	0.01	-40.17	37.37	-0.01	40.17	-37.37	0.000%
28	-18.74	-40.17	32.55	18.74	40.17	-32.55	0.000%
29	-26.42	-40.17	26.50	26.42	40.17	-26.50	0.000%
30	-33.05	-40.17	19.12	33.05	40.17	-19.12	0.000%
31	-37.49	-40.17	-0.01	37.49	40.17	0.01	0.000%
32	-32.28	-40.17	-18.69	32.28	40.17	18.69	0.000%
33	-26.44	-40.17	-26.51	26.44	40.17	26.51	0.000%
34	-18.76	-40.17	-32.56	18.76	40.17	32.56	0.000%
35	-0.00	-25.83	-13.64	0.00	25.83	13.64	0.000%
36	6.61	-25.83	-11.50	-6.61	25.83	11.50	0.000%
37	9.32	-25.83	-9.35	-9.32	25.83	9.35	0.000%
38	11.36	-25.83	-6.58	-11.36	25.83	6.58	0.000%
39	13.24	-25.83	0.00	-13.24	25.83	-0.00	0.000%
40	11.77	-25.83	6.82	-11.77	25.83	-6.82	0.000%
41	9.32	-25.83	9.35	-9.32	25.83	-9.35	0.000%
42	6.62	-25.83	11.51	-6.62	25.83	-11.51	0.000%
43	0.00	-25.83	13.17	-0.00	25.83	-13.17	0.000%
44	-6.61	-25.83	11.50	6.61	25.83	-11.50	0.000%
45	-9.32	-25.83	9.35	9.32	25.83	-9.35	0.000%
46	-11.77	-25.83	6.81	11.77	25.83	-6.81	0.000%
47	-13.24	-25.83	-0.00	13.24	25.83	0.00	0.000%
48	-11.36	-25.83	-6.59	11.36	25.83	6.59	0.000%
49	-9.32	-25.83	-9.35	9.32	25.83	9.35	0.000%
50	-6.62	-25.83	-11.51	6.62	25.83	11.51	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	0.00000171
3	Yes	4	0.00000001	0.00000303
4	Yes	4	0.00000001	0.00000254
5	Yes	4	0.00000001	0.00000177
6	Yes	4	0.00000001	0.00000277
7	Yes	4	0.00000001	0.00000137
8	Yes	4	0.00000001	0.00000221
9	Yes	4	0.00000001	0.00000292
10	Yes	4	0.00000001	0.00000188
11	Yes	4	0.00000001	0.00000303
12	Yes	4	0.00000001	0.00000225
13	Yes	4	0.00000001	0.00000151
14	Yes	4	0.00000001	0.00000256
15	Yes	4	0.00000001	0.00000152
16	Yes	4	0.00000001	0.00000228
17	Yes	4	0.00000001	0.00000288

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18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000373
20	Yes	4	0.00000001	0.00000609
21	Yes	4	0.00000001	0.00000686
22	Yes	4	0.00000001	0.00000700
23	Yes	4	0.00000001	0.00000624
24	Yes	4	0.00000001	0.00000336
25	Yes	4	0.00000001	0.00000506
26	Yes	4	0.00000001	0.00000680
27	Yes	4	0.00000001	0.00000710
28	Yes	4	0.00000001	0.00000613
29	Yes	4	0.00000001	0.00000459
30	Yes	4	0.00000001	0.00000363
31	Yes	4	0.00000001	0.00000635
32	Yes	4	0.00000001	0.00000697
33	Yes	4	0.00000001	0.00000714
34	Yes	4	0.00000001	0.00000689
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
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	140 - 120	4.791	40	0.3695	0.0644
T2	120 - 100	3.325	40	0.3083	0.0476
T3	100 - 80	2.182	40	0.2251	0.0290
T4	80 - 60	1.342	40	0.1612	0.0189
T5	60 - 40	0.743	40	0.1127	0.0129
T6	40 - 20	0.333	40	0.0679	0.0080
T7	20 - 0	0.092	40	0.0316	0.0032

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.00	Lightning Rod 5/8x4'	40	4.791	0.3695	0.0644	46877
143.00	LNK-6512DS-T4M	40	4.791	0.3695	0.0644	46877
142.00	Rohn 14' Rotable Platform	40	4.791	0.3695	0.0644	46877
129.00	KMW AM-X-CD-14-65	40	3.959	0.3385	0.0556	21308

