STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION OF CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS FOR A DECLARATORY RULING FOR APPROVAL OF AN ELIGIBLE FACILITY REQUEST FOR MODIFICATIONS TO AN EXISTING TELECOMMUNICATIONS FACILITY AT 900 OLD TOWN ROAD (a/k/a ROCKY HILL ROAD), TRUMBULL, CONNECTICUT	:	SUB-PETITION NO. 1133 900 OLD TOWN ROAD (a/k/a ROCKY HILL ROAD) TRUMBULL, CT JUNE 2, 2016

SUB-PETITION FOR DECLARATORY RULING:
ELIGIBLE FACILITIES REQUEST FOR MODIFICATIONS
THAT WILL NOT SUBSTANTIALLY CHANGE THE
PHYSICAL DIMENSIONS OF AN EXISTING WIRELESS BASE STATION

I. Introduction

Pursuant to Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, codified at 47 U.S.C. § 1455(a) ("Section 6409(a)") and the October 21, 2014 Report and Order (FCC-14-533) issued by the Federal Communications Commission ("FCC") (the "FCC Order"), Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby petitions the Connecticut Siting Council (the "Council") for a declaratory ruling ("Sub-Petition") that the proposed modifications to an existing telecommunications facility at 900 Old Town Road (a/k/a Rocky Hill Road) in Trumbull, Connecticut (the "Property") constitutes an Eligible Facilities Request ("EFR") under the FCC Order. Cellco has designated this site as its Trumbull 4 Facility.

II. Factual Background

Eversource Energy ("Eversource") currently maintains a 150-foot electric transmission line tower in the northern-most portion of the Property. The Property, a 38.62-acre parcel, is owned by Par Old Town LLC and is surrounded by State Highway 25 to the east, the Merritt Parkway to the north, and single-family and multi-family residential uses to the west and south. *See* Attachment 1 – Site Vicinity and Site Schematic Maps (Aerial Photograph). On July 23, 1998, the Council approved a request of Omnipoint Communication, now T-Mobile ("T-Mobile") to install antennas on a mast attached to the top of the 150-foot transmission line structure. (See Council Petition No. 400). The mast and antennas extend to an overall height of 168.5 feet above grade. Equipment associated with T-Mobile's antenna is located on the ground near the base of the transmission line tower.

III. Proposed Trumbull 4 Facility

Cellco intends to install a total of three (3) antennas and three (3) remote radio heads ("RRHs") at the 90-foot level of the tower. Cellco will install two (2) equipment cabinets and a diesel fueled back-up generator on a 10'-6" x 16'-6" steel platform near the base of the tower. Power and telephone service will extend underground from a new multi-meter utility backboard that Cellco will install at the site. Project Plans for the proposed Trumbull 4 Facility are included in Attachment 2. Specifications for Cellco's antennas, RRHs and back-up generator are included in Attachment 3. As indicated in the Structural Design of Antenna Mast and Tower Analysis ("Structural Report") included in Attachment 4, the existing Eversource tower can accommodate Cellco's proposed antenna installation.

IV. Discussion

A. The Proposed Modification Will Not Cause a Substantial Change to the Physical Dimensions of the Existing Base Station

Section 6409(a) provides, in relevant part, that "a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station." Pursuant to the FCC Order, the proposed modification does not substantially change the physical dimensions of the base station if the following criteria are satisfied.

1. *The proposed modified facility will not increase the height of the base station by more than ten (10) percent or ten (10) feet, whichever is greater.* Cellco intends to install three (3) antennas on the existing tower at the 90-foot level of the 150-foot tower.

2. *The proposed facility will not protrude from the edge of the structure more than six (6) feet.* Cellco's proposed antennas will not protrude more than six (6) feet from the edge of the tower structure.

3. *The proposed facility does not involve installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets.* Cellco intends to install two (2) equipment cabinets and a diesel-fuel generator on a steel platform near the base of the structure.

4. *The proposed facility does not entail any excavation or deployment outside the current site of the base station.* Excavation required for the new equipment platform and related site development activity will occur within the limits of the Eversource right of way on the Property and the existing fence of compound.

5. *The proposed facility does not defeat the existing concealment elements of the base station.* No concealment elements have been incorporated into the existing T-Mobile antenna installation and none are proposed by Cellco.

6. *The proposed facility complies with conditions associated with the prior approval of construction or modification of the base station.* None of the elements of Cellco's proposed facility conflict with any of the existing facility improvements or prior Council approvals for the use of the former transmission line tower.

B. FCC Compliance

Radio frequency ("RF") emissions from Cellco's proposed installation will be well below the standards adopted by the FCC. Included in Attachment 5 is a General Power Density Table indicating that cumulative worst-case RF emissions calculation for the existing T-Mobile installation and Cellco's proposed modifications.

C. Notice to the Town, Property Owner and Abutting Landowners

On June 2, 2016, a copy of this Sub-Petition was sent to Trumbull's First Selectman, Timothy M. Herbst; Bridgeport's Mayor, Joseph P. Ganim[1]; Par Old Town LLC, the owner of the Property; and Eversource, the owner of the tower. *See* Attachment 6.

Copies of this Sub-Petition were also sent to the owners of land that abuts the Property. A sample abutter's cover letter and the list of those abutting landowners who were sent a copy of the Sub-Petition is included in Attachment 7.

V. Conclusion

Based on the information provided above, Cellco respectfully submits that the proposed modification of the existing base station at the Property constitutes an "eligible facilities request" under Section 6409(a) and the FCC Order.

[1] The existing lattice tower is located within 2,500 feet of the Trumbull-Bridgeport town line. (*See* Attachment 2, Plan Sheet C-1).

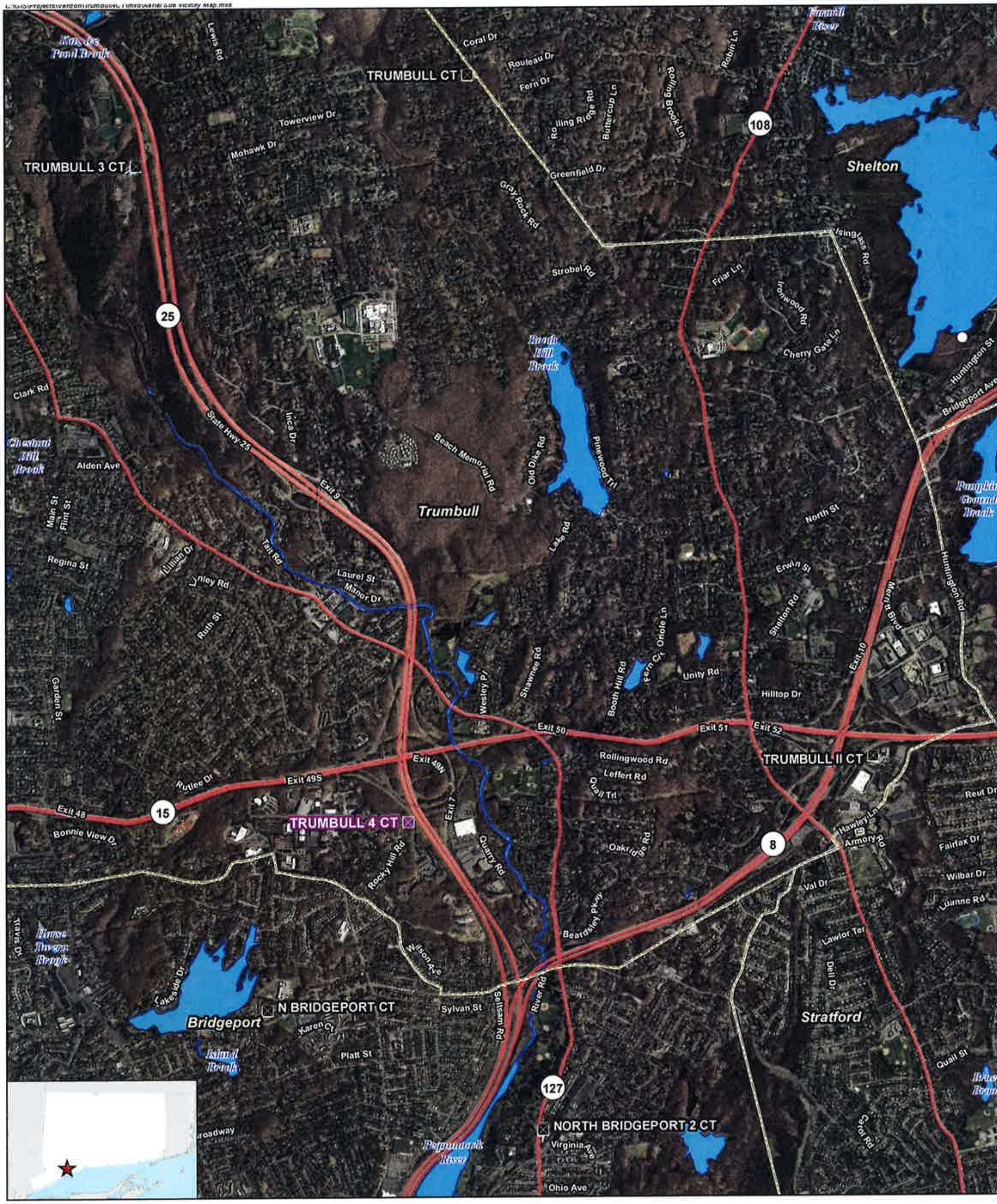
Respectfully submitted,

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

By ______________________________

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597
(860) 275-8200
Its Attorneys

ATTACHMENT 1



Legend

- Proposed Verizon Wireless Facility
- Surrounding Verizon Wireless Facilities
- Municipal Boundary
- Waterbody

Base Map Source: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 3,000 feet
Map Date: February 2016

3,000 1,500 0 3,000 Feet

N S E W

Site Vicinity Map

Proposed Wireless
Telecommunications Facility
Trumbull 4
Eversource Structure #845
900 Old Town Road
(aka Rocky Hill Road)
Trumbull, Connecticut

verizon
ALL-POINTS TECHNOLOGY CORPORATION

Legend

Existing Utility Structure Site

Equipment Area

Host Property

Municipal Boundary

Map Notes:
Base Map Source: 2012 Aerial Photograph (CT ECO)
Map Scale: 1 inch = 300 feet
Map Date: February 2016

N W E S

300 150 0 300 Feet

Site Schematic

Proposed Wireless
Telecommunications Facility
Trumbull 4
Eversource Structure #845
900 Old Town Road
(aka Rocky Hill Road)
Trumbull, Connecticut

verizon

ALL-POINTS TECHNOLOGY CORPORATION

ATTACHMENT 2

verizon

WIRELESS COMMUNICATIONS FACILITY

TRUMBULL 4

EVERSOURCE STRUCTURE #845

900 OLD TOWN ROAD (AKA ROCKY HILL ROAD)

TRUMBULL, CT 06611

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE
EAST HARTFORD, CONNECTICUT

TO: ROCKY HILL ROAD
TRUMBULL, CONNECTICUT

1.	HEAD SOUTHWEST ON E RIVER DR TOWARD PITKIN ST	0.9 MI
2.	CONTINUE ONTO E RIVER DR EXTENSION	0.3 MI
3.	TURN RIGHT ONTO THE US-5 S/CT-15 S RAMP TO NEW HAVEN/I-91 S	0.2 MI
4.	MERGE ONTO US-5 S	0.8 MI
5.	TAKE EXIT 86 TO MERGE ONTO I-91 S TOWARD NEW HAVEN/NYC	17.1 MI
6.	TAKE EXIT 17 TO MERGE ONTO CT-15 S/WILBUR CROSS PKWY	31.9 MI
7.	TAKE EXIT 50 FOR CT-127 TOWARD TRUMBULL	0.2 MI
8.	TURN RIGHT ONTO CT-127 N/WHITE PLAINS RD	0.9 MI
9.	TURN LEFT ONTO RESERVOIR AVE	1.0 MI
10.	TURN LEFT ONTO ROCKY HILL TERRACE	0.3 MI
11.	TURN LEFT ONTO ROCKY HILL RD AND DESTINATION WILL BE ON THE RIGHT	0.1 MI

GENERAL NOTES

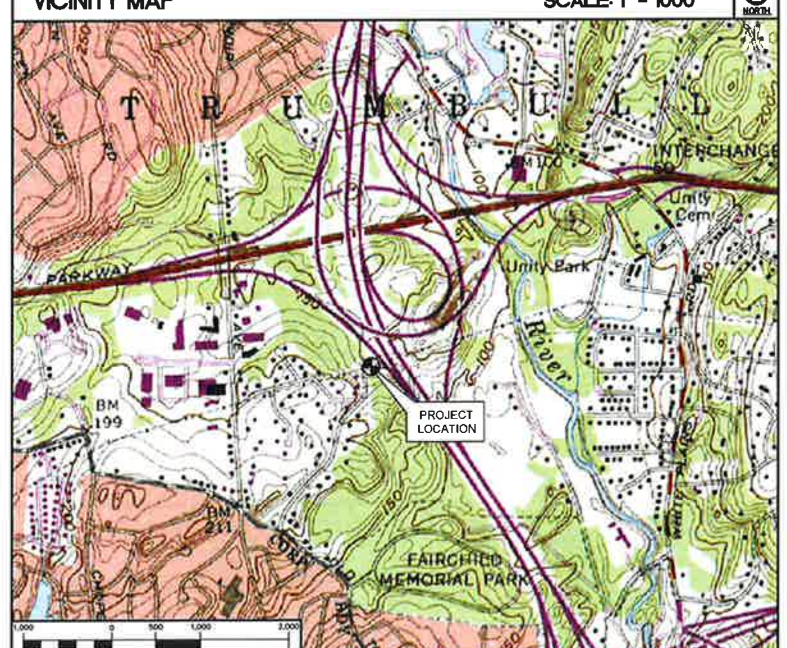
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF PROPOSED CELLCO PARTNERSHIP EQUIPMENT AND DIESEL FUELED GENERATOR MOUNTED TO A PROPOSED ±10'-6"x16'-6" STEEL GRATING PLATFORM AT GRADE.
2. A TOTAL OF THREE (3) PROPOSED DIRECTIONAL PANEL ANTENNAS AND ASSOCIATED APPURTENANCES ARE TO BE MOUNTED ON AN EXISTING 150' TALL EVERSOURCE STEEL TRANSMISSION TOWER WITH AN ANTENNA CENTERLINE ELEVATION OF ±80' AGL.
3. POWER AND TELCO UTILITIES DEPICTED HEREIN ARE TENTATIVE. FINAL ROUTING TO BE DETERMINED DURING THE CONSTRUCTION DOCUMENT PHASE OF PROJECT.
4. THE PROPOSED WIRELESS FACILITY INSTALLATION WILL BE DESIGNED IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2009 CONNECTICUT SUPPLEMENT.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	TRUMBULL 4
SITE ADDRESS:	900 OLD TOWN ROAD (AKA ROCKY HILL ROAD) (EVERSOURCE STRUCTURE #845) TRUMBULL, CT 06611
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON:	DAVID VIVIAN CELLCO PARTNERSHIP (860) 706-4373
LEGAL/REGULATORY COUNSEL:	KENNETH C. BALDWIN, ESQ. ROBINSON & COLE (860) 275-8345
TOWER COORDINATES:	LATITUDE: 41°-13'-53.64"N LONGITUDE: 73°-11'-24.00"W GROUND ELEVATION: ±164' A.M.S.L. SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM THE CONNECTICUT SITING COUNCIL DATABASE.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	1
C-1	ABUTTERS MAP	1
C-2	SITE PLAN, ELEVATION AND ANTENNA MOUNTING CONFIG.	1

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	04/27/16	KAMJR	DMD	ISSUED FOR CSC
0	02/17/16	HMR	CFC	ISSUED FOR CSC-CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

verizon

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

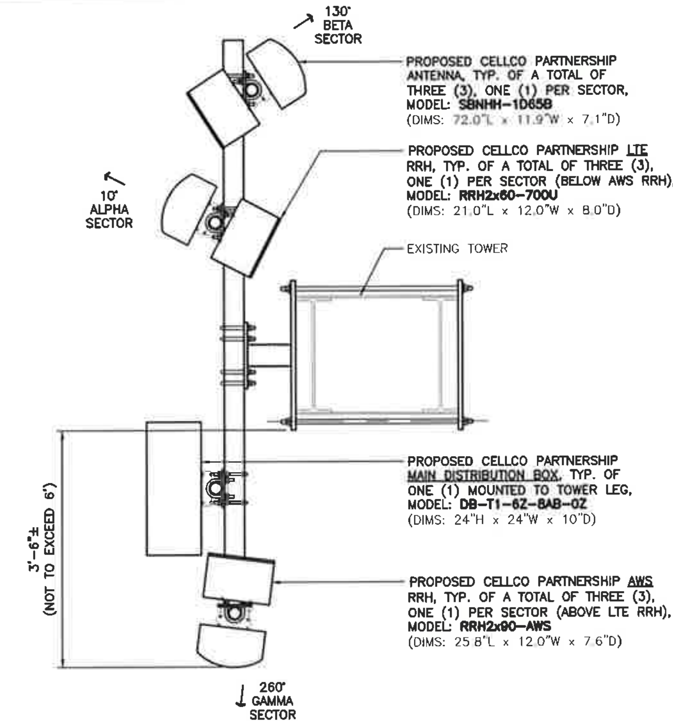
Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
TRUMBULL 4
EVERSOURCE STRUCTURE #845
900 OLD TOWN ROAD (AKA ROCKY HILL ROAD)
TRUMBULL, CT 06611

DATE: 02/08/16
SCALE: AS NOTED
JOB NO. 15240.000

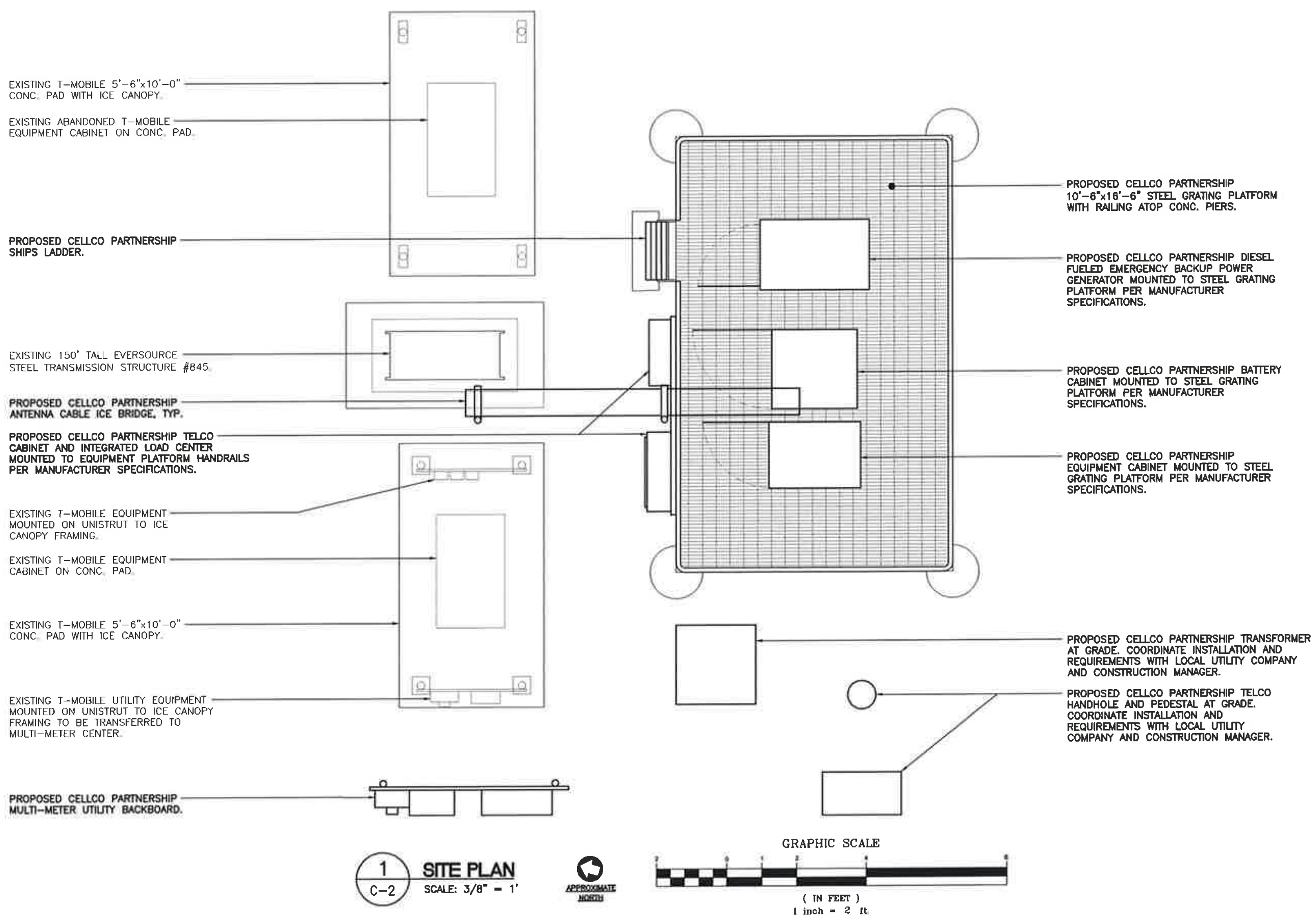
TITLE SHEET

T-1

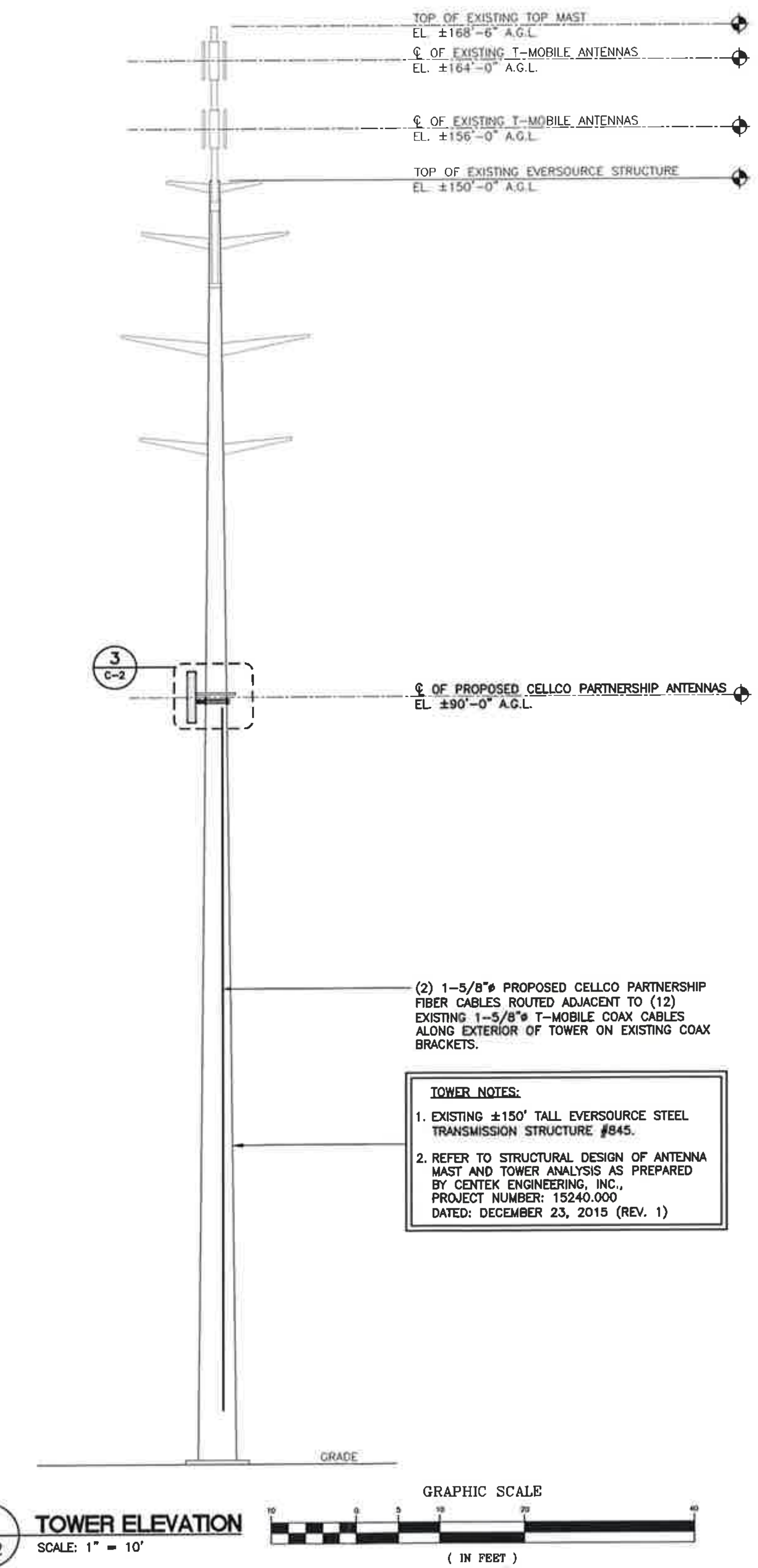
Sheet No. 1 of 3



3 C-2 **ANTENNA MOUNTING CONFIGURATION**
SCALE: 3/4" = 1'-0"



1 C-2 **SITE PLAN**
SCALE: 3/8" = 1'



TOWER NOTES:

1. EXISTING ±150' TALL EVERSOURCE STEEL TRANSMISSION STRUCTURE #845.
2. REFER TO STRUCTURAL DESIGN OF ANTENNA MAST AND TOWER ANALYSIS AS PREPARED BY CENTEK ENGINEERING, INC., PROJECT NUMBER: 15240.000 DATED: DECEMBER 23, 2015 (REV. 1)

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	04/27/16	KAMJR	DMD	ISSUED FOR CSC
0	02/17/16	HMR	CFC	ISSUED FOR CSC-CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

verizon

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

Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
TRUMBULL 4
EVERSOURCE STRUCTURE #845
900 OLD TOWN ROAD (AKA ROCKY HILL ROAD)
TRUMBULL, CT 06611

DATE: 02/08/16
SCALE: AS NOTED
JOB NO. 15240.000

SITE PLAN, ELEVATION & ANTENNA MOUNTING CONFIG.

C-2

Sheet No. 3 of 3

ATTACHMENT 3

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

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

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Performance Note	Outdoor usage

Product Specifications

SBNHH-1D65B

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Depth	180.0 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

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

Packed Dimensions

Depth	299.0 mm | 11.8 in
Length	1970.0 mm | 77.6 in
Width	409.0 mm | 16.1 in
Shipping Weight	31.0 kg | 68.3 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

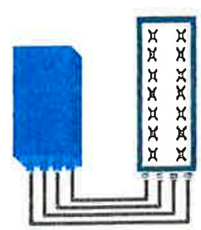
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

TECHNICAL SPECIFICATIONS

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

ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the 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 a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-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.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

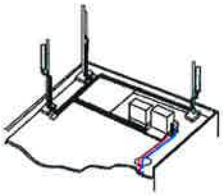
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

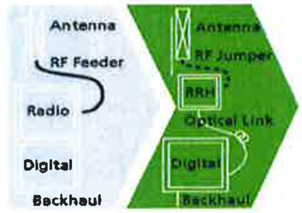
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

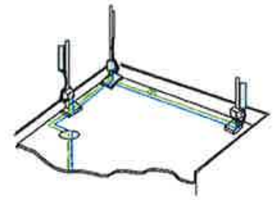
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

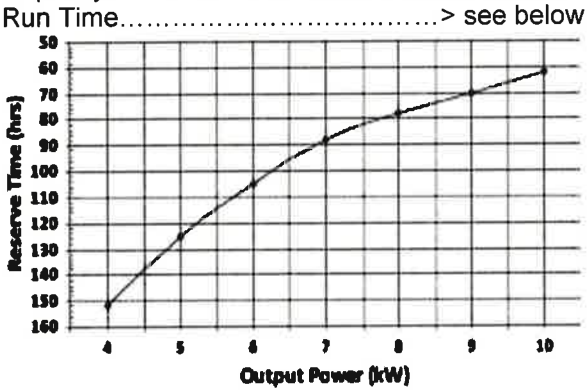
Alcatel·Lucent

AT THE SPEED OF IDEAS™

8220I-3CA1 GENERATOR SET SPECIFICATIONS
10kW Diesel

ENGINE
Engine……………………………………Isuzu 3CA1
Cylinders……………………………………3 In-line
Displacement……………………………………854
Aspiration……………………………………Natural
Emissions………………..EPA and CARB Certified
Variable RPM ………….2300RPM to 2600RPM
Engine Start SuperCapacitor ……………..14.4V
SuperCapacitor DC-DC Charger……………>1A
Muffler……………………………………………Dual
Radiator……………………………………Aluminum
with Electric Fan

FUEL SYSTEM
Type……………………………………………Diesel
Fuel Tank…………………Double Wall – UL 142
Capacity…………………………………54 Gallons
Run Time………………………………> see below



ALTERNATOR
Type……………………………Permanent Magnet
Regulation Type……………………RPM Control
Output Ripple……….Less than 50 milivolts RMS
No. of Poles……………………………………32
Overcurrent Protection…………………………250A
Disconnect Means…………….Fused Disconnect

ENGINE CONTROLLER
Engine Controller model…………..Supra 250
Instrumentation……………………..Generator output voltage, amperage, kW, Coolant, Temperature, RPM, Hour meter, maintenance intervals, Starting circuit voltage

Automatic Shutdown & Alarm for:………… Under/ Overspeed, Low Oil Pressure, High Coolant Temp., Fail to Start,

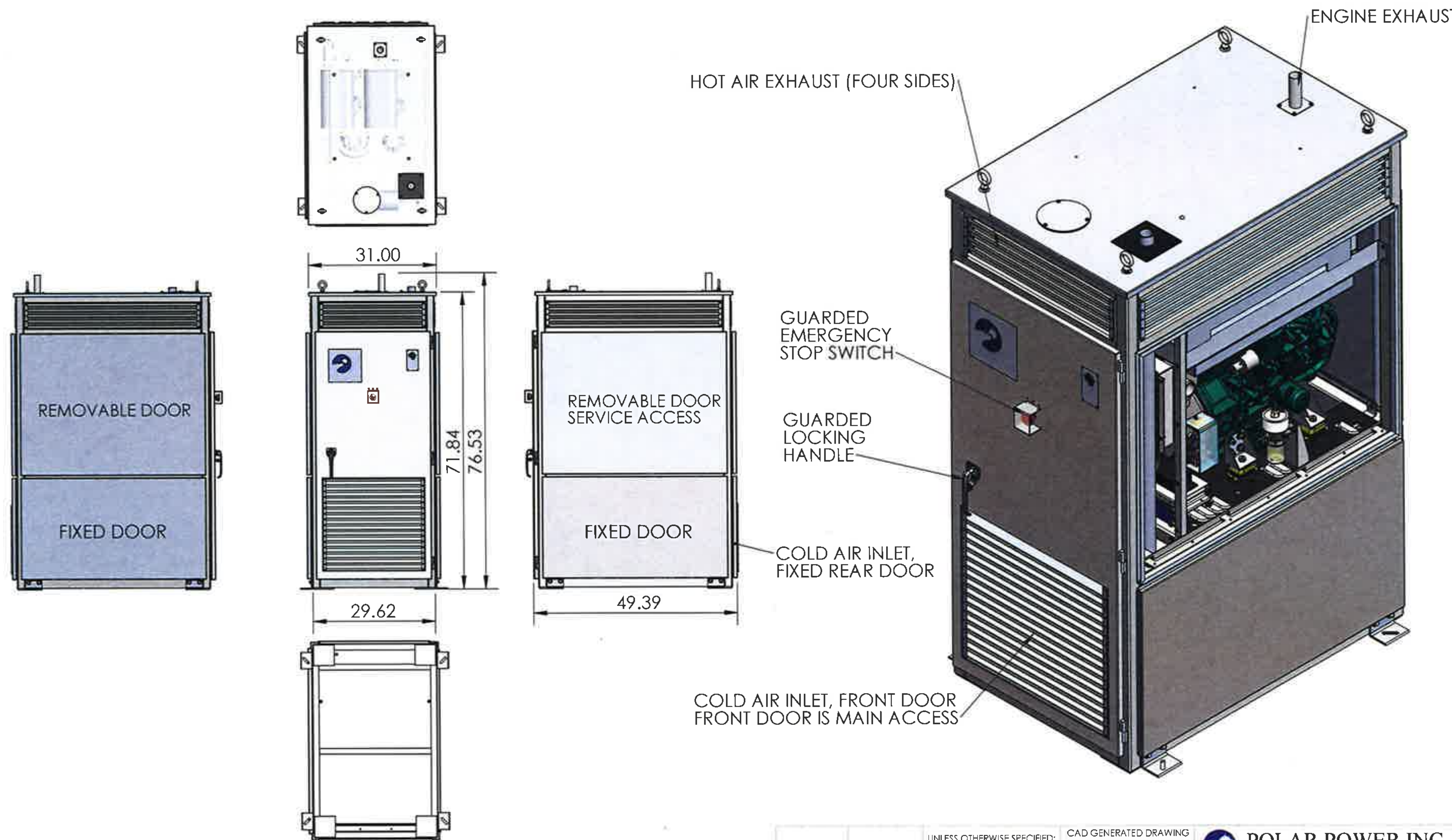
Warning Alarm for:…………………………. Low Fuel Level, Fuel Tank Rupture Basin, Low/High Engine Battery Voltage, High Water Temp, and Low Oil Press, Pre-alarm

Glow Plug Delay……….Automatic with temp
Engine Start Delay…….Adj. set at 60 seconds
Return to Utility Delay...Adj. set at 60 seconds
Engine Cool-Down……Adj. set at 60 seconds
Exerciser…………..Programmable/ bi-weekly

Contact Closure for Remote Indication …… …..Shutdown Alarm, Warning Alarm, Engine Run, Low Fuel Level, Fuel Leak, E-Stop Depressed

ENCLOSURE
Model……………………………………88-25-0603
Type…………………………Weather Protective
Materials……………..Marine Grade Aluminum
Sound Attenuated……….66 dBA @ 7 Meters
Door Hardware…………………….. Three Point / w Padlock Hasp and Removable Side Panel
Mounting……………..Secure Mounting Tabs
Dimensions……………………..32” x 50” x 72”
Weight (Dry)…………………………….1106 lbs

Genset UL 2200 LISTED
ETL listed per UL 2200 by Interek Testing Labs.
Fuel tank is UL 142 Listed



REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	—		

COMMENTS:

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF POLAR POWER INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF POLAR POWER INC. IS PROHIBITED.

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.02" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING DO NOT MANUALLY UPDATE

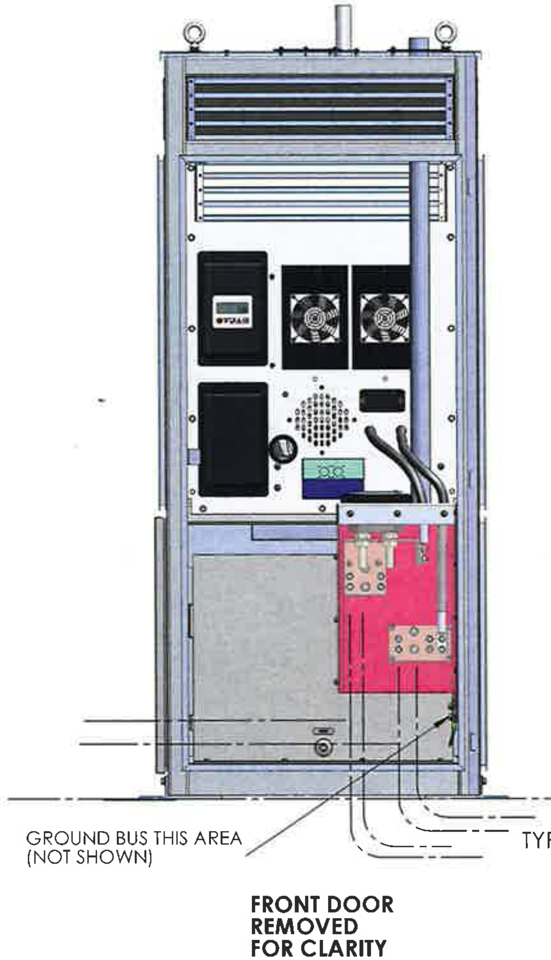
APPROVALS		DATE
DRAWN	GLEESON	1/22/2015
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

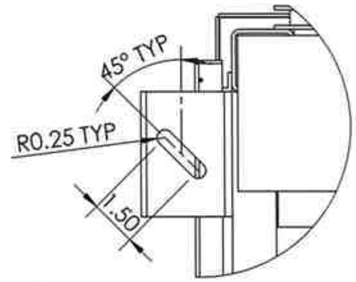
POLAR POWER INC.
249 E GARDENA AVE, GARDENA CA. 90248

TITLE: ALUMINUM VERTICAL ENCLOSURE, 72 IN

SIZE B | DWG. NO. 88-25-0603 | REV A-1

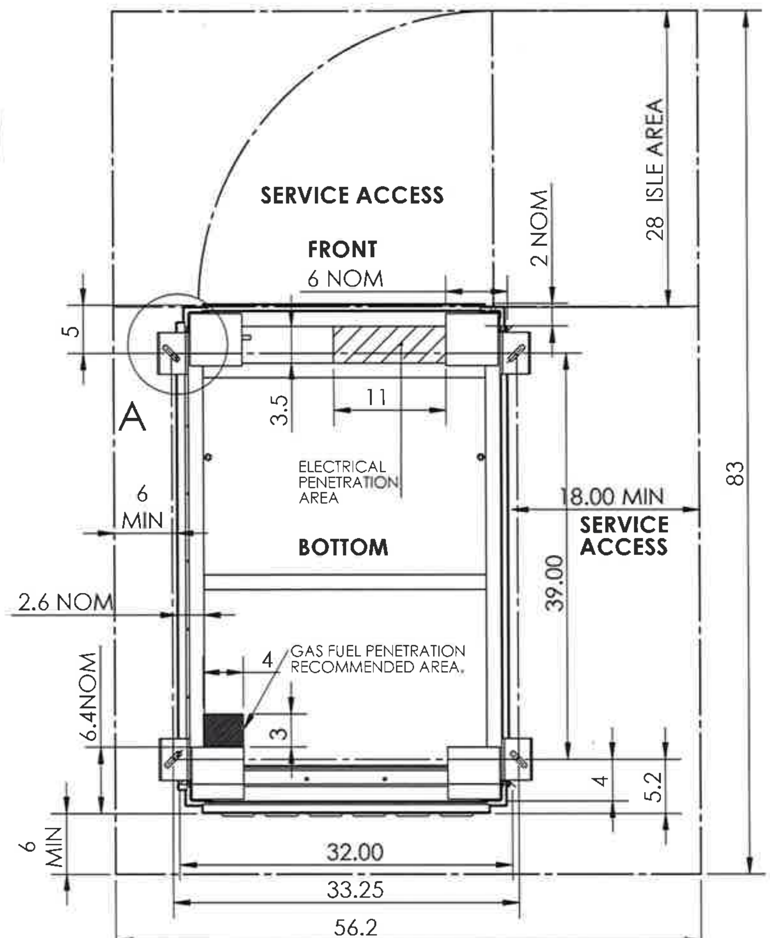
SCALE: 1:24 WEIGHT: SHEET 1 OF 4





DETAIL A
SCALE 1 : 4

INSTALLATION FOOTPRINT, BOTTOM VIEW



REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	–		

COMMENTS:

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF POLAR POWER INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF POLAR POWER INC. IS PROHIBITED.

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN GLEASON	1/22/2015
CHECKED	
ENG APPR.	
MFG APPR.	
Q.A.	

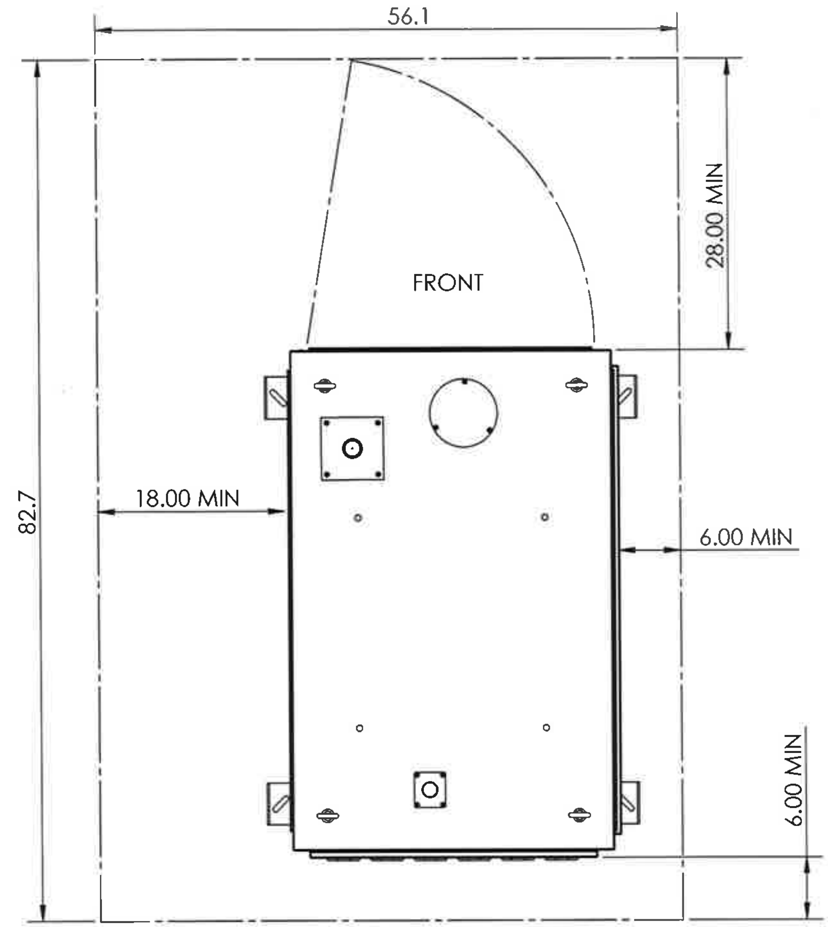
POLAR POWER INC.
249 E GARDENA AVE, GARDENA CA, 90248

TITLE: ALUMINUM VERTICAL ENCLOSURE, 72 IN

SIZE: B | DWG. NO.: 88-25-0603 | REV: A-1

SCALE: 1:24 | WEIGHT: | SHEET 2 OF 4

INSTALLATION FOOTPRINT, PLAN VIEW



REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	–		

COMMENTS:

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF POLAR POWER INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF POLAR POWER INC. IS PROHIBITED.

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

APPROVALS		DATE
DRAWN	GLEESON	1/22/2015
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

POLAR POWER INC.
249 E GARDENA AVE, GARDENA CA. 90248

TITLE: ALUMINUM VERTICAL ENCLOSURE, 72 IN

SIZE: B | DWG. NO. 88-25-0603 | REV A-1

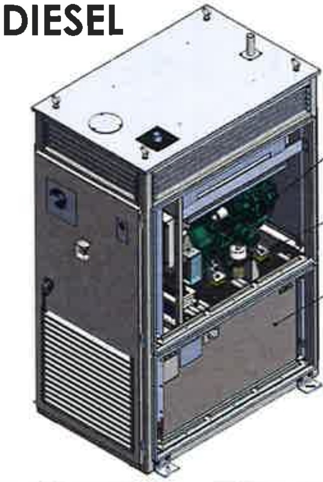
SCALE: 1:24 WEIGHT: SHEET 3 OF 4

CONFIGURATIONS

DIESEL

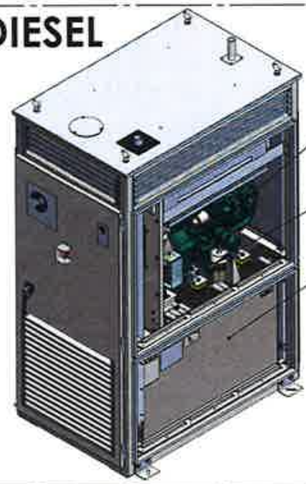
8220I-3CA1-101
6 KW DIESEL

8220I-3CA1-102
10 KW DIESEL



DIESEL

8220Y-3TNV88-101
15 KW DIESEL



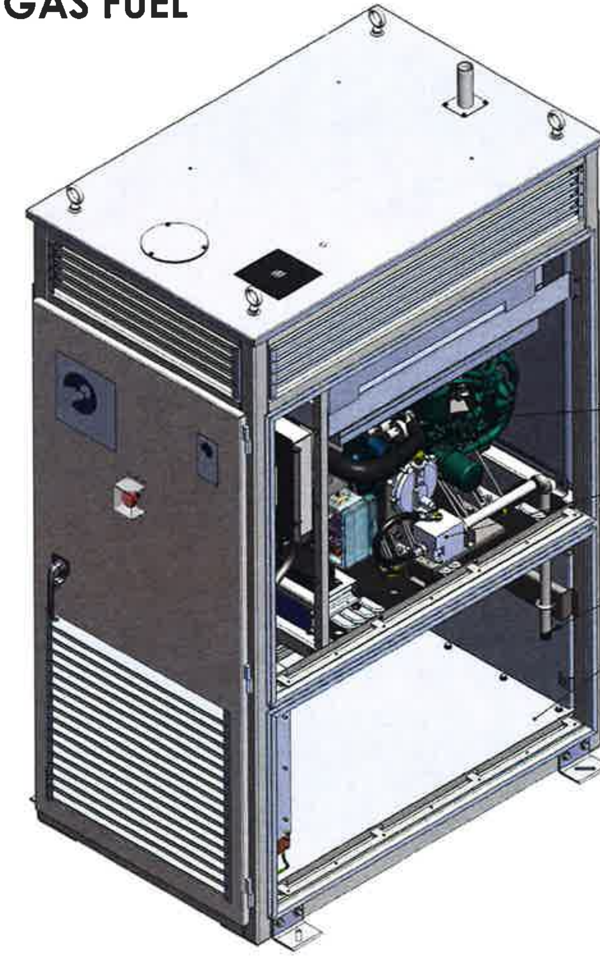
GAS FUEL

8220K-DG972-101
6 KW NATURAL GAS

8220K-DG972-102
10 KW NATURAL GAS

8220K-WG972-101
6 KW PROPANE

8220K-WG972-102
10 KW PROPANE



REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	--		

COMMENTS:

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF POLAR POWER INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF POLAR POWER INC. IS PROHIBITED.