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
ft						
121.00	DB212-2-A	40	3.392	0.3120	0.0486	12702
119.00	DB212-2-A	40	3.259	0.3045	0.0466	12228
112.00	DB540K-E	40	2.825	0.2757	0.0396	13226
111.00	PD220	40	2.767	0.2714	0.0386	13442
108.00	DB810T3E-XT	40	2.597	0.2584	0.0357	14134
104.00	DB212-2-A	40	2.383	0.2414	0.0322	15176
101.00	PD1121-6	40	2.231	0.2291	0.0297	15991
97.00	10'x2 1/2" Pipe Mount	40	2.038	0.2138	0.0269	16815
96.00	DB212-2-A	40	1.992	0.2101	0.0263	16975
94.00	DB810T3E-XT	40	1.901	0.2031	0.0251	17288
90.00	PD340-1	40	1.728	0.1900	0.0230	17947
68.00	DB212-2-A	40	0.957	0.1313	0.0150	23164
67.00	Obstruction Light	40	0.928	0.1290	0.0147	23492
66.00	CCTV camera	40	0.900	0.1266	0.0145	23830
65.00	PD220	40	0.873	0.1243	0.0142	24178
54.00	Rohn 6' Side-Arm(1)	40	0.601	0.0987	0.0114	27120
43.00	2' DISH	40	0.384	0.0741	0.0087	29238
41.50	Misc - Dish Filter/TMA	40	0.358	0.0710	0.0083	29458
37.00	Misc - Dish Filter/TMA	40	0.286	0.0619	0.0072	29257
35.00	2' DISH	40	0.257	0.0580	0.0067	28877
33.00	Rohn 6' Side-Arm(1)	40	0.229	0.0542	0.0062	28486

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	140 - 120	13.122	7	0.9996	0.1791
T2	120 - 100	9.157	24	0.8399	0.1323
T3	100 - 80	6.065	24	0.6184	0.0805
T4	80 - 60	3.751	19	0.4459	0.0524
T5	60 - 40	2.084	19	0.3137	0.0357
T6	40 - 20	0.937	19	0.1898	0.0221
T7	20 - 0	0.259	19	0.0886	0.0088

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
ft						
145.00	Lightning Rod 5/8x4'	7	13.122	0.9996	0.1791	18152
143.00	LNx-6512DS-T4M	7	13.122	0.9996	0.1791	18152
142.00	Rohn 14' Rotable Platform	7	13.122	0.9996	0.1791	18152
129.00	KMW AM-X-CD-14-65	7	10.871	0.9192	0.1546	8251
121.00	DB212-2-A	24	9.335	0.8497	0.1349	4914
119.00	DB212-2-A	24	8.981	0.8299	0.1296	4721
112.00	DB540K-E	24	7.815	0.7537	0.1100	5032
111.00	PD220	24	7.657	0.7422	0.1071	5101
108.00	DB810T3E-XT	24	7.198	0.7077	0.0992	5321
104.00	DB212-2-A	24	6.615	0.6620	0.0894	5642
101.00	PD1121-6	24	6.200	0.6290	0.0826	5892
97.00	10'x2 1/2" Pipe Mount	24	5.672	0.5877	0.0748	6161

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
ft						
96.00	DB212-2-A	24	5.544	0.5779	0.0730	6218
94.00	DB810T3E-XT	24	5.295	0.5589	0.0697	6331
90.00	PD340-1	19	4.819	0.5234	0.0638	6568
68.00	DB212-2-A	19	2.682	0.3648	0.0418	8434
67.00	Obstruction Light	19	2.602	0.3584	0.0410	8551
66.00	CCTV camera	19	2.524	0.3520	0.0402	8671
65.00	PD220	19	2.447	0.3456	0.0394	8794
54.00	Rohn 6' Side-Arm(1)	19	1.689	0.2753	0.0316	9831
43.00	2' DISH	19	1.079	0.2072	0.0242	10513
41.50	Misc - Dish Filter/TMA	19	1.007	0.1984	0.0232	10579
37.00	Misc - Dish Filter/TMA	19	0.805	0.1730	0.0201	10476
35.00	2' DISH	19	0.723	0.1623	0.0187	10329
33.00	Rohn 6' Side-Arm(1)	19	0.645	0.1518	0.0173	10178