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING DO NOT MANUALLY UPDATE

APPROVALS		DATE
DRAWN	GLEESON	1/22/2015
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

POLAR POWER INC.
249 E GARDENA BLVD, GARDENA, CA 90248

TITLE: ALUMINUM VERTICAL ENCLOSURE, 72 IN

SIZE: B | DWG. NO.: 88-25-0603 | REV: A-1

SCALE: 1:24 | WEIGHT: | SHEET 4 OF 4

ATTACHMENT 4

CENTEK engineering

Centered on Solutions℠

Structural Design of Antenna Mast and Tower Analysis

Verizon Site Ref: Trumbull 4

Structure No. 845

150' Electric Transmission Tower

Rocky Hill Road
Trumbull, CT

CENTEK Project No. 15240.000

~~Date: November 4, 2015~~

Rev 1: December 23, 2015

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 28336
LICENSED
PROFESSIONAL ENGINEER

Prepared for:

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

Table of Contents

Introduction

The purpose of this report is to design an antenna mast and analyze the existing 150' tower located on Rocky Hill Road in Trumbull, CT for the proposed antenna and equipment installation by Verizon.

The proposed loads consist of the following:

- T-MOBILE (Existing):
  Antennas: Three (3) RFS APXV18-206516S panel antennas mounted on an existing mast with a RAD center elevation of 164-ft above grade and three (3) RFS APXV18-206516S panel antennas mounted on an existing mast with a RAD center elevation of 156-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the exterior of the existing tower.
- **VERIZON (Proposed):**
  Antennas: Three (3) Andrew SBNHH-1D65B panel antennas mounted on a proposed antenna mast with a RAD center elevation of ±90-ft above grade level.
  Appurtenances: Three (3) Alcatel-Lucent B13 RRH4x30-LTE remote radio heads, three (3) Alcatel-Lucent RRH4x45/2x90-AWS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z distribution box mounted on a proposed antenna mast.
  Coax Cables: Two (2) 1-5/8" ∅ fiber cables running on the exterior of the existing tower.

Primary assumptions used in the analysis

- Allowable steel stresses are defined by AISC-ASD 9th edition for design of the Antenna Mast and antenna supporting elements.
- All utility tower members are adequately protected to prevent corrosion of steel members.
- All proposed antenna mounts are modeled as listed above.
- All coaxial cable will be installed within the Antenna Mast unless specified otherwise.
- Antenna Mast will be properly installed and maintained.
- No residual stresses exist due to incorrect tower erection.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds conform to the requirements of AWS D1.1.
- Antenna Mast and utility tower will be in plumb condition.
- Utility tower was properly installed and maintained and all members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
- Any deviation from the analyzed loading will require a new analysis for verification of structural adequacy.

Analysis

Structural design of the antenna mast was independently completed using the current version of RISA-3D computer program licensed to CENTEK Engineering, Inc. The RISA-3D program contains a library of all AISC shapes and corresponding section properties are computed and applied directly within the program. The program's Steel Code Check option was also utilized.

The proposed Antenna Mast consisting of a 3" Sch. 80 pipe conforming to ASTM A53 Grade B (Fy = 35ksi) connected at one elevation to the existing tower was designed for its ability to resist loads prescribed by the TIA/EIA standard. Section 5 of this report details these gravity and lateral wind loads. Load cases and combinations used in RISA-3D for TIA/EIA loading are listed in report Section 6.

The existing 150-ft tall tower was analyzed for its ability to resist loads prescribed by the NESC standard. Maximum usage for the tower was calculated considering the additional forces from the Antenna Mast and associated appurtenances. Section 7 of this report details these gravity and lateral wind loads.

Design Basis

Our analysis was performed in accordance with EIA-222-F-1996, ASCE Manual No. 10-97, "Design of Latticed Steel Transmission Structures", NESC C2-2007 and Northeast Utilities Design Criteria.

The utility tower structure, considering existing and future conductor and shield wire loading, with the proposed antenna mast was analyzed under two conditions:

- UTILITY TOWER ANALYSIS

  The purpose of this analysis is to determine the adequacy of the existing utility structure to support the proposed antenna loads. The loading and design requirements were analyzed in accordance with the NU Design Criteria Table, NESC C2-2007 ~ Construction Grade B, and ASCE Manual No. 10-97, "Design of Latticed Steel Transmission Structures".

  Load cases considered:

  Load Case 1: NESC Heavy
  Wind Pressure.................................... 4.0 psf
  Radial Ice Thickness............................ 0.5"
  Vertical Overload Capacity Factor............ 1.50
  Wind Overload Capacity Factor................ 2.50
  Wire Tension Overload Capacity Factor...... 1.65

  Load Case 2: NESC Extreme
  Wind Speed.. 110 mph (1)
  Radial Ice Thickness.............................. 0"

  Note 1: NESC C2-2007, Section25, Rule 250C: Extreme Wind Loading, 1.25 x Gust Response Factor (wind speed: 3-second gust)

- ANTENNA MAST DESIGN

  Antenna Mast, appurtenances and connections to the utility tower were analyzed and designed in accordance with the NU Design Criteria Table, TIA/EIA-222-F, and AISC-ASD standards.

  Load cases considered:

  Load Case 1:
  Wind Speed.................................... 85 mph (2)
  Radial Ice Thickness............................ 0"

  Load Case 2:
  Wind Pressure.................................... 75% of 85 mph wind pressure
  Radial Ice Thickness............................ 0.5"

  Note 2: Per NU Mast Design Criteria Exception 1.

Results

- ANTENNA MAST

  The Antenna Mast was determined to be structurally **adequate**.

Member	Stress Ratio (% of capacity)	Result
3" Sch. 80 Pipe	68.8%	PASS
Mast Connection to Tower	37.4% (1)	PASS

Note 1 – 1/3 increase in allowable stress not used for connection to tower per OTRM 059.

- UTILITY TOWER

  This analysis finds that the subject utility structure is adequate to support the existing proposed mast and related appurtenances. The tower stresses meet the requirements set forth by the ASCE Manual No. 10-97, "Design of Latticed Steel Transmission Structures", for the applied NESC Heavy and Hi-Wind load cases. The detailed analysis results are provided in Section 9 of this report. The analysis results are summarized as follows:

  A maximum usage of **75.8%** occurs in the utility tower under the **NESC Extreme** loading condition.

  TOWER SECTION:

  The utility structure was found to be within allowable limits.

Tower Section	Stress Ratio (% of capacity)	Result
30'-40' AGL	76.2%	PASS

- FOUNDATION AND ANCHORS

The existing foundation consists of a 4-ft x 7.5-ft x 14-ft long reinforced concrete pier and an 18-ft x 22-ft x 2.5-ft thick reinforced concrete pad. The base of the tower is connected to the foundation by means of (26) 2.25"∅, ASTM A615 Grade 60 anchor bolts embedded into the concrete foundation structure.

Subgrade properties were taken from a soil investigation done by DR. Clarence Welti, P.E., P.C. dated July 7, 2009.

BASE REACTIONS:

From analysis of utility tower based on NESC/NU prescribed loads.

Load Case	Shear (kips)	Axial (kips)	Moment (k-ft)
NESC Heavy Wind x-dir	18.2	89.6	2102
NESC Extreme Wind x-dir	36.0	45.6	3788
NESC Heavy Wind y-dir	9.0	89.6	681
NESC Extreme Wind y-dir	28.8	45.6	2179

Note 1 – 10% increase to be applied to the above tower base reactions for foundation verification per OTRM 051

FLANGE BOLTS / FLANGE PLATE:

The bolts and plate was found to be within allowable limits.

Component	Design Limit	Stress Ratio (percent of capacity)	Result
Flange Bolts	Tension	75.0%	**PASS**
Flange Plate	Bending	72.6%	**PASS**

ANCHOR BOLTS / BASE PLATE:

The bolts and plate was found to be within allowable limits.

Component	Design Limit	Stress Ratio (percent of capacity)	Result
Anchor Bolts	Tension	51.9%	**PASS**
Base Plate	Bending	60.3%	**PASS**

FOUNDATION:

The foundation was found to be within allowable limits.

Foundation	Design Limit	Allowable Limit	Proposed Loading (2)	Result
Reinforced Conc. Pad and Pier	Uplift	1.0 FS (1)	3.17 FS (1)	**PASS**

Note 1: FS denotes Factor of Safety
Note 2: 10% increase to PLS base reactions used in foundation analysis per OTRM 051.

Conclusions and Recommendations

This analysis shows that the subject utility tower **is adequate** to support the proposed Verizon equipment installation.

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING STRUCTURES

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

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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ RISA-3D

RISA-3D Structural Analysis Program is an integrated structural analysis and design software package for buildings, bridges, tower structures, etc.

Modeling Features:

- Comprehensive CAD-like graphic drawing/editing capabilities that let you draw, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, mesh, delete, apply, etc.
- Versatile drawing grids (orthogonal, radial, skewed)
- Universal snaps and object snaps allow drawing without grids
- Versatile general truss generator
- Powerful graphic select/unselect tools including box, line, polygon, invert, criteria, spreadsheet selection, with locking
- Saved selections to quickly recall desired selections
- Modification tools that modify single items or entire selections
- Real spreadsheets with cut, paste, fill, math, sort, find, etc.
- Dynamic synchronization between spreadsheets and views so you can edit or view any data in the plotted views or in the spreadsheets
- Simultaneous view of multiple spreadsheets
- Constant in-stream error checking and data validation
- Unlimited undo/redo capability
- Generation templates for grids, disks, cylinders, cones, arcs, trusses, tanks, hydrostatic loads, etc.
- Support for all units systems & conversions at any time
- Automatic interaction with RISASection libraries
- Import DXF, RISA-2D, STAAD and ProSteel 3D files
- Export DXF, SDNF and ProSteel 3D files

Analysis Features:

- Static analysis and P-Delta effects
- Multiple simultaneous dynamic and response spectra analysis using Gupta, CQC or SRSS mode combinations
- Automatic inclusion of mass offset (5% or user defined) for dynamic analysis
- Physical member modeling that does not require members to be broken up at intermediate joints
- State of the art 3 or 4 node plate/shell elements
- High-end automatic mesh generation — draw a polygon with any number of sides to create a mesh of well-formed quadrilateral (NOT triangular) elements.
- Accurate analysis of tapered wide flanges - web, top and bottom flanges may all taper independently
- Automatic rigid diaphragm modeling
- Area loads with one-way or two-way distributions
- Multiple simultaneous moving loads with standard AASHTO loads and custom moving loads for bridges, cranes, etc.
- Torsional warping calculations for stiffness, stress and design
- Automatic Top of Member offset modeling
- Member end releases & rigid end offsets
- Joint master-slave assignments
- Joints detachable from diaphragms
- Enforced joint displacements
- 1-Way members, for tension only bracing, slipping, etc.

- 1-Way springs, for modeling soils and other effects
- Euler members that take compression up to their buckling load, then turn off.
- Stress calculations on any arbitrary shape
- Inactive members, plates, and diaphragms allows you to quickly remove parts of structures from consideration
- Story drift calculations provide relative drift and ratio to height
- Automatic self-weight calculations for members and plates
- Automatic subgrade soil spring generator

Graphics Features:

- Unlimited simultaneous model view windows
- Extraordinary "true to scale" rendering, even when drawing
- High-speed redraw algorithm for instant refreshing
- Dynamic scrolling stops right where you want
- Plot & print virtually everything with color coding & labeling
- Rotate, zoom, pan, scroll and snap views
- Saved views to quickly restore frequent or desired views
- Full render or wire-frame animations of deflected model and dynamic mode shapes with frame and speed control
- Animation of moving loads with speed control
- High quality customizable graphics printing

Design Features:

- Designs concrete, hot rolled steel, cold formed steel and wood
- ACI 1999/2002, BS 8110-97, CSA A23.3-94, IS456:2000,EC 2-1992 with consistent bar sizes through adjacent spans
- Exact integration of concrete stress distributions using parabolic or rectangular stress blocks
- Concrete beam detailing (Rectangular, T and L)
- Concrete column interaction diagrams
- Steel Design Codes: AISC ASD 9th, LRFD 2nd & 3rd, HSS Specification, CAN/CSA-S16.1-1994 & 2004, BS 5950-1-2000, IS 800-1984, Euro 3-1993 including local shape databases
- AISI 1999 cold formed steel design
- NDS 1991/1997/2001 wood design, including Structural Composite Lumber, multi-ply, full sawn
- Automatic spectra generation for UBC 1997, IBC 2000/2003
- Generation of load combinations: ASCE, UBC, IBC, BOCA, SBC, ACI
- Unbraced lengths for physical members that recognize connecting elements and full lengths of members
- Automatic approximation of K factors
- Tapered wide flange design with either ASD or LRFD codes
- Optimization of member sizes for all materials and all design codes, controlled by standard or user-defined lists of available sizes and criteria such as maximum depths
- Automatic calculation of custom shape properties
- Steel Shapes: AISC, HSS, CAN, ARBED, British, Euro, Indian, Chilean
- Light Gage Shapes: AISI, SSMA, Dale / Incor, Dietrich, MarinoWARE
- Wood Shapes: Complete NDS species/grade database
- Full seamless integration with RISAFoot (Ver 2 or better) for advanced footing design and detailing
- Plate force summation tool

Results Features:

- Graphic presentation of color-coded results and plotted designs
- Color contours of plate stresses and forces with quadratic smoothing, the contours may also be animated
- Spreadsheet results with sorting and filtering of: reactions, member & joint deflections, beam & plate forces/stresses, optimized sizes, code designs, concrete reinforcing, material takeoffs, frequencies and mode shapes
- Standard and user-defined reports
- Graphic member detail reports with force/stress/deflection diagrams and detailed design calculations and expanded diagrams that display magnitudes at any dialed location
- Saved solutions quickly restore analysis and design results.

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ PLS-TOWER

PLS-TOWER is a Microsoft Windows program for the analysis and design of steel latticed towers used in electric power lines or communication facilities. Both self-supporting and guyed towers can be modeled. The program performs design checks of structures under user specified loads. For electric power structures it can also calculate maximum allowable wind and weight spans and interaction diagrams between different ratios of allowable wind and weight spans.

Modeling Features:

- Powerful graphics module (stress usages shown in different colors)
- Graphical selection of joints and members allows graphical editing and checking
- Towers can be shown as lines, wire frames or can be rendered as 3-d polygon surfaces
- Can extract geometry and connectivity information from a DXF CAD drawing
- CAD design drawings, title blocks, drawing borders or photos can be tied to structure model
- XML based post processor interface
- Steel Detailing Neutral File (SDNF) export to link with detailing packages
- Can link directly to line design program PLS-CADD
- Automatic generation of structure files for PLS-CADD
- Databases of steel angles, rounds, bolts, guys, etc.
- Automatic generation of joints and members by symmetries and interpolations
- Automated mast generation (quickly builds model for towers that have regular repeating sections) via graphical copy/paste
- Steel angles and rounds modeled either as truss, beam or tension-only elements
- Guys are easily handled (can be modeled as exact cable elements)

Analysis Features:

- Automatic handling of tension-only members
- Automatic distribution of loads in 2-part suspension insulators (v-strings, horizontal vees, etc.)
- Automatic calculation of tower dead, ice, and wind loads as well as drag coefficients according to:
    - ASCE 74-1991
    - NESC 2002
    - NESC 2007
    - IEC 60826:2003
    - EN50341-1:2001 (CENELEC)
    - EN50341-3-9:2001 (UK NNA)
    - EN50341-3-17:2001 (Portugal NNA)
    - ESAA C(b)1-2003 (Australia)
    - TPNZ (New Zealand)
    - REE (Spain)
    - EIA/TIA 222-F
    - ANSI/TIA 222-G
    - CSA S37-01
- Automated microwave antenna loading as per EIA/TIA 222-F and ANSI/TIA 222-G
- Minimization of problems caused by unstable joints and mechanisms
- Automatic bandwidth minimization and ability to solve large problems
- Design checks according to (other standards can be added easily):
    - ASCE Standard 10-90

- AS 3995 (Australian Standard 3995)
- BS 8100 (British Standard 8100)
- EN50341-1 (CENELEC, both empirical and analytical methods are available)
- ECCS 1985
- NGT-ECCS
- PN-90/B-03200
- EIA/TIA 222-F
- ANSI/TIA 222-G
- CSA S37-01
- EDF/RTE Resal
- IS 802 (India Standard 802)

Results Features:

- Design summaries printed for each group of members
- Easy to interpret text, spreadsheet and graphics design summaries
- Automatic determination of allowable wind and weight spans
- Automatic determination of interaction diagrams between allowable wind and weight spans
- Capability to batch run multiple tower configurations and consolidate the results
- Automated optimum angle member size selection and bolt quantity determination

Tool for interactive angle member sizing and bolt quantity determination.

Criteria for Design of PCS Facilities On or Extending Above Metal Electric Transmission Towers & Analysis of Transmission Towers Supporting PCS Masts (1)

Introduction

This criteria is the result from an evaluation of the methods and loadings specified by the separate standards, which are used in designing telecommunications towers and electric transmission towers. That evaluation is detailed elsewhere, but in summary; the methods and loadings are significantly different. This criteria specifies the manner in which the appropriate standard is used to design PCS facilities including masts and brackets (hereafter referred to as "masts"), and to evaluate the electric transmission towers to support PCS masts. The intent is to achieve an equivalent level of safety and security under the extreme design conditions expected in Connecticut and Massachusetts.

ANSI Standard TIA/EIA-222 covering the design of telecommunications structures specifies a working strength/allowable stress design approach. This approach applies the loads from extreme weather loading conditions, and designs the structure so that it does not exceed some defined percentage of failure strength (allowable stress).

ANSI Standard C2-2007 (National Electrical Safety Code) covering the design of electric transmission metal structures is based upon an ultimate strength/yield stress design approach. This approach applies a multiplier (overload capacity factor) to the loads possible from extreme weather loading conditions, and designs the structure so that it does not exceed its ultimate strength (yield stress).

Each standard defines the details of how loads are to be calculated differently. Most of the NU effort in "unifying" both codes was to establish what level of strength each approach would provide, and then increasing the appropriate elements of each to achieve a similar level of security under extreme weather loadings.

Two extreme weather conditions are considered. The first is an extreme wind condition (hurricane) based upon a 50-year recurrence (2% annual probability). The second is a winter condition combining wind and ice loadings.

The following sections describe the design criteria for any PCS mast extending above the top of an electric transmission tower, and the analysis criteria for evaluating the loads on the transmission tower from such a mast from the lower portions of such a mast, and loads on the pre-existing electric lower portions of such a mast, and loads on the pre-existing electric transmission tower and the conductors it supports.

| <u>Note 1</u>: *Prepared from documentation provide from Northeast Utilities.*

P C S M a s t

The PCS facility (mast, external cable/trays, including the initial and any planned future support platforms, antennas, etc. extending the full height above the top level of the electric transmission structure) shall be designed in accordance with the provisions of TIA/EIA Standard 222 with two exceptions:

1. An 85 mph extreme wind speed shall be used for locations in all counties throughout the NU system.
2. The stress increase of TIA Section 3.1.1.1 is disallowed. The combined wind and ice condition shall consider ½" radial ice in combination with the wind load (0.75 Wi) as specified in TIA section 2.3.16.

E L E C T R I C T R A N S M I S S I O N T O W E R

The electric transmission tower shall be analyzed using yield stress theory in accordance with the attached table titled "NU Design Criteria". This specifies uniform loadings (different from the TIA loadings) on the each of the following components of the installed facility:

- PCS mast for its total height above ground level, including the initial and planned future support platforms, antennas, etc. above the top of an electric transmission structure.
- Conductors are related devices and hardware.
- Electric transmission structure. The loads from the PCS facility and from the electric conductors shall be applied to the structure at conductor and PCS mast attachment points, where those load transfer to the tower.

The uniform loadings and factors specified for the above components in the table are based upon the National Electrical Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to TIA and its loads and factors with the exceptions noted above. (Note that the NESC does not require the projected wind surfaces of structures and equipment to be increased by the ice covering.)

In the event that the electric transmission tower is not sufficient to support the additional loadings of the PCS mast, reinforcement will be necessary to upgrade the strength of the overstressed members.

Attachment A

NU Design Criteria

Condition	Standard	Item	Basic Wind Speed V (MPH)	Pressure Q (PSF)	Height Factor Kz	Gust Factor Gh	Load or Stress Factor	Force Coef - Shape Factor
Ice Condition	TIA/EIA	Antenna Mount	TIA	TIA (.75Wi)	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
Ice Condition	NESC Heavy	Tower/Pole Analysis with antennas extending above top of Tower/Pole (Yield Stress)	-----	4	1.00	1.00	2.50	1.6 Flat Surfaces 1.3 Round Surfaces
Ice Condition	NESC Heavy	Tower/Pole Analysis with Antennas below top of Tower/Pole (on two faces)	-----	4	1.00	1.00	2.50	1.6 Flat Surfaces 1.3 Round Surfaces
Ice Condition	NESC Heavy	Conductors:	Conductor loads provided by NU					
High Wind Condtion	TIA/EIA	Antenna Mount	85	TIA	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
High Wind Condtion	NESC Extreme Wind	Tower/Pole Analysis with antennas extending above top of Tower/Pole	Use NESC C2-2007, Section 25, Rule 250C: Extreme Wind Loading 1.25 x Gust Response Factor Height above ground level based on top of Mast/Antenna					1.6 Flat Surfaces 1.3 Round Surfaces
High Wind Condtion	NESC Extreme Wind	Tower/Pole Analysis with Antennas below top of Tower/Pole	Use NESC C2-2007, Section 25, Rule 250C: Extreme Wind Loading Height above ground level based on top of Tower/Pole					1.6 Flat Surfaces 1.3 Round Surfaces
High Wind Condtion	NESC Extreme Wind	Conductors:	Conductor loads provided by NU					
NESC Extreme Ice with Wind Conditon*		Tower/Pole Analysis with antennas extending above top of Tower/Pole	Use NESC C2-2007, Section 25, Rule 250D: Extreme Ice with Wind Loading 4PSF Wind Load 1.25 x Gust Response Factor Height above ground level based on top of Mast/Antenna					1.6 Flat Surfaces 1.3 Round Surfaces
NESC Extreme Ice with Wind Conditon*		Tower/Pole Analysis with Antennas below top of Tower/Pole	Use NESC C2-2007, Section 25, Rule 250D: Extreme Ice with Wind Loading 4PSF Wind Load Height above ground level based on top of Tower/Pole					1.6 Flat Surfaces 1.3 Round Surfaces
NESC Extreme Ice with Wind Conditon*		Conductors:	Conductor loads provided by NU					

* Only for Structures Installed after 2007

Shape Factor Criteria shall be per TIA Shape Factors.

2) STEP 2 - The electric transmission structure analysis and evaluation shall be performed in accordance with NESC requirements and shall include the mast and antenna loads determined from NESC applied loading conditions (not TIA/EIA Loads) on the structure and mount as specified below, and shall include the wireless communication mast and antenna loads per NESC criteria)

The structure shall be analyzed using yield stress theory in accordance with Attachment A, "NU Design Criteria." This specifies uniform loadings (different from the TIA loadings) on each of the following components of the installed facility:

a) Wireless communication mast for its total height above ground level, including the initial and any planned future equipment (Support Platforms, Antennas, TMA's etc.) above the top of an electric transmission structure.

b) Conductors and related devices and hardware (wire loads will be provided by NU).

c) Electric Transmission Structure

i) The loads from the wireless communication equipment components based on NESC and NU Criteria in Attachment A, and from the electric conductors shall be applied to the structure at conductor and wireless communication mast attachment points, where those loads transfer to the tower.

ii) Shape Factor Multiplier:

NESC Structure Shape	Cd
Polyround (for polygonal steel poles)	1.3
Flat	1.6
Open Lattice	3.2

iii) When Coaxial Cables are mounted along side the pole structure, the shape multiplier shall be:

Mount Type	Cable Cd	Pole Cd
Coaxial Cables on outside periphery (One layer)	1.45	1.45
Coaxial Cables mounted on stand offs	1.6	1.3

d) The uniform loadings and factors specified for the above components in Attachment A, "NU Design Criteria" are based upon the National Electric Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to the TIA and its loads and factors with the exceptions noted above.

Note: The NESC does not require ice load be included in the supporting structure. (Ice on conductors and shield wire only, and NU will provide these loads).

e) Mast reaction loads shall be evaluated for local effects on the transmission structure members at the attachment points.

INPUT DATA

TOWER ID: 845

Structure Height (ft) : 150

Wind Zone : Central CT (green)

Wind Speed : 90.5711047 mph

Tower Type : (●) Suspension ( ) Strain

Extreme Wind Model : PCS Addition

Shield Wire Properties:

	BACK	AHEAD
NAME =	*OPGW-120*	*OPGW-120*
DESCRIPTION =	6-Groove	6-Groove
STRANDING =	10/9 FOCAS	10/9 FOCAS
DIAMETER =	0.738 in	0.738 in
WEIGHT =	0.518 lb/ft	0.518 lb/ft

Conductor Properties:

	BACK	AHEAD
NAME =	*LAPWING*	*LAPWING*
	1590.000	1590.000
	45/7 ACSR	45/7 ACSR
DIAMETER =	1.504 in	1.504 in
WEIGHT =	1.790 lb/ft	1.790 lb/ft
Number of Conductors per phase	1	1

Insulator Weight = 0 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK		AHEAD	
	Shield	Conductor	Shield	Conductor
NESC HEAVY =	6,500	11,400	6,500	11,400
EXTREME WIND =	6,641	12,612	6,641	12,612
LONG. WIND =	na	na	na	na
250D COMBINED =	na	na	na	na
NESC W/O OLF =	na	na	na	na
60 DEG F NO WIND =	2,210	5,702	2,210	5,702

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	0	AHEAD:	0	**0**
WIND SPAN (ft) =	BACK:	382	AHEAD:	382	**764**
WEIGHT SPAN (ft) =	BACK:	443	AHEAD:	443	**886**

WIRE LOADING AT ATTACHMENTS

TOWER ID: 845

Wind Span =	764 ft
Weight Span =	886 ft
Total Angle =	0 degrees

Broken Wire Span =	AHEAD SPAN
Type of Insulator Attachment =	SUSPENSION

1. NESC RULE 250B Heavy Loading:

	INTACT CONDITION			BROKEN WIRE CONDITION		
	Horizontal	Longitudinal	Vertical	Horizontal	Longitudinal	Vertical
Shield Wire =	1,107 lb	0 lb	1,711 lb	553 lb	10,725 lb	856 lb
Conductor =	1,594 lb	0 lb	4,035 lb	797 lb	18,810 lb	2,017 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	1,137 lb	0 lb	528 lb
Conductor =	2,318 lb	0 lb	1,824 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	528 lb
Conductor =	#VALUE!	#VALUE!	1,824 lb

4. NESC RULE 250D Extreme Ice & Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	2,374 lb
Conductor =	#VALUE!	#VALUE!	4,345 lb

5. NESC RULE 250B w/o OLF's

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,141 lb
Conductor =	#VALUE!	#VALUE!	2,690 lb

6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	459 lb
Conductor =	0 lb	0 lb	1,586 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	688 lb
Conductor =	0 lb	0 lb	2,379 lb

Northeast Utilities System

Job :	Spec. Number	Page	of
Description:	Computed by	Sheet	of
	Checked by	Date	10/13/15
		Date	

INPUT DATA

TOWER ID: 845

Structure Height (ft) : 150

Wind Zone : Central CT (green)

Wind Speed : 90.5711047 mph

Tower Type : (●) Suspension ( ) Strain

Extreme Wind Model : PCS Addition

Shield Wire Properties:

	BACK	AHEAD
NAME =	*3/8 AW*	*3/8 AW*
DESCRIPTION =	3/8	3/8
STRANDING =	7 #8 Al Weld	7 #8 Al Weld
DIAMETER =	0.385 in	0.385 in
WEIGHT =	0.262 lb/ft	0.262 lb/ft

Conductor Properties:

		BACK	AHEAD		
	NAME =	*LAPWING*	*LAPWING*		
Number of Conductors per phase	1	1590.000	1590.000	1	Number of Conductors per phase
		45/7 ACSR	45/7 ACSR		
	DIAMETER =	1.504 in	1.504 in		
	WEIGHT =	1.790 lb/ft	1.790 lb/ft		

Insulator Weight = 0 lbs

Broken Wire Side = AHEAD SPAN

Horizontal Line Tensions:

	BACK Shield	BACK Conductor	AHEAD Shield	AHEAD Conductor
NESC HEAVY =	4,200	11,400	4,200	11,400
EXTREME WIND =	3,454	12,612	3,454	12,612
LONG. WIND =	na	na	na	na
250D COMBINED =	na	na	na	na
NESC W/O OLF =	na	na	na	na
60 DEG F NO WIND =	1,112	5,702	1,112	5,702

Line Geometry:

					SUM
LINE ANGLE (deg) =	BACK:	0	AHEAD:	0	**0**
WIND SPAN (ft) =	BACK:	382	AHEAD:	382	**764**
WEIGHT SPAN (ft) =	BACK:	443	AHEAD:	443	**886**

WIRE LOADING AT ATTACHMENTS

TOWER ID: 845

Wind Span =	764	ft
Weight Span =	886	ft
Total Angle =	0	degrees

Broken Wire Span =	AHEAD SPAN
Type of Insulator Attachment =	SUSPENSION

1. NESC RULE 250B Heavy Loading:

	INTACT CONDITION			BROKEN WIRE CONDITION		
	Horizontal	Longitudinal	Vertical	Horizontal	Longitudinal	Vertical
Shield Wire =	882 lb	0 lb	1,079 lb	441 lb	6,930 lb	540 lb
Conductor =	1,594 lb	0 lb	4,035 lb	797 lb	18,810 lb	2,017 lb

2. NESC RULE 250C Transverse Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	593 lb	0 lb	267 lb
Conductor =	2,318 lb	0 lb	1,824 lb

3. NESC RULE 250C Longitudinal Extreme Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	267 lb
Conductor =	#VALUE!	#VALUE!	1,824 lb

4. NESC RULE 250D Extreme Ice & Wind Loading:

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	1,758 lb
Conductor =	#VALUE!	#VALUE!	4,345 lb

5. NESC RULE 250B w/o OLF's

	Horizontal	Longitudinal	Vertical
Shield Wire =	#VALUE!	#VALUE!	719 lb
Conductor =	#VALUE!	#VALUE!	2,690 lb

6. 60 Deg. F, No Wind

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	232 lb
Conductor =	0 lb	0 lb	1,586 lb

7. Construction

	Horizontal	Longitudinal	Vertical
Shield Wire =	0 lb	0 lb	348 lb
Conductor =	0 lb	0 lb	2,379 lb

ANTENNA INSTALLATION

EVERSOURCE STRUCT. NO. 845
VERIZON SITE REF: TRUMBULL 4
ROCKY HILL ROAD
TRUMBULL, CT 06611

VICINITY MAP

PROJECT SUMMARY

SITE ADDRESS:	ROCKY HILL ROAD TRUMBULL, CT 06611
PROJECT COORDINATES:	LAT: 41°-13'-53.64"N LON: 73°-11'-24.00"W ELEV:±156' AMSL
EVERSOURCE STRUCT NO:	845
EVERSOURCE CONTACT:	ROBERT GRAY 860.665.3175
VERIZON SITE REF.:	TRUMBULL 4
VERIZON CONTACT:	DAVID VIVIAN 860.706.4373
ANTENNA CL HEIGHT:	90'-0" AGL
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD ROAD BRANFORD, CT 06405
CENTEK CONTACT:	TIMOTHY LYNN, PE 203-433-7507

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	1
N-1	DESIGN BASIS & GENERAL NOTES	1
N-2	STRUCTURAL STEEL NOTES	1
MI-1	MODIFICATION INSPECTION REQUIREMENTS	1
S-1	TOWER ELEVATION & FEEDLINE PLAN	1
S-2	ANTENNA MAST DETAILS	1

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/23/15	T.A.	CFC	ISSUED FOR CONSTRUCTION
0	11/4/15	T.A.	CFC	ISSUED FOR EVERSOURCE REVIEW

PROFESSIONAL ENGINEER SEAL

CENTEK engineering
Centered on Solutions
www.CentekEng.com

VERIZON WIRELESS
ANTENNA INSTALLATION
TRUMBULL 4
STRUCTURE 845
ROCKY HILL ROAD
TRUMBULL, CT 06611

DATE: 11/4/15
SCALE: AS SHOWN
JOB NO. 15240.000

TITLE SHEET

SHEET NO.
T-1

DESIGN BASIS

1. GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CT STATE BUILDING CODE AND 2009 AMENDMENTS.

2. TIA/EIA-222-F-1996, ASCE MANUAL NO. 72 – "DESIGN OF STEEL TRANSMISSION POLE STRUCTURES SECOND EDITION", NESC C2-2007 AND NORTHEAST UTILITIES DESIGN CRITERIA.

3. DESIGN CRITERIA

   WIND LOAD: (ANTENNA MAST)
   BASIC WIND SPEED (V) =85 MPH (FASTEST MILE); BASED ON TIA/EIA-222F AND NU MAST DESIGN CRITERIA EXCEPTION 1.

   WIND LOAD: (UTILITY POLE & FOUNDATION)
   BASIC WIND SPEED (V) =110 MPH (3-SECOND GUST) BASED ON NESC C2-2007, SECTION 25 RULE 250C.

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS PREPARED BY CENTEK ENGINEERING, INC., FOR VERIZON DATED 12/23/15.

2. TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM THE ORIGINAL TOWER DESIGN DOCUMENTS PREPARED BY THE FINNEY STEEL POLE CO. JOB NO. 1300.8 CIRCA 1971.

3. THE TEMPORARY DETACHMENT AND/OR REPLACEMENT OF TOWER MEMBERS SHALL BE DONE ONE AT A TIME AND SHALL BE CONDUCTED ON DAYS WITH LESS THAN 15 MPH WIND PRESENT. NO MEMBER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY.

4. ALL STEEL REINFORCEMENT SHOWN HEREIN APPLIES TO ALL SIDES OF THE TOWER.

5. ALL REPLACEMENT STEEL MEMBERS SHALL BE INSTALLED WITH A325-N BOLTS (SIZE TO MATCH EXISTING), UNLESS OTHERWISE NOTED BELOW.

6. THE TOWER STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER REINFORCEMENTS ARE COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE & SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES PROVIDING AND MAINTAINING ADEQUATE SHORING, BRACING, UNDERPINNING, TEMPORARY ANCHORS, GUYING, BARRICADES, ETC. AS MAY BE REQUIRED FOR THE PROTECTION OF EXISTING PROPERTY, CONSTRUCTION WORKERS, AND FOR PUBLIC SAFETY. MAINTAIN EXISTING SITE OPERATIONS AND COORDINATE WORK WITH TOWER OWNER.

7. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE GOVERNING BUILDING CODE.

8. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.

9. BEFORE BEGINNING THE WORK, THE CONTRACTOR IS RESPONSIBLE FOR MAKING SUCH INVESTIGATIONS CONCERNING PHYSICAL CONDITIONS (SURFACE AND SUBSURFACE) AT OR CONTIGUOUS TO THE SITE WHICH MAY AFFECT PERFORMANCE AND COST OF THE WORK. THIS INCLUDES VERIFYING ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.

10. TOWER REINFORCEMENTS SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF TRANSMISSION STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.

11. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH THE TOWER REINFORCEMENT WORK.

12. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

13. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.

14. NO DRILLING WELDING OR TAPING IS PERMITTED ON CL&P OWNED EQUIPMENT.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/4/15	T.K.	CFC	ISSUED FOR EVERSOURCE REVIEW
1	12/23/15	T.K.	CFC	ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

CENTEK engineering
Centered on Solutions
www.CentekEng.com

VERIZON WIRELESS
ANTENNA INSTALLATION
TRUMBULL 4
STRUCTURE 845
ROCKY HILL ROAD
TRUMBULL, CT 06611

DATE:	11/4/15
SCALE:	AS SHOWN
JOB NO.	15240.000

DESIGN BASIS AND GENERAL NOTES

SHEET NO.
N-1
Sheet No. 2 of 8

STRUCTURAL STEEL

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

2. MATERIAL SPECIFICATIONS

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

3. FASTENER SPECIFICATIONS

   A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
   B. U-BOLTS---ASTM A307
   C. ANCHOR RODS---ASTM F1554
   D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572_GR50 STEELS, ASTM E80XX FOR A572_GR65 STEEL.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19. FABRICATE BEAMS WITH MILL CAMBER UP.

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

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

REV.	DATE	DRAWN	BY/CHK'D	BY/DESCRIPTION
1	12/23/15	TA	CFC	ISSUED FOR CONSTRUCTION
0	11/4/15	TA	CFC	ISSUED FOR EVERSOURCE REVIEW

PROFESSIONAL ENGINEER SEAL

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

VERIZON WIRELESS
ANTENNA INSTALLATION
TRUMBULL 4
STRUCTURE 845
ROCKY HILL ROAD
TRUMBULL, CT 0668

DATE: 11/4/15
SCALE: AS SHOWN
JOB NO: 15240.000

STRUCTURAL STEEL NOTES

SHEET NO.
N-2
Sheet No. 3 of 8

MODIFICATION INSPECTION REPORT REQUIREMENTS

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

NOTES:

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

GENERAL

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

MODIFICATION INSPECTOR (MI)

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

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON–SITE INSPECTIONS AND COMPILATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

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

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

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

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

REQUIRED PHOTOGRAPHS

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

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/23/15	T.K.	CFC	ISSUED FOR CONSTRUCTION
0	11/4/15	T.K.	CFC	ISSUED FOR EVERSOURCE REVIEW

PROFESSIONAL ENGINEER SEAL

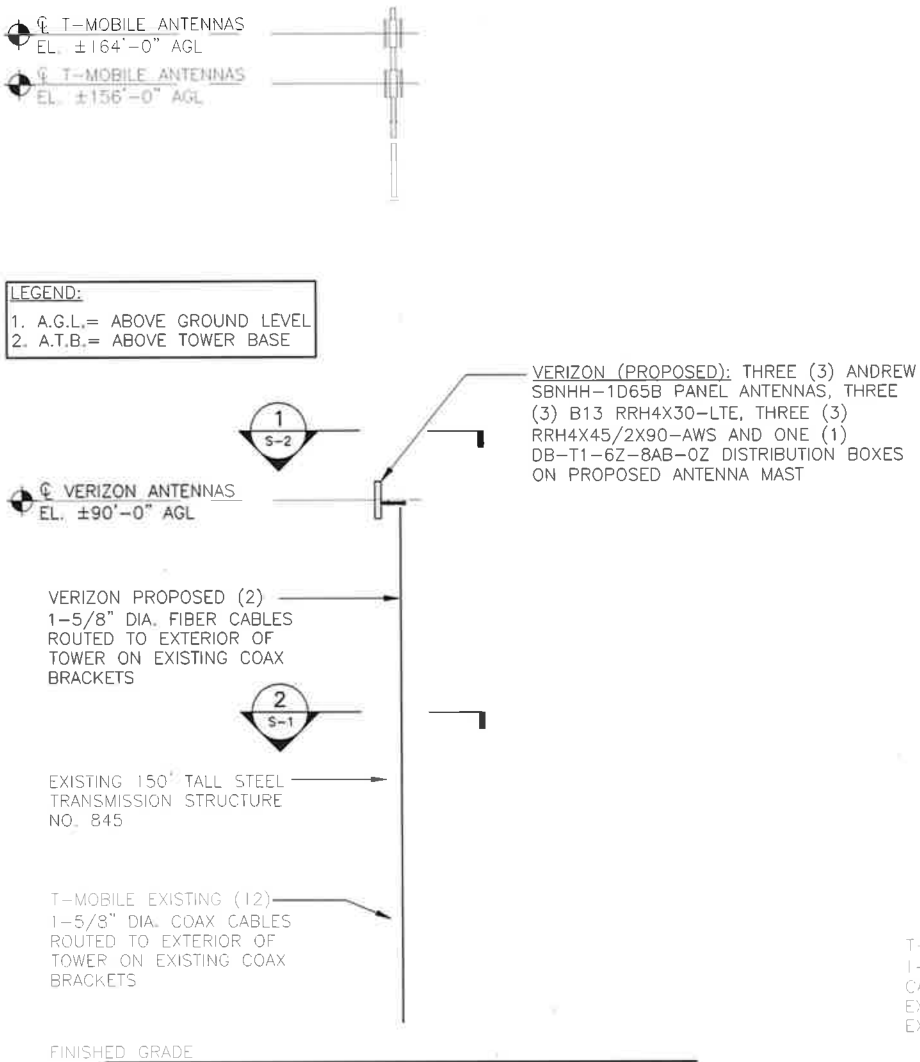
CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

VERIZON WIRELESS
ANTENNA INSTALLATION
TRUMBULL 4
STRUCTURE 845
ROCKY HILL ROAD
TRUMBULL, CT 06611

DATE:	11/4/15
SCALE:	AS SHOWN
JOB NO.	15240.000

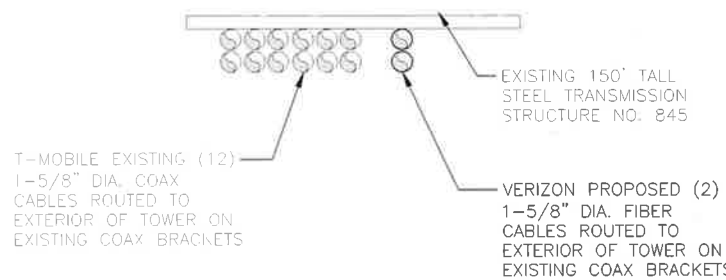
MODIFICATION INSPECTION REQUIREMENTS

SHEET NO.
MI-1
Sheet No. 4 of 5



1 / S-1 **TOWER & ANTENNA MAST ELEVATION**

SCALE: NOT TO SCALE



2 / S-1 **FEEDLINE PLAN**

SCALE: 1" = 1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/4/15	TJL	CFC	ISSUED FOR EVERSOURCE REVIEW
1	12/23/15	TJL	CFC	ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

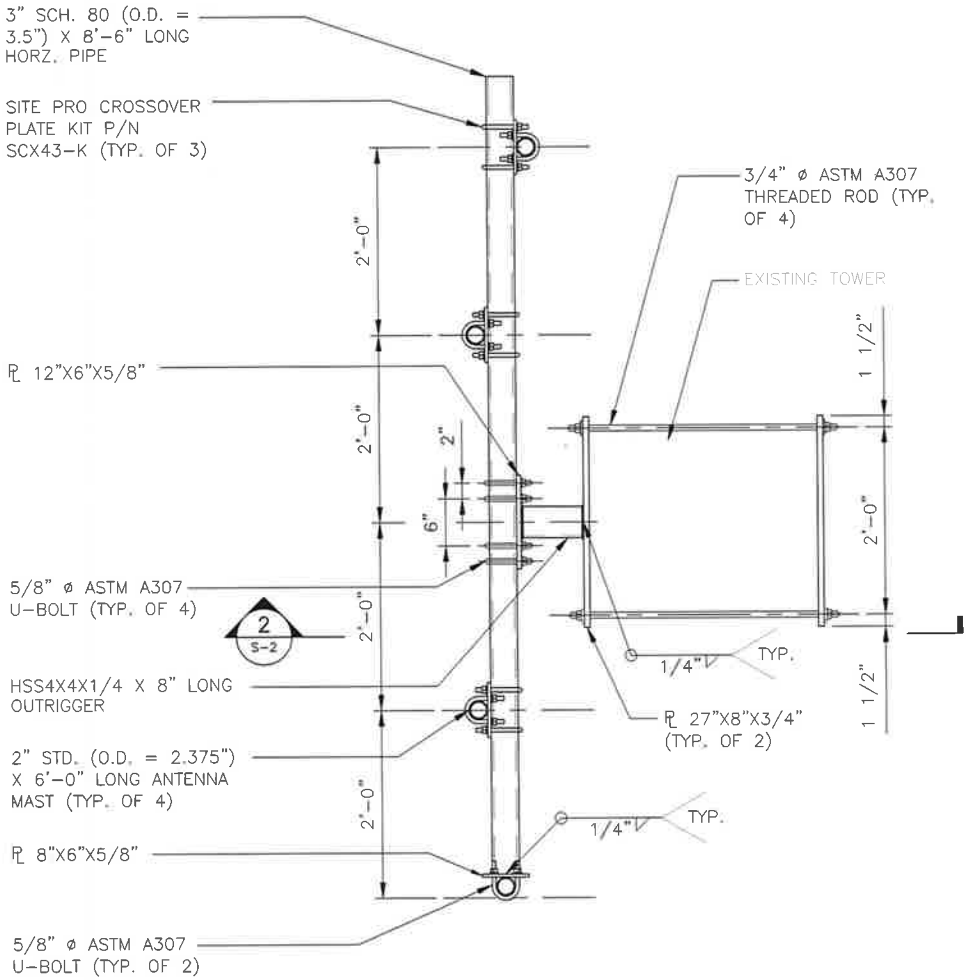
CENTEK engineering
Centered on Solutions
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