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	140	Diagonal	A325N	0.6250	1	5.24	6.44	0.813 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.6250	1	0.72	6.44	0.112 ✓	1.333	Bolt Shear
T2	120	Leg	A325N	0.8750	4	9.43	26.39	0.357 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	4.33	6.44	0.672 ✓	1.333	Bolt Shear
T3	100	Leg	A325N	1.0000	4	17.38	34.47	0.504 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	5.05	6.44	0.785 ✓	1.333	Bolt Shear
T4	80	Leg	A325N	1.0000	4	25.02	34.44	0.726 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	5.76	6.44	0.893 ✓	1.333	Bolt Shear
T5	60	Leg	A325N	1.0000	6	21.11	34.49	0.612 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	6.66	6.44	1.033 ✓	1.333	Bolt Shear
T6	40	Leg	A325N	1.0000	6	25.45	34.46	0.739 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	8.06	6.44	1.251 ✓	1.333	Bolt Shear
T7	20	Leg	A325N	1.0000	8	22.29	34.49	0.646 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	9.94	9.28	1.071 ✓	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _a ft	KI/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P/P _a
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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 P P _a
T1	140 - 120	ROHN 2.5 EH	20.03	3.99	51.8 K=1.00	24.065	2.2535	-42.64	54.23	0.786 ✓
T2	120 - 100	ROHN 3 EH	20.03	3.97	42.0 K=1.00	25.554	3.0159	-75.98	77.07	0.986 ✓
T3	100 - 80	ROHN 4 EH	20.03	4.97	40.4 K=1.00	25.781	4.4074	-109.15	113.63	0.961 ✓
T4	80 - 60	ROHN 5 EH	20.03	6.62	43.2 K=1.00	25.373	6.1120	-140.45	155.08	0.906 ✓
T5	60 - 40	ROHN 6 EHS	20.03	6.62	35.7 K=1.00	26.419	6.7133	-171.84	177.36	0.969 ✓
T6	40 - 20	ROHN 6 EH	20.03	6.62	36.2 K=1.00	26.353	8.4049	-202.85	221.49	0.916 ✓
T7	20 - 0	ROHN 8 EHS	20.03	9.98	41.0 K=1.00	25.691	9.7193	-225.82	249.70	0.904 ✓

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 P P _a
T1	140 - 120	L2x2x1/4	5.68	2.68	91.8 K=1.11	13.990	0.9380	-5.24	13.12	0.399 ✓
T2	120 - 100	L2x2x1/4	7.60	3.61	113.1 K=1.02	11.248	0.9380	-4.08	10.55	0.387 ✓
T3	100 - 80	L2x2x1/4	9.81	4.70	144.1 K=1.00	7.188	0.9380	-5.05	6.74	0.750 ✓
T4	80 - 60	L2 1/2x2 1/2x1/4	12.33	5.95	145.5 K=1.00	7.053	1.1900	-5.76	8.39	0.686 ✓
T5	60 - 40	L2 1/2x2 1/2x1/4	14.09	6.79	165.9 K=1.00	5.424	1.1900	-6.66	6.45	1.031 ✓
T6	40 - 20	L3x3x1/4	15.31	7.40	150.0 K=1.00	6.635	1.4400	-7.64	9.55	0.799 ✓
T7	20 - 0	L3 1/2x3 1/2x1/4	18.29	8.88	153.5 K=1.00	6.337	1.6900	-9.60	10.71	0.896 ✓

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 P P _a
T1	140 - 120	L2x2x1/4	2.63	2.12	92.5 K=1.42	13.902	0.9380	-0.72	13.04	0.055 ✓

Tension Checks

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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 P P _a
T1	140 - 120	ROHN 2.5 EH	20.03	3.99	51.8	30.000	2.2535	37.71	67.61	0.558 ✓
T2	120 - 100	ROHN 3 EH	20.03	3.97	42.0	30.000	3.0159	69.54	90.48	0.769 ✓
T3	100 - 80	ROHN 4 EH	20.03	4.97	40.4	30.000	4.4074	100.07	132.22	0.757 ✓
T4	80 - 60	ROHN 5 EH	20.03	6.62	43.2	30.000	6.1120	126.67	183.36	0.691 ✓
T5	60 - 40	ROHN 6 EHS	20.03	6.62	35.7	30.000	6.7133	152.70	201.40	0.758 ✓
T6	40 - 20	ROHN 6 EH	20.03	6.62	36.2	30.000	8.4049	178.30	252.15	0.707 ✓
T7	20 - 0	ROHN 8 EHS	20.03	9.98	41.0	30.000	9.7193	195.82	291.58	0.672 ✓

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 P P _a
T1	140 - 120	L2x2x1/4	5.68	2.68	55.6	29.000	0.5629	5.03	16.32	0.308 ✓
T2	120 - 100	L2x2x1/4	6.28	2.96	61.1	29.000	0.5629	4.19	16.32	0.257 ✓
T3	100 - 80	L2x2x1/4	9.81	4.70	95.2	29.000	0.5629	4.97	16.32	0.305 ✓
T4	80 - 60	L2 1/2x2 1/2x1/4	12.33	5.95	95.0	29.000	0.7519	5.63	21.80	0.258 ✓
T5	60 - 40	L2 1/2x2 1/2x1/4	14.09	6.79	108.1	29.000	0.7519	6.29	21.80	0.289 ✓
T6	40 - 20	L3x3x1/4	15.92	7.70	101.1	32.500	0.9394	8.06	30.53	0.264 ✓
T7	20 - 0	L3 1/2x3 1/2x1/4	19.14	9.30	104.0	32.500	1.1034	9.94	35.86	0.277 ✓

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 P P _a
T1	140 - 120	L2x2x1/4	2.63	2.12	47.1	29.000	0.5629	0.67	16.32	0.041 ✓