VERIZON WIRELESS
ANTENNA INSTALLATION
TRUMBULL 4
STRUCTURE 845
ROCKY HILL ROAD
TRUMBULL, CT 0661

DATE: 11/4/15
SCALE: AS SHOWN
JOB NO. 15240.000

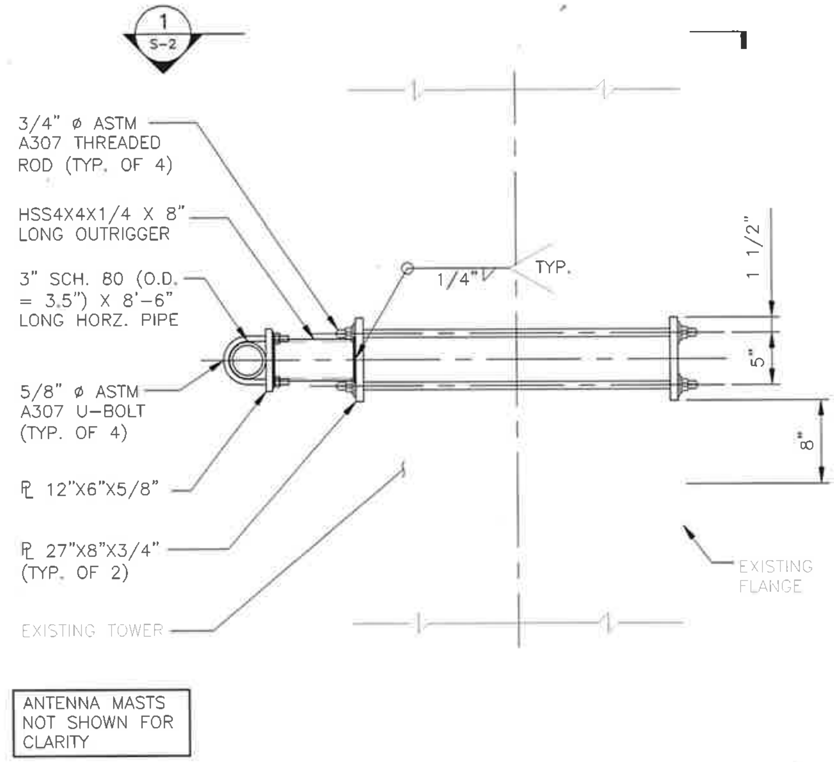
TOWER ELEVATION AND FEEDLINE PLAN

SHEET NO.
S-1
Sheet No. _ of _



1 S-2 ANTENNA MAST DETAIL

SCALE: 3/4" = 1'-0"



ANTENNA MASTS NOT SHOWN FOR CLARITY

2 S-2 CONNECTION DETAIL

SCALE: 1" = 1'-0"

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/23/15	TJL	CFC	ISSUED FOR CONSTRUCTION
0	11/4/15	TJL	CFC	ISSUED FOR EVERSOURCE REVIEW

PROFESSIONAL ENGINEER SEAL

CENTEK engineering
www.CentekEng.com

VERIZON WIRELESS
ANTENNA INSTALLATION
TRUMBULL 4
STRUCTURE 845
ROCKY HILL ROAD
TRUMBULL, CT 0668

DATE: 11/4/15
SCALE: AS SHOWN
JOB NO. 15240.000

ANTENNA MAST DETAILS

SHEET NO. S-2

Development of Design Heights, Exposure Coefficients, and Velocity Pressures Per TIA/EIA

Wind Speeds

Basic Wind Speed $V := 85$ mph (User Input per NU Mast Design Criteria Exception 1)

Basic Wind Speed with Ice $V_i := 74$ mph (User Input per TIA/EIA-222-F Section 2.3.16)

Heights above ground level, z

Mast $z_{mast} := 90$ ft (User Input)

Verizon $z_{vz} := 90$ ft (User Input)

Exposure Coefficients, kz

(per TIA/EIA-222-F Section 2.3.3)

Mast $Kz_{mast} := \left(\frac{z_{mast}}{33}\right)^{\frac{2}{7}} = 1.332$

Verizon $Kz_{vz} := \left(\frac{z_{vz}}{33}\right)^{\frac{2}{7}} = 1.332$

Velocity Pressure without ice, qz

(per TIA/EIA-222-F Section 2.3.3)

Mast $qz_{mast} := 0.00256 \cdot Kz_{mast} \cdot V^2 = 24.636$

Verizon $qz_{vz} := 0.00256 \cdot Kz_{vz} \cdot V^2 = 24.636$

Velocity Pressure with ice, qzICE

(per TIA/EIA-222-F Section 2.3.3)

Mast $qzICE_{mast} := 0.00256 \cdot Kz_{mast} \cdot V_i^2 = 18.672$

Verizon $qzICE_{vz} := 0.00256 \cdot Kz_{vz} \cdot V_i^2 = 18.672$

TIA/EIA Common Factors:

Gust Response Factor = $G_H := 1.69$ (User Input per TIA/EIA-222-F Section 2.3.4)

Gust Response Factor Multiplier = $m := 1.25$ (User Input per TIA/EIA-222-F Section 2.3.4.4)

Radial Ice Thickness = $Ir := 0.50$ in (User Input per TIA/EIA-222-F Section 2.3.1)

Radial Ice Density = $Id := 56.00$ pcf (User Input)

CENTEK engineering Centered on Solutions™ www.centekeng.com 63-2 North Branford Road P: (203) 488-0580 Branford, CT 06405 F: (203) 488-8587	Subject:	Load Analysis of Verizon Equipment on Tower # 845
	Location:	Trumbull, CT
	Rev. 0: 11/2/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 15240.000

Development of Wind & Ice Load on Mast (per TIA/EIA-222-F-1996 Criteria)

Mast Data: (3" Sch 80) (User Input)

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 3.5$ in (User Input)

Mast Length = $L_{mast} := 8.5$ ft (User Input)

Mast Thickness = $t_{mast} := 0.3$ in (User Input)

Mast Aspect Ratio = $Ar_{mast} := \frac{12L_{mast}}{D_{mast}} = 29.1$

Mast Force Coefficient = $Ca_{mast} = 1.2$ (per TIA/EIA-222-F Table 3)

Wind Load (without ice) (per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 0.292$ sf/ft

Total Mast Wind Force = $qz_{mast} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 15$ plf **BLC 5,7**

Wind Load (with ice) (per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 0.375$ sf/ft

Total Mast Wind Force w/ Ice = $qzICE_{mast} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 14$ plf **BLC 4,6**

Gravity Loads (without ice)

Weight of the mast = Self Weight **(Computed internally by Risa-3D)** plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^{\ 2}\right] = 6.3$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 2$ plf **BLC 3**

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Andrew SBNHH-1D65B			
Antenna Shape =	Flat		(User Input)	
Antenna Height =	$L_{ant} := 72$	in	(User Input)	
Antenna Width =	$W_{ant} := 11.9$	in	(User Input)	
Antenna Thickness =	$T_{ant} := 7.1$	in	(User Input)	
Antenna Weight =	$WT_{ant} := 45$	lbs	(User Input)	
Number of Antennas =	$N_{ant} := 1$		(User Input)	(One per pipe mast / tot. of 3)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 6.1$			
Antenna Force Coefficient =	$Ca_{ant} = 1.4$			(per TIA/EIA-222-F-1996 Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$	sf	
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 6$	sf	
Total Antenna Wind Force =	$F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 347$	lbs	**BLC 5,7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.5$	sf	
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 6.5$	sf	
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qzICE_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 289$	lbs	**BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 45$	lbs	**BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 6083$	cu in	
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1544$	cu in	
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 50$	lbs	
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 50$	lbs	**BLC 3**

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model = Alcatel-Lucent B13 RRH4x30/2x60-LTE

Antenna Shape = Flat (User Input)

Antenna Height = $L_{ant} := 21.6$ in (User Input)

Antenna Width = $W_{ant} := 12$ in (User Input)

Antenna Thickness = $T_{ant} := 9$ in (User Input)

Antenna Weight = $WT_{ant} := 57$ lbs (User Input)

Number of Antennas = $N_{ant} := 1$ (User Input) (One per pipe mast / tot. of 3)

Antenna Aspect Ratio = $Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 1.8$

Antenna Force Coefficient = $Ca_{ant} = 1.4$ (per TIA/EIA-222-F-1996 Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 1.8$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 1.8$ sf

Total Antenna Wind Force = $F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 105$ lbs **BLC 5,7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 2$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 2$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qzICE_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 90$ lbs **BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 57$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2333$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 605$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 20$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 20$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Alcatel-Lucent RRH4x45/2x90-AWS			
Antenna Shape =	Flat		(User Input)	
Antenna Height =	$L_{ant} := 25.8$	in	(User Input)	
Antenna Width =	$W_{ant} := 12$	in	(User Input)	
Antenna Thickness =	$T_{ant} := 7.6$	in	(User Input)	
Antenna Weight =	$WT_{ant} := 72$	lbs	(User Input)	
Number of Antennas =	$N_{ant} := 1$		(User Input)	(One per pipe mast / tot. of 3)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 2.2$			
Antenna Force Coefficient =	$Ca_{ant} = 1.4$		(per TIA/EIA-222-F-1996 Table 3)	

Wind Load (without ice) (per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 2.2$	sf	
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 2.2$	sf	
Total Antenna Wind Force =	$F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 125$	lbs	**BLC 5,7**

Wind Load (with ice) (per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 2.4$	sf	
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 2.4$	sf	
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qzICE_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 107$	lbs	**BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 72$	lbs	**BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2353$	cu in	
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 643$	cu in	
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 21$	lbs	
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 21$	lbs	**BLC 3**

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	RFS DB-T1-6Z-8AB-0Z		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 24$	in	(User Input)
Antenna Width =	$W_{ant} := 24$	in	(User Input)
Antenna Thickness =	$T_{ant} := 10$	in	(User Input)
Antenna Weight =	$WT_{ant} := 45$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 1.0$		
Antenna Force Coefficient =	$Ca_{ant} = 1.4$		(per TIA/EIA-222-F-1996 Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 4$ sf

Total Antenna Wind Force = $F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 233$ lbs **BLC 5,7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 4.3$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 4.3$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := qzICE_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 192$ lbs **BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 45$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5760$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1115$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 36$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 36$ lbs **BLC 3**

CENTEK engineering, INC.
Consulting Engineers
63-2 North Branford Road
Branford, CT 06405
Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of TIA/EIA Wind and Ice Loads for Design of Antenna Mast**
Load Cases
Location: **Trumbull, CT**
Date: 11/3/15 Prepared by: T.J.L. Checked by: C.F.C. Job No. 15240.000

Load Case	Description
1	Self Weight
2	Weight of Appurtenances
3	Weight of Ice Only
4	x-direction TIA/EIA Wind with Ice
5	x-direction TIA/EIA Wind
6	z-direction TIA/EIA Wind with Ice
7	z-direction TIA/EIA Wind

Footnotes:

CENTEK engineering, INC.
Consulting Engineers
63-2 North Branford Road
Branford, CT 06405
Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of TIA/EIA Wind and Ice Loads for Design of Antenna Mast Load Combinations**

Location: **Trumbull, CT**

Date: 11/3/15 Prepared by: T.J.L. Checked by: C.F.C. Job No. 15240.000

Load Combination	Description	Envelope Soultion	Wind Factor	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	x-direction TIA/EIA Wind + Ice		1		1	1	2	1	3	1	4	1		
2	x-direction TIA/EIA Wind		1		1	1	2	1	5	1				
3	z-direction TIA/EIA Wind + Ice		1		1	1	2	1	3	1	6	1		
4	z-direction TIA/EIA Wind		1		1	1	2	1	7	1				

Footnotes:
(1) BLC = Basic Load Case

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
1	M1	Outrigger	1												Lateral
2	M2	Horz Mast	8.5												Lateral
3	M3	Pipe Mast	6												Lateral
4	M4	Pipe Mast	6												Lateral
5	M5	Pipe Mast	6												Lateral
6	M6	Pipe Mast	6												Lateral
7	M7	Plate	2												Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Horz Mast	PIPE_3.0X	Beam	Pipe	A53 Gr. B	Typical	2.83	3.7	3.7	7.4
2	Pipe Mast	PIPE_2.0	Beam	Tube	A53 Gr. B	Typical	1.02	.627	.627	1.25
3	Outrigger	HSS4x4x4	Beam	Tube	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
4	Plate	6"X3/4" PL	Beam	Tube	A36 Gr.36	Typical	4.5	.211	13.5	.777

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	N3	N4			Outrigger	Beam	Tube	A500 Gr.46	Typical
2	M2	N5	N10			Horz Mast	Beam	Pipe	A53 Gr. B	Typical
3	M3	N11	N12			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
4	M4	N13	N14			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
5	M5	N15	N16			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
6	M6	N17	N18			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
7	M7	N2	N1			Plate	Beam	Tube	A36 Gr.36	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From D...
1	N1	1	0	0	0	
2	N2	-1	0	0	0	
3	N3	0	0	0	0	
4	N4	0	0	1	0	
5	N5	-4.5	0	1	0	
6	N7	-4	0	1	0	
7	N8	-2	0	1	0	
8	N9	2	0	1	0	
9	N10	4	0	1	0	
10	N11	-4	3	1	0	
11	N12	-4	-3	1	0	
12	N13	-2	3	1	0	
13	N14	-2	-3	1	0	
14	N15	2	3	1	0	
15	N16	2	-3	1	0	
16	N17	4	3	1	0	
17	N18	4	-3	1	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N2	Reaction	Reaction	Reaction	Reaction		Reaction	
2	N1	Reaction	Reaction	Reaction	Reaction		Reaction	

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M3	Y	-.022	.5
2	M4	Y	-.022	.5
3	M6	Y	-.022	.5
4	M3	Y	-.022	5.5
5	M4	Y	-.022	5.5
6	M6	Y	-.022	5.5
7	M3	Y	-.057	1
8	M4	Y	-.057	1
9	M6	Y	-.057	1
10	M3	Y	-.072	5
11	M4	Y	-.072	5
12	M6	Y	-.072	5
13	M5	Y	-.045	2

Member Point Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M3	Y	-.025	.5
2	M4	Y	-.025	.5
3	M6	Y	-.025	.5
4	M3	Y	-.025	5.5
5	M4	Y	-.025	5.5
6	M6	Y	-.025	5.5
7	M3	Y	-.02	1
8	M4	Y	-.02	1
9	M6	Y	-.02	1
10	M3	Y	-.021	5
11	M4	Y	-.021	5
12	M6	Y	-.021	5
13	M5	Y	-.036	2

Member Point Loads (BLC 4 : x-dir TIA/EIA Wind with Ice)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M3	X	.144	.5
2	M4	X	.144	.5
3	M6	X	.144	.5
4	M3	X	.144	5.5
5	M4	X	.144	5.5
6	M6	X	.144	5.5
7	M3	X	.09	1
8	M4	X	.09	1
9	M6	X	.09	1
10	M3	X	.107	5
11	M4	X	.107	5

Member Point Loads (BLC 4 : x-dir TIA/EIA Wind with Ice) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
12	M6	X	.107	5
13	M5	X	.192	2

Member Point Loads (BLC 5 : x-dir TIA/EIA Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M3	X	.173	.5
2	M4	X	.173	.5
3	M6	X	.173	.5
4	M3	X	.173	5.5
5	M4	X	.173	5.5
6	M6	X	.173	5.5
7	M3	X	.105	1
8	M4	X	.105	1
9	M6	X	.105	1
10	M3	X	.125	5
11	M4	X	.125	5
12	M6	X	.125	5
13	M5	X	.233	2

Member Point Loads (BLC 6 : z-dir TIA/EIA Wind with Ice)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M3	Z	.144	.5
2	M4	Z	.144	.5
3	M6	Z	.144	.5
4	M3	Z	.144	5.5
5	M4	Z	.144	5.5
6	M6	Z	.144	5.5
7	M3	Z	.09	1
8	M4	Z	.09	1
9	M6	Z	.09	1
10	M3	Z	.107	5
11	M4	Z	.107	5
12	M6	Z	.107	5
13	M5	Z	.192	2

Member Point Loads (BLC 7 : z-dir TIA/EIA Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M3	Z	.173	.5
2	M4	Z	.173	.5
3	M6	Z	.173	.5
4	M3	Z	.173	5.5
5	M4	Z	.173	5.5
6	M6	Z	.173	5.5
7	M3	Z	.105	1
8	M4	Z	.105	1
9	M6	Z	.105	1
10	M3	Z	.125	5
11	M4	Z	.125	5
12	M6	Z	.125	5
13	M5	Z	.233	2

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
No Data to Print ...			

Member Distributed Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M2	Y	-.002	-.002	0	0

Member Distributed Loads (BLC 6 : z-dir TIA/EIA Wind with Ice)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	.014	.014	0	0

Member Distributed Loads (BLC 7 : z-dir TIA/EIA Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	.015	.015	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Grav...	Joint	Point	Distrib...	Area(...	Surfac...
1	Self Weight	None		-1						
2	Weight of Appurtenances	None					13			
3	Weight of Ice Only	None					13	1		
4	x-dir TIA/EIA Wind with Ice	None					13			
5	x-dir TIA/EIA Wind	None					13			
6	z-dir TIA/EIA Wind with Ice	None					13	1		
7	z-dir TIA/EIA Wind	None					13	1		

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	x-dir TIA/EIA Wind + Ice	Yes			1	1	2	1	3	1	4	1								
2	x-dir TIA/EIA Wind	Yes			1	1	2	1	5	1										
3	z-dir TIA/EIA Wind + Ice	Yes			1	1	2	1	3	1	6	1								
4	z-dir TIA/EIA Wind	Yes			1	1	2	1	7	1										
5	Self Weight																			

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
1	M1	1	max	0	1	1.07	1	1.964	2	-.165	2	-.618	3	1.154	3
2			min	-2.092	4	.744	4	0	3	-.393	3	-1.964	2	.738	2
3		2	max	0	1	1.067	1	1.964	2	-.165	2	-.618	3	.887	3
4			min	-2.092	4	.741	4	0	3	-.393	3	-1.473	2	.552	2
5		3	max	0	1	1.064	1	1.964	2	-.165	2	-.618	3	.621	3
6			min	-2.092	4	.738	4	0	3	-.393	3	-.982	2	.368	2
7		4	max	0	1	1.061	1	1.964	2	-.165	2	-.413	1	.355	3
8			min	-2.092	4	.735	4	0	3	-.393	3	-.72	4	.183	2
9		5	max	0	1	1.058	1	1.964	2	-.165	2	0	1	.113	4
10			min	-2.092	4	.732	4	0	3	-.393	3	-.72	4	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
11	M2	1	max	0	1	0	1	0	1	0	1	0	1	0	1
12			min	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	.577	2	-.215	4	.609	4	0	1	.971	4	.525	1
14			min	0	3	-.311	1	0	1	-.04	4	0	1	.338	4
15		3	max	1.154	2	-.431	4	1.218	4	0	1	3.309	4	1.745	1
16			min	0	3	-.621	1	0	1	-.08	4	0	1	1.159	4
17		4	max	0	3	.412	3	0	1	0	1	1.289	4	.804	1
18			min	-.81	2	.281	2	-.842	4	-.193	4	0	1	.444	4
19		5	max	0	3	.286	3	0	1	.04	4	0	1	0	3
20			min	-.577	2	.195	2	-.577	4	0	1	0	1	-.04	2
21	M3	1	max	0	1	0	1	0	1	0	1	0	1	0	1
22			min	0	1	0	1	0	1	0	1	0	1	0	1
23		2	max	.13	3	0	3	0	1	0	1	0	1	.226	2
24			min	.085	4	-.278	2	-.279	4	0	1	-.226	4	0	3
25		3	max	-.105	4	.299	2	.299	4	0	1	0	1	.684	2
26			min	-.151	1	0	3	0	1	0	1	-.684	4	0	3
27		4	max	-.1	4	.299	2	.299	4	0	1	0	1	.236	2
28			min	-.146	1	0	3	0	1	0	1	-.236	4	0	3
29		5	max	0	1	0	1	0	1	0	1	0	1	0	1
30			min	0	1	0	1	0	1	0	1	0	1	0	1
31	M4	1	max	0	1	0	1	0	1	0	1	0	1	0	1
32			min	0	1	0	1	0	1	0	1	0	1	0	1
33		2	max	.13	1	0	3	0	1	0	1	0	1	.226	2
34			min	.085	4	-.278	2	-.279	4	0	1	-.226	4	0	3
35		3	max	-.105	2	.299	2	.298	4	0	1	0	1	.684	2
36			min	-.151	1	0	3	0	1	0	1	-.684	4	0	3
37		4	max	-.1	2	.299	2	.298	4	0	1	0	1	.236	2
38			min	-.146	1	0	3	0	1	0	1	-.236	4	0	3
39		5	max	0	1	0	1	0	1	0	1	0	1	0	1
40			min	0	1	0	1	0	1	0	1	0	1	0	1
41	M5	1	max	0	1	0	1	0	1	0	1	0	1	0	1
42			min	0	1	0	1	0	1	0	1	0	1	0	1
43		2	max	.005	1	0	1	0	1	0	1	0	1	0	1
44			min	.005	3	0	1	0	1	0	1	0	1	0	1
45		3	max	.091	1	0	3	0	1	0	1	0	1	.233	2
46			min	.055	2	-.233	2	-.233	4	0	1	-.233	4	0	3
47		4	max	-.005	1	0	1	0	1	0	1	0	1	0	1
48			min	-.005	2	0	1	0	1	0	1	0	1	0	1
49		5	max	0	1	0	1	0	1	0	1	0	1	0	1
50			min	0	1	0	1	0	1	0	1	0	1	0	1
51	M6	1	max	0	1	0	1	0	1	0	1	0	1	0	1
52			min	0	1	0	1	0	1	0	1	0	1	0	1
53		2	max	.13	3	0	3	0	1	0	1	0	1	.226	2
54			min	.085	2	-.279	2	-.279	4	0	1	-.226	4	0	3
55		3	max	-.105	2	.299	2	.298	4	0	1	0	1	.684	2
56			min	-.151	1	0	3	0	1	0	1	-.684	4	0	3
57		4	max	-.1	2	.299	2	.298	4	0	1	0	1	.236	2
58			min	-.146	1	0	3	0	1	0	1	-.236	4	0	3
59		5	max	0	1	0	1	0	1	0	1	0	1	0	1
60			min	0	1	0	1	0	1	0	1	0	1	0	1
61	M7	1	max	0	3	.797	3	-.825	1	-.369	2	0	1	.323	3
62			min	-.982	2	.491	2	-1.406	4	-.577	3	0	1	.212	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
63		2	max	0	3	.79	3	-.825	1	-.369	2	-.413	1	-.031	2
64			min	-.982	2	.484	2	-1.406	4	-.577	3	-.703	4	-.073	3
65		3	max	0	3	.782	3	-.825	1	-.369	2	-.825	1	-.271	2
66			min	-.982	2	.476	2	-1.406	4	-.577	3	-1.406	4	-.466	3
67		4	max	.982	2	-.204	4	.686	4	.577	3	.491	2	.072	3
68			min	0	3	-.352	1	-.982	2	.369	2	-.343	4	.03	2
69		5	max	.982	2	-.212	4	.686	4	.577	3	0	1	.233	1
70			min	0	3	-.36	1	-.982	2	.369	2	0	1	.155	4

Envelope Member Section Stresses

	Member	Sec		Axial[ksi]	LC	y Shear[...	LC	z Shear[...	LC	y-Top[ksi]	LC	y-Bot[ksi]	LC	z-Top[ksi]	LC	z-Bot[ksi]	LC
1	M1	1	max	0	1	.574	1	1.054	2	-2.27	2	3.55	3	-1.901	3	6.043	2
2			min	-.621	4	.399	4	0	3	-3.55	3	2.27	2	-6.043	2	1.901	3
3		2	max	0	1	.572	1	1.054	2	-1.7	2	2.729	3	-1.901	3	4.532	2
4			min	-.621	4	.397	4	0	3	-2.729	3	1.7	2	-4.532	2	1.901	3
5		3	max	0	1	.571	1	1.054	2	-1.131	2	1.909	3	-1.901	3	3.022	2
6			min	-.621	4	.396	4	0	3	-1.909	3	1.131	2	-3.022	2	1.901	3
7		4	max	0	1	.569	1	1.054	2	-.564	2	1.092	3	-1.269	1	2.215	4
8			min	-.621	4	.394	4	0	3	-1.092	3	.564	2	-2.215	4	1.269	1
9		5	max	0	1	.568	1	1.054	2	0	1	.348	4	0	1	2.215	4
10			min	-.621	4	.393	4	0	3	-.348	4	0	1	-2.215	4	0	1
11	M2	1	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
12			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
13		2	max	.204	2	-.152	4	.43	4	-1.92	4	2.978	1	5.514	4	0	1
14			min	0	3	-.219	1	0	1	-2.978	1	1.92	4	0	1	-5.514	4
15		3	max	.408	2	-.304	4	.861	4	-6.575	4	9.904	1	18.781	4	0	1
16			min	0	3	-.439	1	0	1	-9.904	1	6.575	4	0	1	-18.781	4
17		4	max	0	3	.291	3	0	1	-2.52	4	4.565	1	7.317	4	0	1
18			min	-.286	2	.199	2	-.595	4	-4.565	1	2.52	4	0	1	-7.317	4
19		5	max	0	3	.202	3	0	1	.227	2	0	3	0	1	0	1
20			min	-.204	2	.138	2	-.408	4	0	3	-.227	2	0	1	0	1
21	M3	1	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
22			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
23		2	max	.127	3	0	3	0	1	0	3	5.147	2	0	1	5.147	4
24			min	.083	4	-.546	2	-.546	4	-5.147	2	0	3	-5.147	4	0	1
25		3	max	-.103	4	.585	2	.585	4	0	3	15.572	2	0	1	15.572	4
26			min	-.148	1	0	3	0	1	-15.572	2	0	3	-15.572	4	0	1
27		4	max	-.098	4	.585	2	.585	4	0	3	5.375	2	0	1	5.375	4
28			min	-.143	1	0	3	0	1	-5.375	2	0	3	-5.375	4	0	1
29		5	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
30			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
31	M4	1	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
32			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
33		2	max	.127	1	0	3	0	1	0	3	5.147	2	0	1	5.147	4
34			min	.083	4	-.546	2	-.546	4	-5.147	2	0	3	-5.147	4	0	1
35		3	max	-.103	2	.585	2	.585	4	0	3	15.572	2	0	1	15.572	4
36			min	-.148	1	0	3	0	1	-15.572	2	0	3	-15.572	4	0	1
37		4	max	-.098	2	.585	2	.585	4	0	3	5.375	2	0	1	5.375	4
38			min	-.143	1	0	3	0	1	-5.375	2	0	3	-5.375	4	0	1
39		5	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1

Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC	y Shear[...	LC	z Shear[...	LC	y-Top[ksi]	LC	y-Bot[ksi]	LC	z-Top[ksi]	LC	z-Bot[ksi]	LC
40			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
41	M5	1	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
42			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
43		2	max	.005	1	0	1	0	1	0	1	0	1	0	1	0	1
44			min	.005	3	0	1	0	1	0	1	0	1	0	1	0	1
45		3	max	.09	1	0	3	0	1	0	3	5.307	2	0	1	5.307	4
46			min	.054	2	-.457	2	-.457	4	-5.307	2	0	3	-5.307	4	0	1
47		4	max	-.005	1	0	1	0	1	0	1	0	1	0	1	0	1
48			min	-.005	2	0	1	0	1	0	1	0	1	0	1	0	1
49		5	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
50			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
51	M6	1	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
52			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
53		2	max	.127	3	0	3	0	1	0	3	5.147	2	0	1	5.147	4
54			min	.083	2	-.546	2	-.546	4	-5.147	2	0	3	-5.147	4	0	1
55		3	max	-.103	2	.585	2	.585	4	0	3	15.572	2	0	1	15.572	4
56			min	-.148	1	0	3	0	1	-15.572	2	0	3	-15.572	4	0	1
57		4	max	-.098	2	.585	2	.585	4	0	3	5.375	2	0	1	5.375	4
58			min	-.143	1	0	3	0	1	-5.375	2	0	3	-5.375	4	0	1
59		5	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
60			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
61	M7	1	max	0	3	.266	3	-.275	1	-.567	2	.862	3	0	1	0	1
62			min	-.218	2	.164	2	-.469	4	-.862	3	.567	2	0	1	0	1
63		2	max	0	3	.263	3	-.275	1	.196	3	-.083	2	-8.8	1	14.994	4
64			min	-.218	2	.161	2	-.469	4	.083	2	-.196	3	-14.994	4	8.8	1
65		3	max	0	3	.261	3	-.275	1	1.244	3	-.723	2	-17.6	1	29.988	4
66			min	-.218	2	.159	2	-.469	4	.723	2	-1.244	3	-29.988	4	17.6	1
67		4	max	.218	2	-.068	4	.229	4	-.08	2	.192	3	10.475	2	7.315	4
68			min	0	3	-.117	1	-.327	2	-.192	3	.08	2	-7.315	4	-10.475	2
69		5	max	.218	2	-.071	4	.229	4	-.413	4	.622	1	0	1	0	1
70			min	0	3	-.12	1	-.327	2	-.622	1	.413	4	0	1	0	1

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	0	3	.797	3	-.825	1	-.369	2	0	1	.323	3
2		min	-.982	2	.491	2	-1.406	4	-.577	3	0	1	.212	2
3	N1	max	0	3	.36	1	.982	2	-.369	2	0	1	-.155	4
4		min	-.982	2	.212	4	-.686	4	-.577	3	0	1	-.233	1
5	Totals:	max	0	3	1.1	1	0	1						
6		min	-1.964	2	.774	2	-2.092	4						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...	LC	Y Rotation...	LC	Z Rotation...	LC
1	N1	max	0	2	0	4	0	4	0	3	1.09e-2	4	0	1
2		min	0	3	0	1	0	2	0	2	-3.83e-3	2	0	4
3	N2	max	0	2	0	2	0	4	0	3	-3.217e-3	1	0	2
4		min	0	3	0	3	0	1	0	2	-1.371e-2	4	0	3
5	N3	max	0	2	0	2	.099	4	9.582e-3	3	7.729e-3	2	2.675e-5	3
6		min	0	3	0	1	0	1	6.128e-3	2	2.431e-3	3	1.127e-5	2

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...	LC	Y Rotation...	LC	Z Rotation...	LC
7	N4	max	.099	2	-.076	2	.099	4	9.978e-3	3	8.354e-3	2	4.228e-4	3
8		min	.032	3	-.119	3	0	1	6.362e-3	2	2.824e-3	3	1.782e-4	2
9	N5	max	.1	2	-.209	2	.598	4	9.622e-3	3	1.134e-2	4	4.673e-3	1
10		min	.032	3	-.305	3	.379	1	6.362e-3	2	7.018e-3	1	3.111e-3	4
11	N7	max	.1	2	-.189	2	.53	4	9.622e-3	3	1.134e-2	4	4.672e-3	1
12		min	.032	3	-.278	3	.337	1	6.362e-3	2	7.018e-3	1	3.11e-3	4
13	N8	max	.099	2	-.115	2	.27	4	9.74e-3	3	9.739e-3	4	3.774e-3	1
14		min	.032	3	-.176	3	.168	1	6.362e-3	2	7.018e-3	1	2.554e-3	4
15	N9	max	.099	2	-.104	2	.096	4	1.053e-2	3	8.354e-3	2	-1.566e-3	4
16		min	.032	3	-.147	3	-.2	2	6.362e-3	2	-2.168e-3	4	-2.819e-3	1
17	N10	max	.1	2	-.153	4	.174	4	1.041e-2	3	8.354e-3	2	-2.106e-3	4
18		min	.032	3	-.224	1	-.401	2	6.362e-3	2	-3.744e-3	4	-3.515e-3	1
19	N11	max	.14	2	-.189	2	.94	4	1.462e-2	3	1.134e-2	4	4.495e-3	3
20		min	-.13	3	-.278	3	.63	2	6.362e-3	2	7.018e-3	1	-2.646e-3	2
21	N12	max	.394	1	-.189	2	.449	4	9.173e-3	1	1.134e-2	4	9.943e-3	1
22		min	.149	4	-.278	3	.007	1	6.799e-4	4	7.018e-3	1	3.11e-3	4
23	N13	max	.164	2	-.115	2	.714	3	1.474e-2	3	9.739e-3	4	3.688e-3	3
24		min	-.101	3	-.176	3	.43	2	6.362e-3	2	7.018e-3	1	-3.31e-3	2
25	N14	max	.363	2	-.115	2	.183	4	9.173e-3	1	9.739e-3	4	9.044e-3	1
26		min	.129	4	-.176	3	-.162	1	8.195e-4	4	7.018e-3	1	2.554e-3	4
27	N15	max	.21	1	-.104	2	.484	3	1.129e-2	3	8.354e-3	2	-1.566e-3	4
28		min	.093	4	-.147	3	.029	2	6.362e-3	2	-2.168e-3	4	-3.579e-3	1
29	N16	max	.02	2	-.104	2	-.194	4	1.053e-2	3	8.354e-3	2	-1.566e-3	4
30		min	-.051	3	-.147	3	-.499	1	6.362e-3	2	-2.168e-3	4	-2.819e-3	1
31	N17	max	.354	2	-.153	4	.654	3	1.541e-2	3	8.354e-3	2	-2.106e-3	4
32		min	.113	4	-.225	1	-.172	2	6.362e-3	2	-3.744e-3	4	-8.596e-3	2
33	N18	max	.173	2	-.153	4	.058	4	9.173e-3	1	8.354e-3	2	3.635e-3	2
34		min	-.08	3	-.225	1	-.667	1	1.632e-3	4	-3.744e-3	4	-3.086e-3	3

Envelope AISC ASD Steel Code Checks

	Me...	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Fa ...	Ft [...	Fb y-y [ksi]	Fb			...	AS...
1	M1	HSS4x...	.206	0	1	.058	0	z	1	36...	36...	40.47	40...	...	.6	...	H1-2
2	M2	PIPE_3...	.688	4.427	4	.064	4.516		4	18...	27...	30.792	30...	1	...	...	H1-2
3	M3	PIPE_2.0	.509	3	2	.031	3		2	18...	27...	30.792	30...	1	.6	...	H2-1
4	M4	PIPE_2.0	.509	3	4	.031	3		2	18...	27...	30.792	30...	...	...	.6	H2-1
5	M5	PIPE_2.0	.174	3	4	.024	2		4	18...	27...	30.792	30...	...	...	.6	H1-2
6	M6	PIPE_2.0	.509	3	4	.031	3		2	18...	27...	30.792	30...	...	...	.6	H2-1
7	M7	6"X3/4"...	.861	1	4	.365	0	z	3	15...	28...	35.991	31...	1	.6	...	H1-2

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N2	-.825	.741	-.825	-.532	0	.312
2	1	N1	-.825	.36	.825	-.532	0	-.233
3	1	Totals:	-1.65	1.1	0			
4	1	COG (ft):	X: -.357	Y: -.014	Z: .967			

Joint Reactions

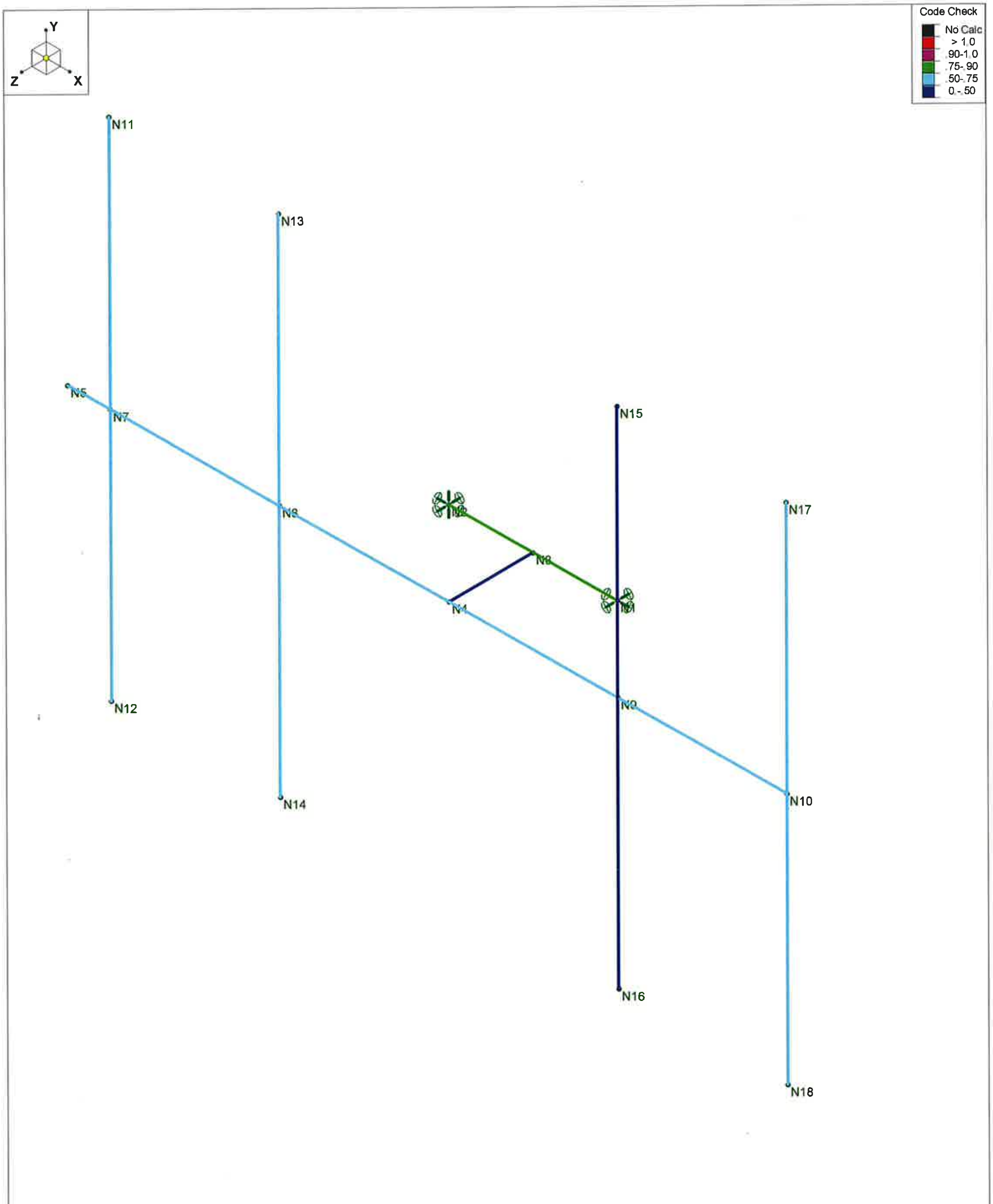
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	N2	-.982	.491	-.982	-.369	0	.212
2	2	N1	-.982	.283	.982	-.369	0	-.17
3	2	Totals:	-1.964	.774	0			
4	2	COG (ft):	X: -.36	Y: -.058	Z: .953			

Joint Reactions

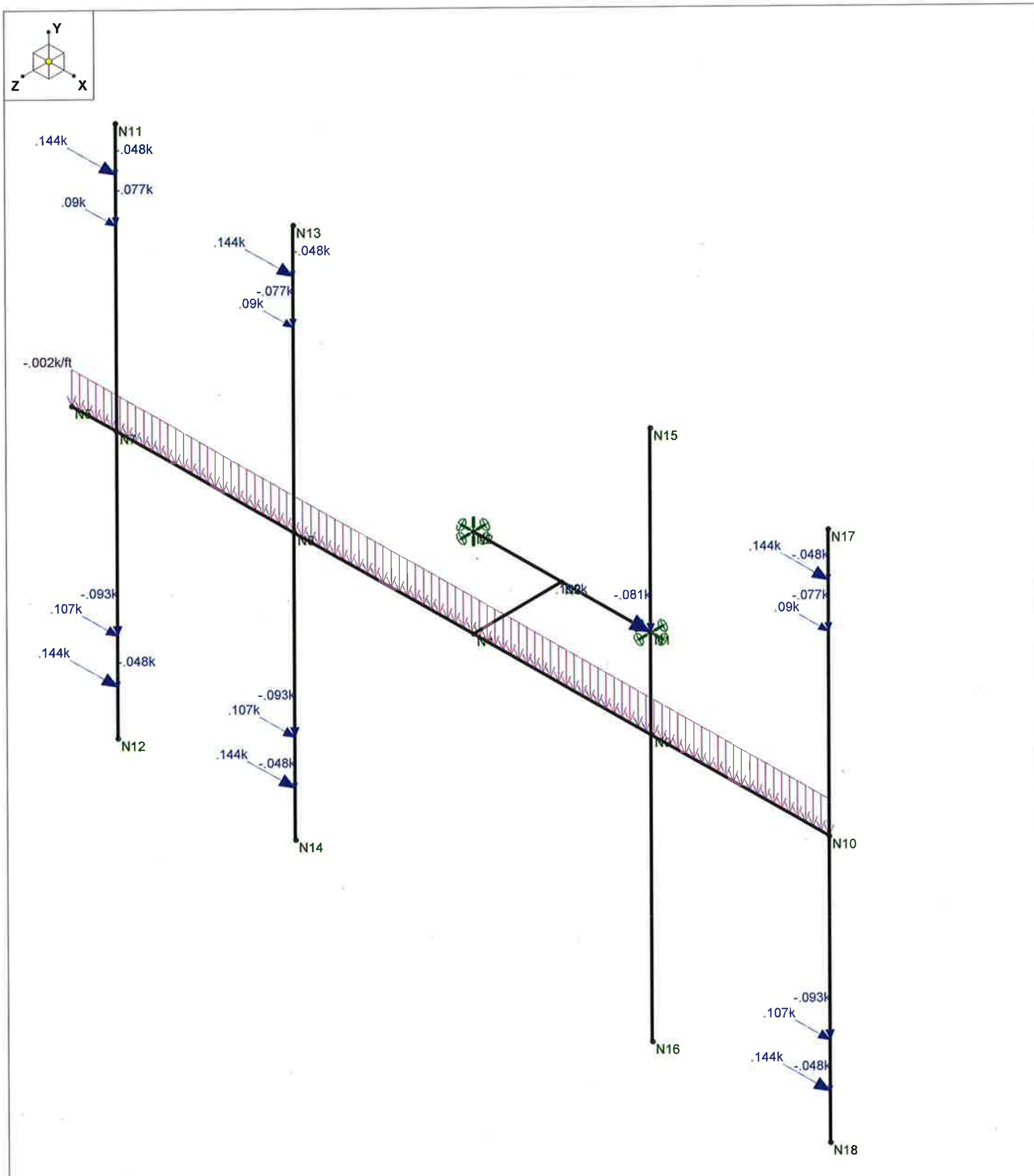
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	N2	0	.797	-1.193	-.577	0	.323
2	3	N1	0	.303	-.576	-.577	0	-.222
3	3	Totals:	0	1.1	-1.769			
4	3	COG (ft):	X: -.357	Y: -.014	Z: .967			

Joint Reactions

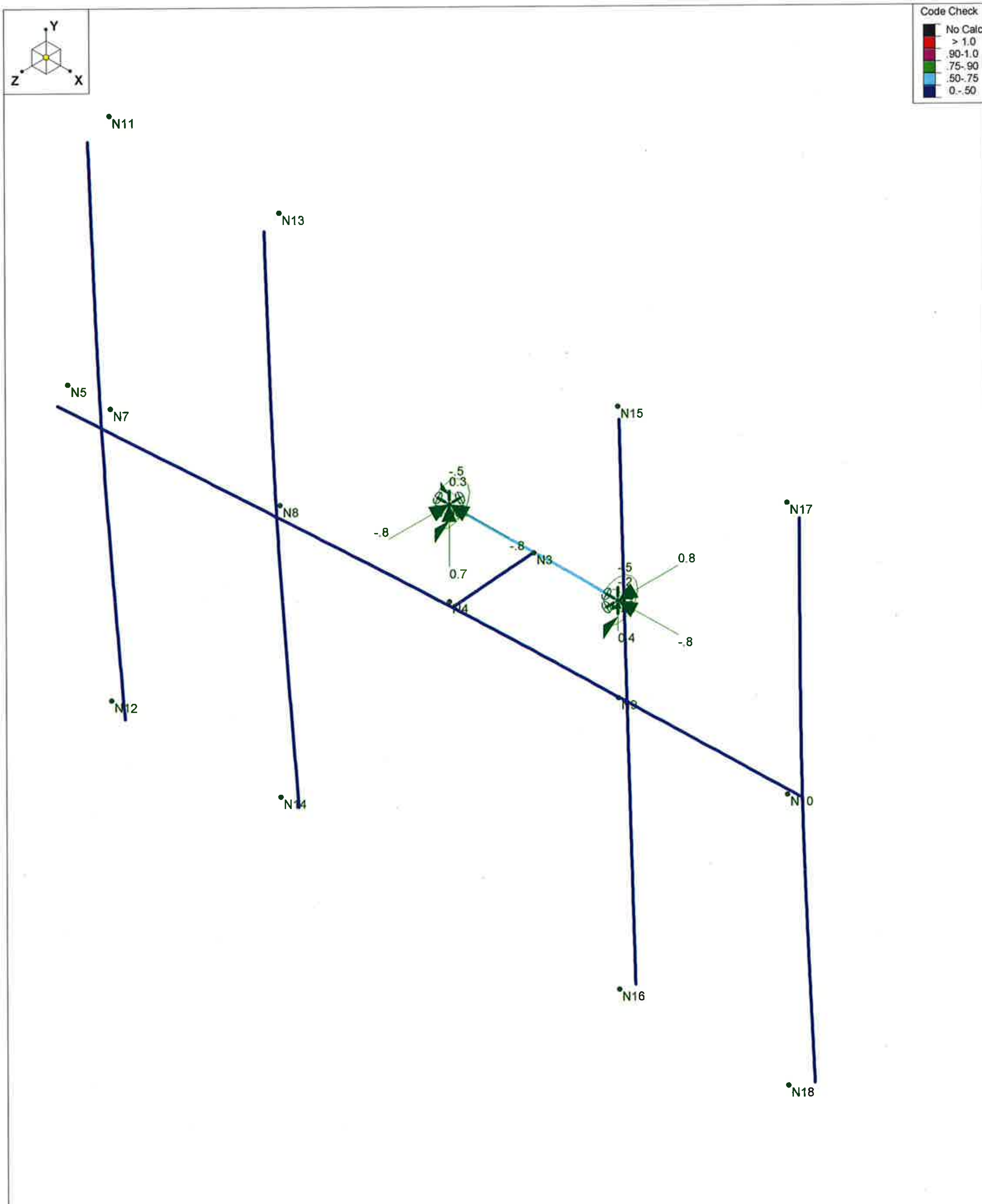
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N2	0	.562	-1.406	-.425	0	.227
2	4	N1	0	.212	-.686	-.425	0	-.155
3	4	Totals:	0	.774	-2.092			
4	4	COG (ft):	X: -.36	Y: -.058	Z: .953			