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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 P P _a
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Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P _{allow} K	% Capacity	Pass Fail
T1	140 - 120	Leg	ROHN 2.5 EH	2	-42.64	72.29	59.0	Pass
T2	120 - 100	Leg	ROHN 3 EH	38	-75.98	102.73	74.0	Pass
T3	100 - 80	Leg	ROHN 4 EH	71	-109.15	151.47	72.1	Pass
T4	80 - 60	Leg	ROHN 5 EH	98	-140.45	206.72	67.9	Pass
T5	60 - 40	Leg	ROHN 6 EHS	119	-171.84	236.42	72.7	Pass
T6	40 - 20	Leg	ROHN 6 EH	141	-202.85	295.25	68.7	Pass
T7	20 - 0	Leg	ROHN 8 EHS	162	-225.82	332.85	67.8	Pass
T1	140 - 120	Diagonal	L2x2x1/4	16	-5.24	17.49	29.9	Pass
							61.0 (b)	
T2	120 - 100	Diagonal	L2x2x1/4	43	-4.08	14.06	29.0	Pass
							50.4 (b)	
T3	100 - 80	Diagonal	L2x2x1/4	76	-5.05	8.99	56.2	Pass
							58.9 (b)	
T4	80 - 60	Diagonal	L2 1/2x2 1/2x1/4	103	-5.76	11.19	51.4	Pass
							67.0 (b)	
T5	60 - 40	Diagonal	L2 1/2x2 1/2x1/4	124	-6.66	8.60	77.4	Pass
							77.5 (b)	
T6	40 - 20	Diagonal	L3x3x1/4	151	-7.64	12.74	59.9	Pass
							93.8 (b)	
T7	20 - 0	Diagonal	L3 1/2x3 1/2x1/4	172	-9.60	14.28	67.2	Pass
							80.4 (b)	
T1	140 - 120	Top Girt	L2x2x1/4	4	-0.72	17.38	4.2	Pass
							8.4 (b)	
							Summary	
							Leg (T2)	Pass
							Diagonal (T6)	Pass
							Top Girt (T1)	Pass
							Bolt Checks	Pass
							RATING =	Pass

ANCHOR BOLT ANALYSIS

ANCHOR BOLT ANALYSIS

Input Data

Max Corner Reactions:

Uplift:	Uplift := 202·kips	<i>user input</i>
Shear:	Shear := 25·kips	<i>user input</i>
Compression:	Compression := 231·kips	<i>user input</i>

Anchor Bolt Data:

Use ASTM A354 Grade BC

Number of Anchor Bolts = N	N := 8	<i>user input</i>
Bolt Ultimate Strength:	$F_u := 125 \cdot \text{ksi}$	<i>user input</i>
Bolt Yield Strength:	$F_y := 109 \cdot \text{ksi}$	<i>user input</i>
Bolt Modulus:	$E := 29000 \cdot \text{ksi}$	<i>user input</i>
Thickness of Anchor Bolts	D := 1.0in	<i>user input</i>
Threads per Inch:	n := 8.0	<i>user input</i>
Coefficient of Friction:	$\mu := 0.55$	<i>user input</i> (for baseplate with grout ASCE 10-97)

Anchor Bolt Area:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \quad A_g = 0.785 \cdot \text{in}^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 \quad A_n = 0.606 \cdot \text{in}^2$$

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

$$\text{AllowableTension} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) \quad \text{AllowableTension} = 43.2 \cdot \text{kips}$$

Note: 1.333 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$$F_{\text{net.area}} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) \quad F_{\text{net.area}} = 52.8 \cdot \text{kips}$$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$$\text{MaxTension} := \frac{\text{Uplift}}{N} \quad \text{MaxTension} = 25.3 \cdot \text{kips}$$

Check Stresses:

$$\frac{\text{MaxTension}}{F_{\text{net.area}}} = 0.48$$

$$\text{Condition1} := \text{if} \left(\frac{\text{MaxTension}}{F_{\text{net.area}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$$

$$\text{Condition1} = \text{"OK"}$$



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Description	Anchor Bolt Analysis	Computed by	KAB	Sheet	3 of 3
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Check Anchor Bolt Area:

Based on the ASCE 10-97 Design of Latticed Steel Transmission Structures

Required Area:

$$A_{s1} := \frac{\text{Uplift}}{F_y} + \frac{\text{Shear}}{\mu \cdot 0.85 \cdot F_y} \quad A_{s1} = 2.3 \cdot \text{in}^2$$

$$A_{s2} := \left| \frac{\text{Shear} - (0.3 \cdot \text{Compression})}{\mu \cdot 0.85 \cdot F_y} \right| \quad A_{s2} = 0.9 \cdot \text{in}^2$$

Provided Area:

$$A_{\text{provided}} := A_n \cdot N \quad A_{\text{provided}} = 4.8 \cdot \text{in}^2$$

$$\text{Condition2} := \text{if} \left(\frac{A_{s1}}{A_{\text{provided}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right) \quad \frac{A_{s1}}{A_{\text{provided}}} = 0.48$$

Condition2 = "OK"

$$\text{Condition3} := \text{if} \left(\frac{A_{s2}}{A_{\text{provided}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right) \quad \frac{A_{s2}}{A_{\text{provided}}} = 0.18$$

Condition3 = "OK"

FOUNDATION ANALYSIS

Job 140' ROHN SSV Tower - Groton, CT
Description Foundation Analysis

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Computed by KAB
Checked by

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Date

PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower $M_t := 3179 \cdot \text{kip} \cdot \text{ft}$
Shear at Base of Tower $S_t := 38 \cdot \text{kip}$
Max Compressive Force $C_t := 231 \cdot \text{kip}$
Max Uplift $U_t := 202 \cdot \text{kip}$
Height of Tower $H_t := 140 \cdot \text{ft}$
Width of Tower at Base $W_t := 16.85 \cdot \text{ft}$
Weight of Tower $WT_t := 1.0 \cdot \text{kip}$

NOTE: Weight of Tower is incorporated into the other loads listed above and is therefore set equal to one for programming.

FOOTING DIMENSIONS:

Width of Footing $W_f := 26.5 \cdot \text{ft}$
Overall Depth of Footing $D_f := 4.0 \cdot \text{ft}$
Thickness of Footing $T_f := 4.5 \cdot \text{ft}$
Footing Extension Above Grade $E_{ftg} := 0.5 \cdot \text{ft}$
Reinforcement Cover: $C_{vr} := 3 \cdot \text{in}$
Length of Pier $L_p := 0 \cdot \text{ft}$
Extension of Pier Above Grade $L_{pag} := 0 \cdot \text{ft}$
Diameter of Pier $d_p := 0 \cdot \text{ft}$

MATERIAL PROPERTIES:

Compressive Strength of Concrete $f'_c := 3000 \cdot \text{psi}$
Yield Strength of Steel Reinforcement $f_y := 60000 \cdot \text{psi}$
Internal Friction Angle of Soil $\phi_s := 30 \cdot \text{deg}$
Allowable Bearing Capacity $q_s := 4000 \cdot \text{psf}$
Coefficient of Lateral Soil Pressure $K_p := \frac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$

Unit Weight of Soil $\gamma_s := 100 \cdot \text{pcf}$
Unit Weight of Concrete $\gamma_c := 150 \cdot \text{pcf}$
Depth to Neglect $n := 0 \cdot \text{ft}$
Cohesion of Clay Type Soil $c := 0 \cdot \text{ksf}$
Note: Use 0 for Sandy Soil

What is Position of Center of Tower with respect to Center of Pad?

1=Offset
2=Not Offset

$Pos_{tower} := 2$

STEEL REINFORCING:

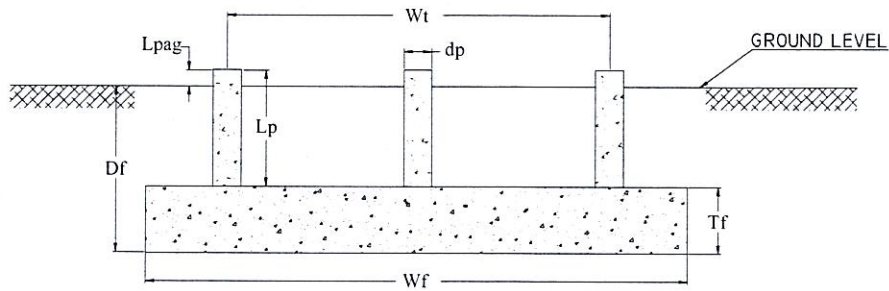
PIER REINFORCEMENT:

Bar Size $BS_{pier} := 0$ Bar Diameter $d_{bpier} := 0 \cdot \text{in}$
Number of Bars $NB_{pier} := 0$ Bar Area $A_{bpier} := 0 \cdot \text{in}^2$