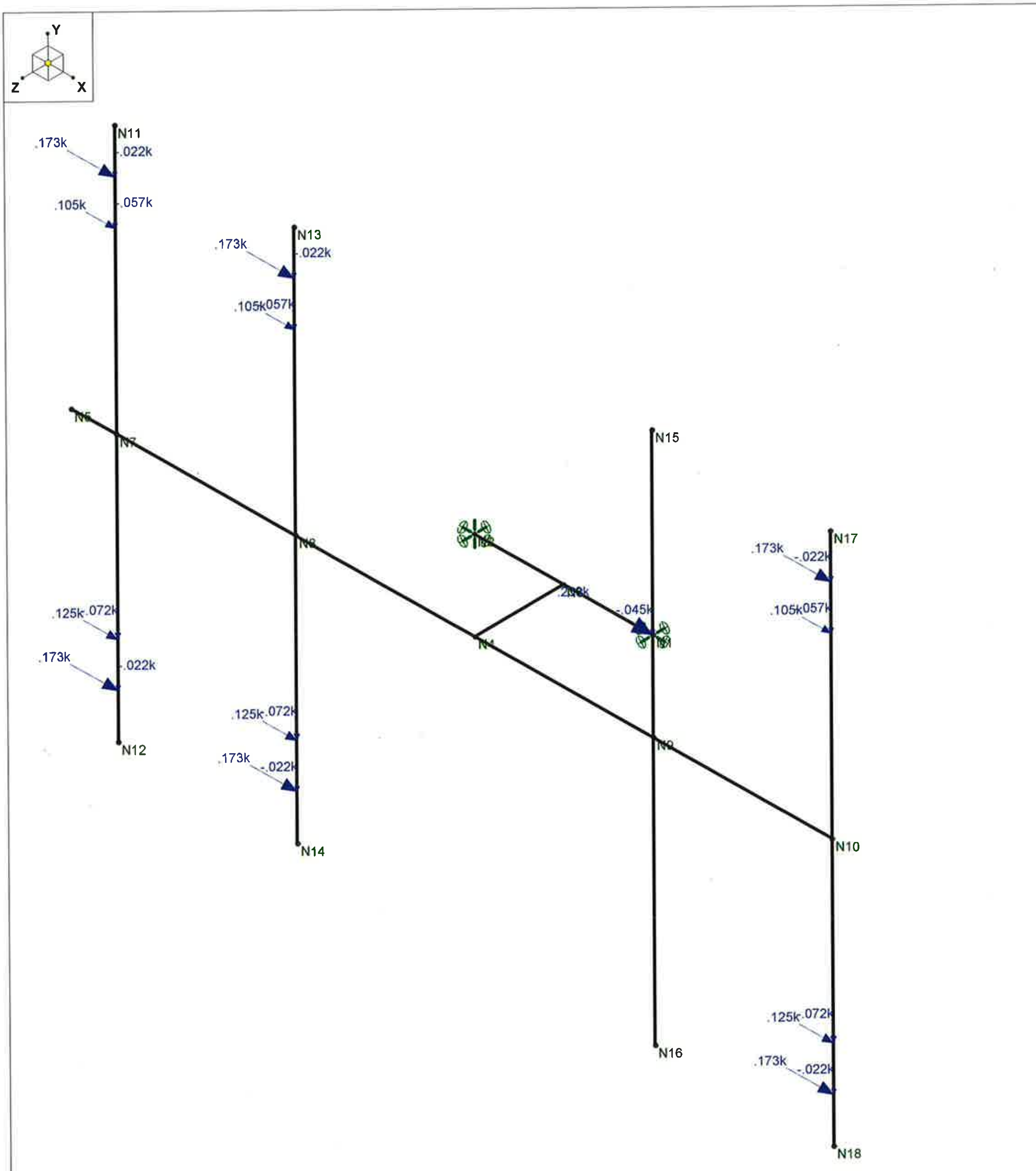
CENTEK Engineering, INC.	Tower # 845 - Verizon Mast	
tjl, cfc		Dec 23, 2015 at 11:02 AM
15240.000 - Trumbull 4	Unity Check	Antenna Mast - TIA-EIA.r3d



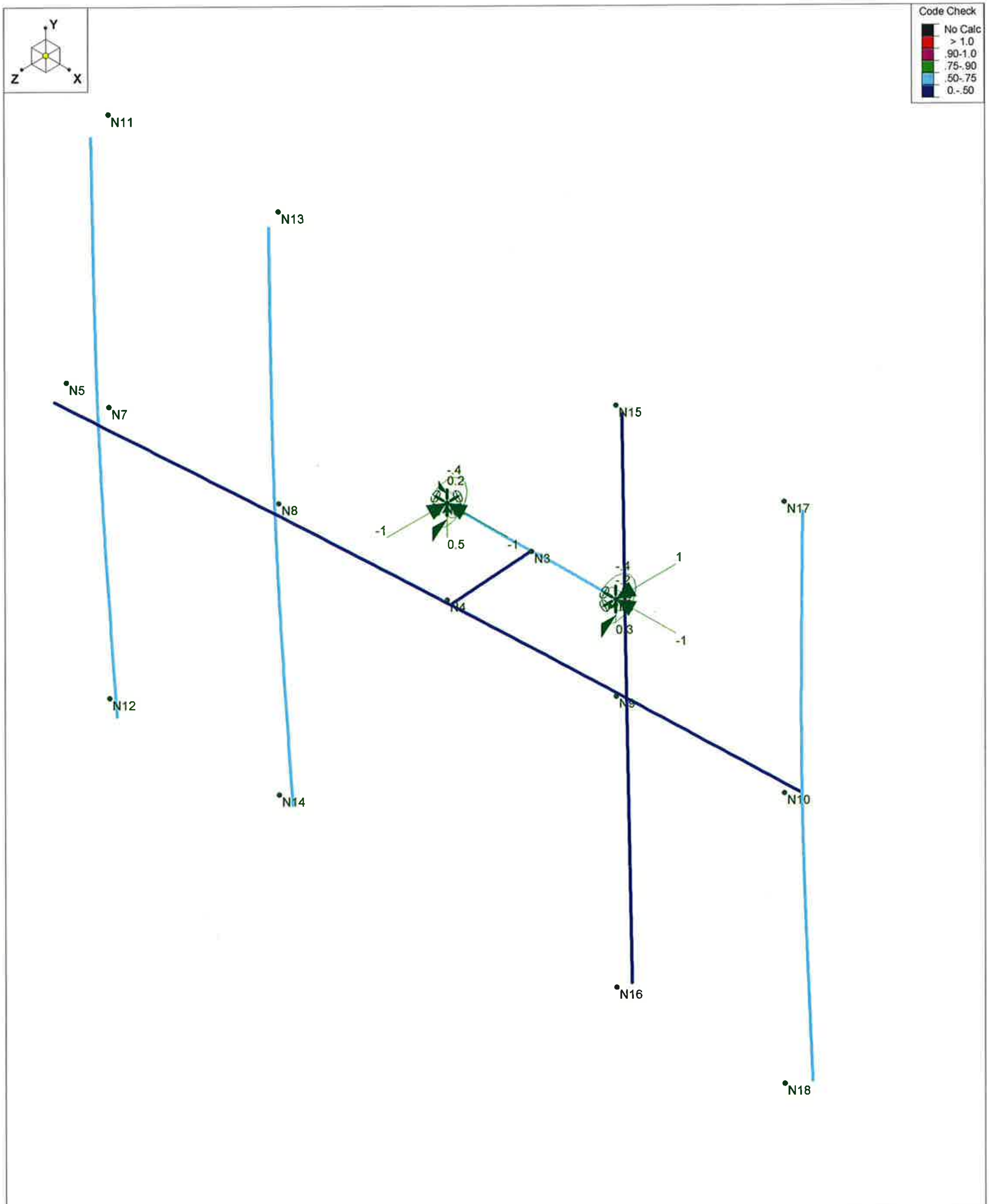
CENTEK Engineering, INC.	Tower # 845 - Verizon Mast	
tjl, cfc		Dec 23, 2015 at 11:03 AM
15240.000 - Trumbull 4	LC #1 Loads	Antenna Mast - TIA-EIA.r3d



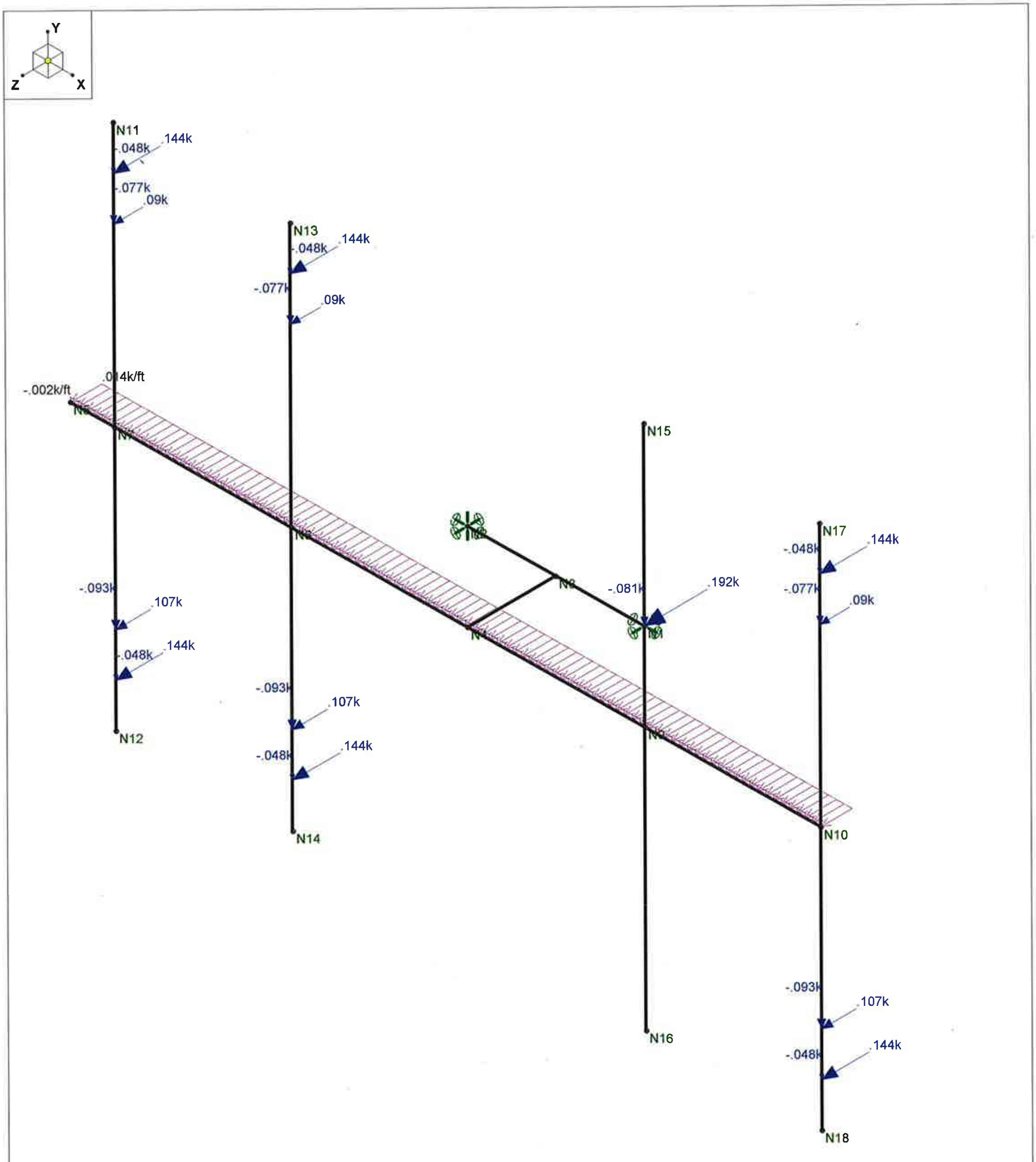
CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:05 AM
15240.000 - Trumbull 4	LC #1 Reactions and Deflected Shape	Antenna Mast - TIA-EIA.r3d



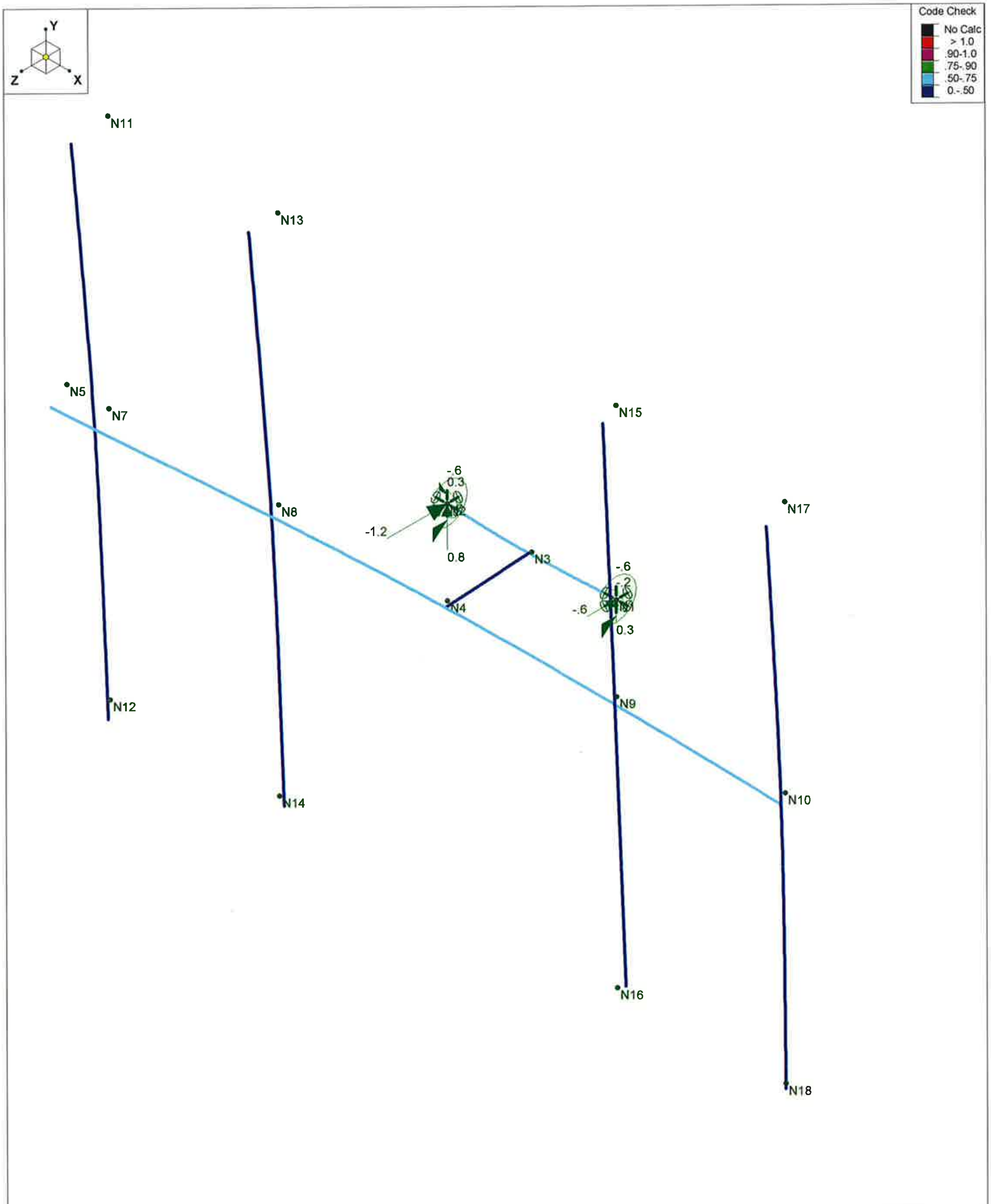
CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:03 AM
15240.000 - Trumbull 4	LC #2 Loads	Antenna Mast - TIA-EIA.r3d



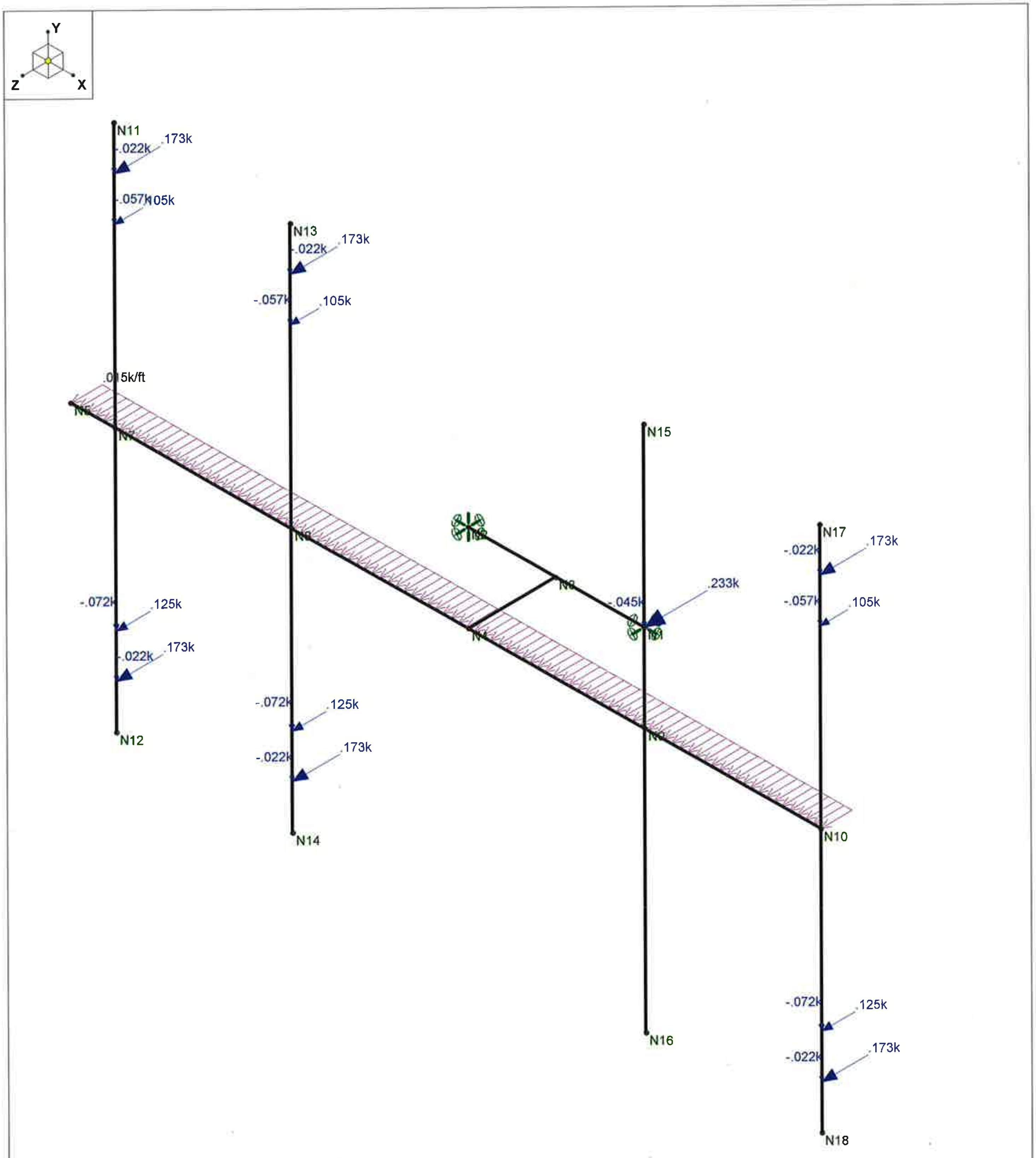
CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:05 AM
15240.000 - Trumbull 4	LC #2 Reactions and Deflected Shape	Antenna Mast - TIA-EIA.r3d