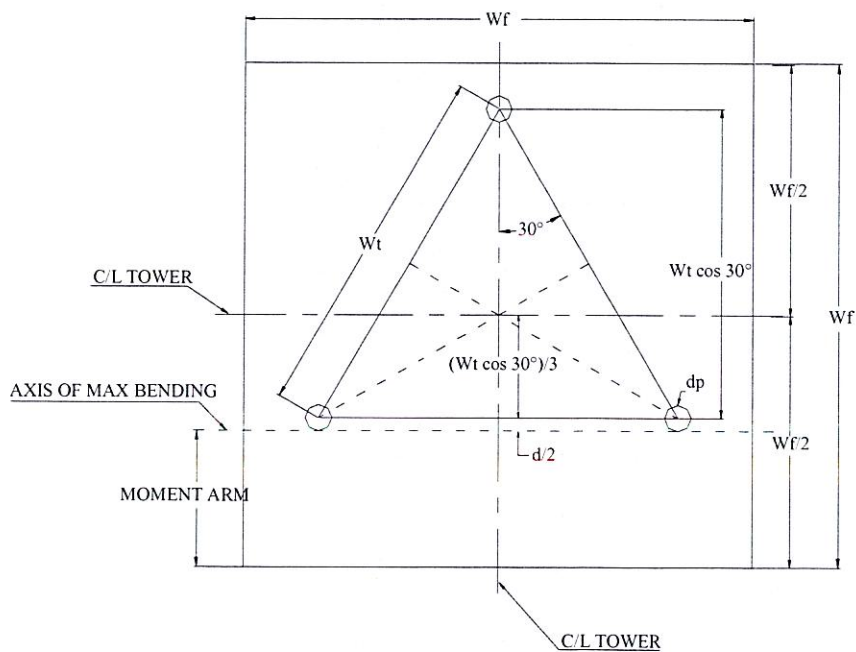
PAD REINFORCEMENT:

Bar Size $BS_{pad} := 8$ Bar Diameter $d_{bpad} := 1.000 \cdot \text{in}$
Number of Bars $NB_{pad} := 35$ Bar Area $A_{bpad} := 0.790 \cdot \text{in}^2$

FOUNDATION OVERVIEW



ELEVATION



PLAN

STABILITY OF FOOTING

Factor of Safety Req'd: $FS_{req} := 2.0$

Passive Pressure:

$$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} \quad P_{pn} = 0 \cdot \text{ksf}$$

$$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} \quad P_{pt} = -0.15 \cdot \text{ksf}$$

$$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}] \quad P_{top} = 0 \cdot \text{ksf}$$

$$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} \quad P_{bot} = 1.2 \cdot \text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} \quad P_{ave} = 0.6 \cdot \text{ksf}$$

Shear:

$$T_{pp} := \text{if}[n < (D_f - T_f), T_f, (D_f - n)] \quad T_{pp} = 4 \cdot \text{ft}$$

$$A_{pp} := W_f \cdot T_{pp} \quad A_{pp} = 106 \cdot \text{ft}^2$$

Ultimate Shear:

$$S_u := P_{ave} \cdot A_{pp} \quad S_u = 63.6 \cdot \text{kip}$$

Weight of Concrete Pad:

$$WT_c := (W_f^2 \cdot T_f) \cdot \gamma_c \quad WT_c = 474.0188 \cdot \text{kip}$$

Weight of Soil above Footing:

$$WT_{s1} := W_f^2 \cdot (D_f + E_{ftg} - T_f) \cdot \gamma_s \quad WT_{s1} = 0 \cdot \text{kip}$$

Weight of Soil Wedge at back face:

$$WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f \right] \cdot \gamma_s \quad WT_{s2} = 12.2398 \cdot \text{kip}$$

Distance to center of Tower Leg from Edge of Footing:

$$X_{t1} := \frac{W_f}{2} - \frac{W_t \cdot \cos(30 \cdot \text{deg})}{2} \quad X_{t2} := \frac{W_f}{2} - \frac{W_t \cdot \cos(30 \cdot \text{deg})}{3}$$

$$X_t := \text{if}(\text{Pos}_{tower} = 1, X_{t1}, X_{t2}) \quad X_t = 8.3858 \cdot \text{ft}$$

Additional Offset of Footing:

$$X_{off1} := \frac{W_f}{2} - \left(\frac{W_t \cdot \cos(30 \cdot \text{deg})}{3} + X_t \right) \quad X_{off2} := 0$$

$$X_{off} := \text{if}(\text{Pos}_{tower} = 1, X_{off1}, X_{off2}) \quad X_{off} = 0 \cdot \text{ft}$$

Resisting Moment:

$$M_r := (WT_c + WT_{s1}) \cdot \frac{W_f}{2} + WT_t \cdot \left(\frac{W_f}{2} - X_{off} \right) + S_u \cdot \frac{T_{pp}}{3} + WT_{s2} \cdot \left(W_f + \frac{T_{pp} \cdot \tan(\phi_s)}{3} \right) \quad M_r = 6712.576 \cdot \text{kip} \cdot \text{ft}$$

Overtuning Moment:

$$M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off} \quad M_{ot} = 3350 \cdot \text{kip} \cdot \text{ft}$$

Factor of Safety:

$$FS := \frac{M_r}{M_{ot}} \quad FS = 2$$

$$\text{SafetyCheck} := \text{if}(FS > FS_{req}, \text{"Okay"}, \text{"No Good"}) \quad \text{SafetyCheck} = \text{"Okay"}$$

BEARING PRESSURE CHECK:

Pressure Applied:

$$\text{LOAD}_{\text{tot}} := \text{WT}_c + \text{WT}_{s1} + \text{WT}_t \quad \text{LOAD}_{\text{tot}} = 475.0188 \cdot \text{kip}$$

$$A_{\text{mat}} := W_f^2 \quad A_{\text{mat}} = 702.25 \cdot \text{ft}^2$$

$$S := \frac{W_f^3}{6} \quad S = 3101.6042 \cdot \text{ft}^3$$

$$P_{\text{max}} := \frac{\text{LOAD}_{\text{tot}}}{A_{\text{mat}}} + \frac{M_{\text{ot}}}{S} \quad P_{\text{max}} = 1.7565 \cdot \text{ksf}$$

$$P_{\text{min}} := \frac{\text{LOAD}_{\text{tot}}}{A_{\text{mat}}} - \frac{M_{\text{ot}}}{S} \quad P_{\text{min}} = -0.4037 \cdot \text{ksf}$$

$$\text{MaxPressure} := \text{if}(P_{\text{max}} < q_s, \text{"Okay"}, \text{"No Good"}) \quad \text{MaxPressure} = \text{"Okay"}$$

$$\text{MinPressure} := \text{if}[(P_{\text{min}} \geq 0) \cdot (P_{\text{min}} < q_s), \text{"Okay"}, \text{"No Good"}] \quad \text{MinPressure} = \text{"No Good"}$$

Distance to Resultant of Pressure Distribution:

$$X_p := \frac{P_{\text{max}}}{P_{\text{max}} - P_{\text{min}}} \cdot \frac{1}{3} \quad X_p = 7.1827 \cdot \text{ft}$$

$$X_k := \frac{W_f}{3}$$

Distance to Kern:

$$X_k := \frac{W_f}{3} \quad X_k = 8.8333 \cdot \text{ft}$$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity:

$$e := \frac{M_{\text{ot}}}{\text{LOAD}_{\text{tot}}} \quad e = 7.0524$$

Adjusted Soil Pressure:

$$q_a := \frac{2 \cdot \text{LOAD}_{\text{tot}}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e \right)} \quad q_a = 1.9282 \cdot \text{ksf}$$

Revised Maximum:

$$q_{\text{max}} := \text{if}(X_p < X_k, q_a, P_{\text{max}}) \quad q_{\text{max}} = 1.9282 \cdot \text{kip}$$

$$\text{PressureCheck} := \text{if}(q_{\text{max}} < q_s, \text{"Okay"}, \text{"No Good"}) \quad \text{PressureCheck} = \text{"Okay"}$$

CHECK PUNCHING AND BEAM SHEAR:

Load Factor: (EIA 3.1.1) $LF := \text{if} \left[H_t \leq 700 \cdot \text{ft}, 1.333, \text{if} \left[H_t \geq 1200, 1.7, 1.333 + \left(\frac{H_t - 700}{1200 - 700} \right) \cdot (1.7 - 1.333) \right] \right]$

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := .85$ (ACI 9.3.2.3)

$d := T_f - C_{vr} - .5 \cdot \text{in}$

$d = 50.5 \cdot \text{in}$

Factored load: $FL := LF \cdot \frac{C_t}{W_f^2}$

$FL = 0.4385 \cdot \text{ksf}$

$V_{req} := \frac{FL \cdot (X_t - 0.5 \cdot d_p - d) \cdot W_f}{\phi_c}$

$V_{req} = 57.1075 \cdot \text{kip}$

ACI 11.3.1.1

$V_{Avail} := 2 \cdot \sqrt{f_c \cdot \text{psi}} \cdot W_f \cdot d$

$V_{Avail} = 1759.1753 \cdot \text{kip}$

$\text{BeamShearCheck} := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$

$\text{BeamShearCheck} = \text{"Okay"}$

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.12.2.1)

$b_o := (d_p + d) \cdot \pi$

$b_o = 13.2209 \cdot \text{ft}$

$V_{req} := FL \cdot \frac{W_f^2 - (d_p + d)^2 \cdot \frac{\pi}{4}}{\phi_c}$

$V_{req} = 355.087 \cdot \text{kip}$

$V_{Avail} := 4 \cdot \sqrt{f_c \cdot \text{psi}} \cdot b_o \cdot d$

$V_{Avail} = 1755.3077 \cdot \text{kip}$

$\text{PunchingShearCheck} := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$

$\text{PunchingShearCheck} = \text{"Okay"}$

TENSILE REINFORCEMENT IN PAD:

$$\phi_m := .90 \text{ per ACI 9.3.2.2}$$

Applied Moments:

$$M_{nT} := LF \cdot \left[U_t \cdot \left(W_t \cdot \sin(60 \cdot \text{deg}) - \frac{d_p}{2} \right) + S_t \cdot (D_f + L_{\text{pag}}) \right] - W_{T_t} \cdot X_{\text{off}}$$

$$M_{nS} := -1 \cdot \left[\frac{1}{2} \cdot \left(\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot \text{deg}) - \frac{d_p}{2} \right)^2 \cdot W_t \cdot [\gamma_s \cdot (T_{pp} - T_f)] + W_{T_{s2}} \cdot \left[\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot \text{deg}) - \frac{d_p}{2} + (D_f - n) \cdot \tan(\phi_s) \right] \right]$$

$$M_{nC} := -1 \cdot \left[\frac{1}{2} \cdot \left(\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot \text{deg}) - \frac{d_p}{2} \right)^2 \cdot W_t \cdot (\gamma_c \cdot T_f) \right]$$

$$\text{Design Moment: } M_n := \frac{M_{nT} + M_{nS} + M_{nC}}{\phi_m} \quad M_n = 2393.48 \cdot \text{kips} \cdot \text{ft}$$

Required Reinforcement:

$$\text{ACI 10.2.7.3} \quad \beta := \text{if} \left[f_c \leq 4000 \cdot \text{psi}, .85, \text{if} \left[f_c \geq 8000 \cdot \text{psi}, .65, .85 - \left(\frac{\frac{f_c}{\text{psi}} - 4000}{1000} \right) \cdot .05 \right] \right] \quad \beta = 0.85$$

$$\text{Effective Width: } b_{\text{eff}} := W_t \cdot \cos(30 \cdot \text{deg}) + d_p \quad b_{\text{eff}} = 175.1103 \cdot \text{in}$$

$$A_s := \frac{M_n}{\phi_m \cdot f_y \cdot d} \quad A_s = 10.5324 \cdot \text{in}^2$$

$$a := \frac{A_s \cdot f_y}{\beta \cdot f_c \cdot b_{\text{eff}}} \quad a = 1.4152 \cdot \text{in}$$

$$A_s := \frac{M_n}{f_y \cdot \left(d - \frac{a}{2} \right)} \quad A_s = 9.6138 \cdot \text{in}^2$$

$$\rho := \frac{A_s}{b_{\text{eff}} \cdot d} \quad \rho = 0.0011$$

Job 140' ROHN SSV Tower - Groton, CT

Project No. VZ5-145

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Description Foundation Analysis

Computed by KAB

Date 12/06/12

Checked by

Date

Temperature and Shrinkage: (ACI 7.12.2.1b)

$$\rho_{sh} := \text{if}(f_y \geq 60000 \cdot \text{psi}, 0.0018, 0.0020)$$

$$\rho_{sh} = 0.0018$$

Area Required:

$$A_s := \text{if}\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$$

$$A_s = 7.9588 \cdot \text{in}^2$$

Area Provided:

$$A_{s_{prov}} := A_{b_{pad}} \cdot N_{b_{pad}}$$

$$A_{s_{prov}} = 27.65 \cdot \text{in}^2$$

$$\text{PadReinforcement} := \text{if}(A_{s_{prov}} > A_s, \text{"Okay"}, \text{"No Good"})$$

$$\text{PadReinforcement} = \text{"Okay"}$$

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 12.2.3)

Bar Spacing:

$$B_{s_{pad}} := \frac{W_f - 2 \cdot C_{vr} - N_{b_{pad}} \cdot d_{b_{pad}}}{N_{b_{pad}} - 1}$$

$$B_{s_{pad}} = 8.1471 \cdot \text{in}$$

Development Length Factors:

Reinforcement Location Factor $\alpha := 1.0$

Coating Factor $\beta := 1.0$

Concrete strength Factor $\lambda := 1.0$

Reinforcement Size Factor $\gamma := 1.0$

Spacing or Cover Dimension:

$$c := \text{if}\left(C_{vr} < \frac{B_{s_{pad}}}{2}, C_{vr}, \frac{B_{s_{pad}}}{2}\right) \quad c = 3 \cdot \text{in}$$

Transverse Reinforcement Inde As allowed by ACI 12.2.4

$$k_{tr} := 0$$

Development Length:

$$L_{dbt} := \frac{3}{40} \cdot \frac{f_y}{\sqrt{f'_c \cdot \text{psi}}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{b_{pad}}}} \cdot d_{b_{pad}}$$

$$L_{dbt} = 27.3861 \cdot \text{in}$$

$$L_{dbmin} := 12 \cdot \text{in}$$

Minimum Development Length: $L_{dbtCheck} := \text{if}(L_{dbt} \geq L_{dbmin}, \text{"Use } L_{dbt}\text{"}, \text{"Use } L_{dbmin}\text{"})$
(ACI 12.2.1)

$$L_{dbtCheck} = \text{"Use } L_{dbt}\text{"}$$

Available Length in Pad:

$$L_{pad} := \frac{W_f}{2} - \frac{W_t}{2} - C_{vr}$$

$$L_{pad} = 54.9 \cdot \text{in}$$

$$L_{padTension} := \text{if}(L_{pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$$

$$L_{padTension} = \text{"Okay"}$$