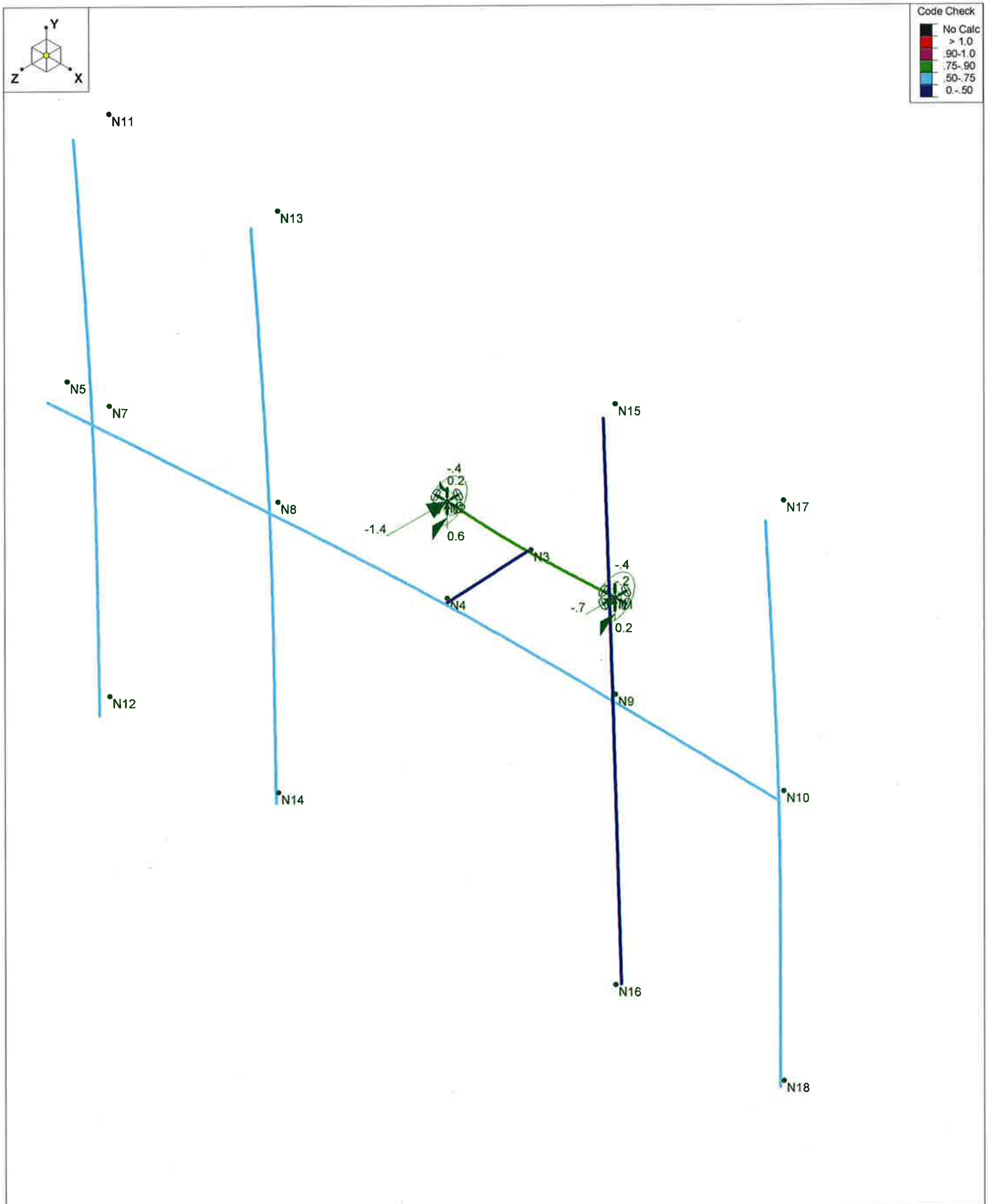
CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:03 AM
15240.000 - Trumbull 4	LC #3 Loads	Antenna Mast - TIA-EIA.r3d



CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:06 AM
15240.000 - Trumbull 4	LC #3 Reactions and Deflected Shape	Antenna Mast - TIA-EIA.r3d



CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:03 AM
15240.000 - Trumbull 4	LC #4 Loads	Antenna Mast - TIA-EIA.r3d



CENTEK Engineering, INC.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:06 AM
15240.000 - Trumbull 4	LC #4 Reactions and Deflected Shape	Antenna Mast - TIA-EIA.r3d

Mast Connection to Tower:

Reactions: (LC #1)

Moment x-dir = $Moment_x := 0.532 \cdot kips \cdot ft$ (Input From Risa-3D)

Moment z-dir = $Moment_z := 0.312 \cdot kip \cdot ft$ (Input From Risa-3D)

Vertical = $Vertical := 0.741 \cdot kips$ (Input From Risa-3D)

Horizontal x-dir = $Horizontal_x := 0.825 \cdot kips$ (Input From Risa-3D)

Horizontal z-dir = $Horizontal_z := 0.825 \cdot kips$ (Input From Risa-3D)

Bolt Data:

Bolt Type = ASTM A307 Threaded Rod (User Input)

Bolt Diameter = $D := 0.75 \cdot in$ (User Input)

Number of Bolts = $N_b := 2$ (User Input) (Per Side of Plate)

Bolt Spacing Vert = $S_b := 5 \cdot in$ (User Input)

Allowable Tensile Strength = $F_t := 9.94 \cdot kips$ (User Input)

Allowable Shear Strength = $F_v := 5.97 \cdot kips$ (User Input)

Shear Force = $$f_v := \sqrt{\left(\frac{Horizontal_x}{N_b} + \frac{Moment_z}{S_b}\right)^2 + \left(\frac{Vertical}{N_b}\right)^2} = 1.2 \cdot kips$$

Bolt Shear % of Capacity = $$\frac{f_v}{F_v} = 20.42 \cdot \%$$

Check Bolt Shear = $$Bolt\_Shear := if\left(\frac{f_v}{F_v} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Bolt_Shear = "OK"

Tension Force = $$f_t := \sqrt{\left(\frac{Horizontal_z}{N_b} + \frac{Moment_x}{S_b}\right)^2} = 1.7 \cdot kips$$

Bolt Tenison % of Capacity = $$\frac{f_t}{F_t} = 16.99 \cdot \%$$

Check Bolt Tension = $$Bolt\_Tension := if\left(\frac{f_t}{F_t} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Bolt_Tension = "OK"

$$Combined := \frac{f_t}{F_t} + \frac{f_v}{F_v} = 37.41 \cdot \%$$

Reactions: (LC #2)

Moment x-dir =	$Moment_x := 0.369 \cdot kips \cdot ft$	(Input From Risa-3D)
Moment z-dir =	$Moment_z := 0.212 \cdot kip \cdot ft$	(Input From Risa-3D)
Vertical =	$Vertical := 0.491 \cdot kips$	(Input From Risa-3D)
Horizontal x-dir =	$Horizontal_x := 0.982 \cdot kips$	(Input From Risa-3D)
Horizontal z-dir =	$Horizontal_z := 0.982 \cdot kips$	(Input From Risa-3D)

Bolt Data:

Bolt Type =	ASTM A307 Threaded Rod	(User Input)	
Bolt Diameter =	$D := 0.75 \cdot in$	(User Input)	
Number of Bolts =	$N_b := 2$	(User Input)	(Per Side of Plate)
Bolt Spacing Vert =	$S_b := 5 \cdot in$	(User Input)	
Allowable Tensile Strength =	$F_t := 9.94 \cdot kips$	(User Input)	
Allowable Shear Strength =	$F_v := 5.97 \cdot kips$	(User Input)	

Shear Force = $$f_v := \sqrt{\left(\frac{Horizontal_x}{N_b} + \frac{Moment_z}{S_b}\right)^2 + \left(\frac{Vertical}{N_b}\right)^2} = 1 \cdot kips$$

Bolt Shear % of Capacity = $$\frac{f_v}{F_v} = 17.24 \cdot \%$$

Check Bolt Shear = $$Bolt\_Shear := if\left(\frac{f_v}{F_v} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Bolt_Shear = "OK"

Tension Force = $$f_t := \sqrt{\left(\frac{Horizontal_z}{N_b} + \frac{Moment_x}{S_b}\right)^2} = 1.4 \cdot kips$$

Bolt Tenison % of Capacity = $$\frac{f_t}{F_t} = 13.85 \cdot \%$$

Check Bolt Tension = $$Bolt\_Tension := if\left(\frac{f_t}{F_t} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Bolt_Tension = "OK"

$$Combined := \frac{f_t}{F_t} + \frac{f_v}{F_v} = 31.09 \cdot \%$$

Reactions: (LC #3)

Moment x-dir =	$Moment_x := 0.577 \cdot kips \cdot ft$	(Input From Risa-3D)
Moment z-dir =	$Moment_z := 0.323 \cdot kip \cdot ft$	(Input From Risa-3D)
Vertical =	$Vertical := 0.797 \cdot kips$	(Input From Risa-3D)
Horizontal x-dir =	$Horizontal_x := 0 \cdot kips$	(Input From Risa-3D)
Horizontal z-dir =	$Horizontal_z := 1.193 \cdot kips$	(Input From Risa-3D)

Bolt Data:

Bolt Type =	ASTM A307 Threaded Rod	(User Input)	
Bolt Diameter =	$D := 0.75 \cdot in$	(User Input)	
Number of Bolts =	$N_b := 2$	(User Input)	(Per Side of Plate)
Bolt Spacing Vert =	$S_b := 5 \cdot in$	(User Input)	
Allowable Tensile Strength =	$F_t := 9.94 \cdot kips$	(User Input)	
Allowable Shear Strength =	$F_v := 5.97 \cdot kips$	(User Input)	

Shear Force = $f_v := \sqrt{\left(\frac{Horizontal_x}{N_b} + \frac{Moment_z}{S_b}\right)^2 + \left(\frac{Vertical}{N_b}\right)^2} = 0.9 \cdot kips$

Bolt Shear % of Capacity = $\frac{f_v}{F_v} = 14.6 \cdot \%$

Check Bolt Shear = $Bolt\_Shear := if\left(\frac{f_v}{F_v} \le 1.00, "OK", "Overstressed"\right)$

$Bolt\_Shear = "OK"$

Tension Force = $f_t := \sqrt{\left(\frac{Horizontal_z}{N_b} + \frac{Moment_x}{S_b}\right)^2} = 2 \cdot kips$

Bolt Tenison % of Capacity = $\frac{f_t}{F_t} = 19.93 \cdot \%$

Check Bolt Tension = $Bolt\_Tension := if\left(\frac{f_t}{F_t} \le 1.00, "OK", "Overstressed"\right)$

$Bolt\_Tension = "OK"$

$Combined := \frac{f_t}{F_t} + \frac{f_v}{F_v} = 34.53 \cdot \%$

Reactions: (LC #4)

Moment x-dir =	$Moment_x := 0.425 \cdot kips \cdot ft$	(Input From Risa-3D)
Moment z-dir =	$Moment_z := 0.227 \cdot kip \cdot ft$	(Input From Risa-3D)
Vertical =	$Vertical := 0.562 \cdot kips$	(Input From Risa-3D)
Horizontal x-dir =	$Horizontal_x := 0 \cdot kips$	(Input From Risa-3D)
Horizontal z-dir =	$Horizontal_z := 1.406 \cdot kips$	(Input From Risa-3D)

Bolt Data:

Bolt Type =	ASTM A307 Threaded Rod	(User Input)	
Bolt Diameter =	$D := 0.75 \cdot in$	(User Input)	
Number of Bolts =	$N_b := 2$	(User Input)	(Per Side of Plate)
Bolt Spacing Vert =	$S_b := 5 \cdot in$	(User Input)	
Allowable Tensile Strength =	$F_t := 9.94 \cdot kips$	(User Input)	
Allowable Shear Strength =	$F_v := 5.97 \cdot kips$	(User Input)	

Shear Force = $$f_v := \sqrt{\left(\frac{Horizontal_x}{N_b} + \frac{Moment_z}{S_b}\right)^2 + \left(\frac{Vertical}{N_b}\right)^2} = 0.6 \cdot kips$$

Bolt Shear % of Capacity = $$\frac{f_v}{F_v} = 10.27 \cdot \%$$

Check Bolt Shear = $$Bolt\_Shear := if\left(\frac{f_v}{F_v} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Bolt_Shear = "OK"

Tension Force = $$f_t := \sqrt{\left(\frac{Horizontal_z}{N_b} + \frac{Moment_x}{S_b}\right)^2} = 1.7 \cdot kips$$

Bolt Tenison % of Capacity = $$\frac{f_t}{F_t} = 17.33 \cdot \%$$

Check Bolt Tension = $$Bolt\_Tension := if\left(\frac{f_t}{F_t} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Bolt_Tension = "OK"

$$Combined := \frac{f_t}{F_t} + \frac{f_v}{F_v} = 27.6 \cdot \%$$

Basic Components

Heavy Wind Pressure =	$p := 4.00$	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	$V := 110$	mph	(User Input NESC 2007 Figure 250-2(e))
Radial Ice Thickness =	$Ir := 0.50$	in	(User Input)
Radial Ice Density =	$Id := 56.0$	pcf	(User Input)

Factors for Extreme Wind Calculation

Elevation of Top of Mast Above Grade =	$TME := 90$	ft	(User Input)
Multiplier Gust Response Factor =	$m := 1.25$		(User Input - Only for NESC Extreme wind case)
NESC Factor =	$kv := 1.43$		(User Input from NESC 2007 Table 250-3 equation)
Importance Factor =	$I := 1.0$		(User Input from NESC 2007 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.238$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.317$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.867$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.879$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 33.7$ psf (NESC 2007 Section 250.C.2)

Shape Factors NUS Design Criteria Issued April 12, 2007

Shape Factor for Round Members =	$Cd_R := 1.3$	(User Input)
Shape Factor for Flat Members =	$Cd_F := 1.6$	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	$Cd_{coax} := 1.45$	(User Input)

Overload Factors NU Design Criteria Table

Overload Factors for Wind Loads:

NESC Heavy Loading =	**2.5**	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	**1.0**	(User Input)	Apply in Risa-3D Analysis

Overload Factors for Vertical Loads:

NESC Heavy Loading =	**1.5**	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	**1.0**	(User Input)	Apply in Risa-3D Analysis

Development of Wind & Ice Load on Mast

Mast Data: (3" Sch. 80 Pipe)

Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 3.5$	in	(User Input)
Mast Length =	$L_{mast} := 8.5$	ft	(User Input)
Mast Thickness =	$t_{mast} := 0.3$	in	(User Input)

Wind Load (NESC Extreme)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 0.292$ sf/ft

Total Mast Wind Force (Below NU Structure) = $qz \cdot Cd_R \cdot A_{mast} = 13$ plf **BLC 5,7**

Wind Load (NESE Heavy)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 0.375$ sf/ft

Total Mast Wind Force w/ Ice = $p \cdot Cd_R \cdot AICE_{mast} = 2$ plf **BLC 4,6**

Gravity Loads (without ice)

Weight of the Mast = Self Weight **(Computed Internally by Risa-3D)** plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^{\ 2}\right] = 6.3$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 2$ plf **BLC 3**

CENTEK engineering
Centered on Solutions™ www.centekeng.com
63-2 North Branford Road
Branford, CT 06405
P: (203) 488-0580
F: (203) 488-8587

Subject:		Load Analysis of Verizon Equipment on Structure #845	
Location:		Trumbull, CT	
Rev. 0: 11/3/15		Prepared by: T.J.L Checked by: C.F.C. Job No. 15240.000	

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	SBNHH-1D65B			
Antenna Shape =	Flat		(User Input)	
Antenna Height =	$L_{ant} := 72$	in	(User Input)	
Antenna Width =	$W_{ant} := 11.9$	in	(User Input)	
Antenna Thickness =	$T_{ant} := 7.1$	in	(User Input)	
Antenna Weight =	$WT_{ant} := 45$	lbs	(User Input)	
Number of Antennas =	$N_{ant} := 1$		(User Input)	(One per pipe mast / tot. of 3)

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 6$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} = 321$ lbs **BLC 5,7**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.5$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 6.5$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 42$ lbs **BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 45$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 6083$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1544$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 50$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 50$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Alcatel-Lucent B13 RRH4x30/2x60-LTE			
Antenna Shape =	Flat		(User Input)	
Antenna Height =	$L_{ant} := 21.6$	in	(User Input)	
Antenna Width =	$W_{ant} := 12$	in	(User Input)	
Antenna Thickness =	$T_{ant} := 9$	in	(User Input)	
Antenna Weight =	$WT_{ant} := 57$	lbs	(User Input)	
Number of Antennas =	$N_{ant} := 1$		(User Input)	(One per pipe mast / tot. of 3)

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 1.8$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 1.8$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} = 97$ lbs **BLC 5,7**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 2$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 2$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 13$ lbs **BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 57$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2333$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 605$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 20$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 20$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	Alcatel-Lucent RRH4x45/2x90-AWS			
Antenna Shape =	Flat		(User Input)	
Antenna Height =	$L_{ant} := 25.8$	in	(User Input)	
Antenna Width =	$W_{ant} := 12$	in	(User Input)	
Antenna Thickness =	$T_{ant} := 7.6$	in	(User Input)	
Antenna Weight =	$WT_{ant} := 72$	lbs	(User Input)	
Number of Antennas =	$N_{ant} := 1$		(User Input)	(One per pipe mast / tot. of 3)

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 2.2$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 2.2$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} = 116$ lbs **BLC 5,7**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 2.4$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 2.4$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 15$ lbs **BLC 4,6**

Gravity Load (without Ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 72$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2353$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 643$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 21$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 21$ lbs **BLC 3**

Development of Wind & Ice Load on Antennas

Antenna Data:

Antenna Model =	RFS DB-T1-6Z-8AB-0Z		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 24$	in	(User Input)
Antenna Width =	$W_{ant} := 24$	in	(User Input)
Antenna Thickness =	$T_{ant} := 10$	in	(User Input)
Antenna Weight =	$WT_{ant} := 45$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input)

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 4$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} = 216$ lbs **BLC 5,7**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 4.3$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 4.3$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 28$ lbs **BLC 4,6**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 45$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5760$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1115$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 36$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 36$ lbs **BLC 3**

CENTEK engineering, INC.
Consulting Engineers
63-2 North Branford Road
Branford, CT 06405
Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining Mast Reactions Applied to Tower Structure Load Cases**

Location: **Trumbull, CT**

Date: 11/3/15 Prepared by: T.J.L. Checked by: C.F.C. Job No. 15240.000

Load Case	Description
1	Self Weight
2	Weight of Appurtenances
3	Weight of Ice Only
4	x-direction NESC Heavy Wind
5	x-direction NESC Extreme Wind
6	z-direction NESC Heavy Wind
7	z-direction NESC Extreme Wind

Footnotes:

CENTEK engineering, INC.
Consulting Engineers
63-2 North Branford Road
Branford, CT 06405
Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining Mast Reactions Applied to Tower Structure Load Combinations**

Location: **Trumbull, CT**

Date: 11/3/15 Prepared by: T.J.L. Checked by: C.F.C. Job No. 15240.000

Load Combination	Description	Envelope Soultion	Wind Factor	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	x-direction NESC Heavy Wind		1		1	1.5	2	1.5	3	1.5	4	2.5		
2	x-direction NESC Extreme Wind		1		1	1	2	1	5	1				
3	z-direction NESC Heavy Wind		1		1	1.5	2	1.5	3	1.5	6	2.5		
4	z-direction NESC Extreme Wind		1		1	1	2	1	7	1				

Footnotes:
(1) BLC = Basic Load Case

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
1	M1	Outrigger	1												Lateral
2	M2	Horz Mast	8.5												Lateral
3	M3	Plate	2												Lateral
4	M4	Pipe Mast	6												Lateral
5	M5	Pipe Mast	6												Lateral
6	M6	Pipe Mast	6												Lateral
7	M7	Pipe Mast	6												Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Horz Mast	PIPE_3.0X	Beam	Pipe	A53 Gr. B	Typical	2.83	3.7	3.7	7.4
2	Pipe Mast	PIPE_2.0	Beam	Tube	A53 Gr. B	Typical	1.02	.627	.627	1.25
3	Outrigger	HSS4x4x4	Beam	Tube	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
4	Plate	6"X3/4" PL	Beam	Tube	A36 Gr.36	Typical	4.5	.211	13.5	.777

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	N3	N4			Outrigger	Beam	Tube	A500 Gr.46	Typical
2	M2	N5	N9			Horz Mast	Beam	Pipe	A53 Gr. B	Typical
3	M3	N2	N1			Plate	Beam	Tube	A36 Gr.36	Typical
4	M4	N10	N11			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
5	M5	N12	N13			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
6	M6	N14	N15			Pipe Mast	Beam	Tube	A53 Gr. B	Typical
7	M7	N16	N17			Pipe Mast	Beam	Tube	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From D...
1	N1	1	0	0	0	
2	N2	-1	0	0	0	
3	N3	0	0	0	0	
4	N4	0	0	1	0	
5	N5	-4.5	0	1	0	
6	N6	-4	0	1	0	
7	N7	-2	0	1	0	
8	N8	2	0	1	0	
9	N9	4	0	1	0	
10	N10	-4	3	1	0	
11	N11	-4	-3	1	0	
12	N12	-2	3	1	0	
13	N13	-2	-3	1	0	
14	N14	2	3	1	0	
15	N15	2	-3	1	0	
16	N16	4	3	1	0	
17	N17	4	-3	1	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N2	Reaction	Reaction	Reaction	Reaction		Reaction	
2	N1	Reaction	Reaction	Reaction	Reaction		Reaction	

Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Y	-.022	.5
2	M5	Y	-.022	.5
3	M7	Y	-.022	.5
4	M4	Y	-.022	5.5
5	M5	Y	-.022	5.5
6	M7	Y	-.022	5.5
7	M4	Y	-.057	1
8	M5	Y	-.057	1
9	M7	Y	-.057	1
10	M4	Y	-.072	5
11	M5	Y	-.072	5
12	M7	Y	-.072	5
13	M6	Y	-.045	2

Member Point Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Y	-.025	.5
2	M5	Y	-.025	.5
3	M7	Y	-.025	.5
4	M4	Y	-.025	5.5
5	M5	Y	-.025	5.5
6	M7	Y	-.025	5.5
7	M4	Y	-.02	1
8	M5	Y	-.02	1
9	M7	Y	-.02	1
10	M4	Y	-.021	5
11	M5	Y	-.021	5
12	M7	Y	-.021	5
13	M6	Y	-.036	2

Member Point Loads (BLC 4 : x-dir NESC Heavy Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	X	.021	.5
2	M5	X	.021	.5
3	M7	X	.021	.5
4	M4	X	.021	5.5
5	M5	X	.021	5.5
6	M7	X	.021	5.5
7	M4	X	.013	1
8	M5	X	.013	1
9	M7	X	.013	1
10	M4	X	.015	5
11	M5	X	.015	5

Member Point Loads (BLC 4 : x-dir NESC Heavy Wind) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
12	M7	X	.015	5
13	M6	X	.028	2

Member Point Loads (BLC 5 : x-dir NESC Extreme Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	X	.161	.5
2	M5	X	.161	.5
3	M7	X	.161	.5
4	M4	X	.161	5.5
5	M5	X	.161	5.5
6	M7	X	.161	5.5
7	M4	X	.097	1
8	M5	X	.097	1
9	M7	X	.097	1
10	M4	X	.116	5
11	M5	X	.116	5
12	M7	X	.116	5
13	M6	X	.216	2

Member Point Loads (BLC 6 : z-dir NESC Heavy Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Z	.021	.5
2	M5	Z	.021	.5
3	M7	Z	.021	.5
4	M4	Z	.021	5.5
5	M5	Z	.021	5.5
6	M7	Z	.021	5.5
7	M4	Z	.013	1
8	M5	Z	.013	1
9	M7	Z	.013	1
10	M4	Z	.015	5
11	M5	Z	.015	5
12	M7	Z	.015	5
13	M6	Z	.028	2

Member Point Loads (BLC 7 : z-dir NESC Extreme Wind)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Z	.161	.5
2	M5	Z	.161	.5
3	M7	Z	.161	.5
4	M4	Z	.161	5.5
5	M5	Z	.161	5.5
6	M7	Z	.161	5.5
7	M4	Z	.097	1
8	M5	Z	.097	1
9	M7	Z	.097	1
10	M4	Z	.116	5
11	M5	Z	.116	5
12	M7	Z	.116	5
13	M6	Z	.216	2

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
No Data to Print ...			

Member Distributed Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M2	Y	-.002	-.002	0	0

Member Distributed Loads (BLC 6 : z-dir NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	.002	.002	0	0

Member Distributed Loads (BLC 7 : z-dir NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	.013	.013	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Grav...	Joint	Point	Distrib...	Area(...	Surfac...
1	Self Weigh	None		-1						
2	Weight of Appurtenances	None					13			
3	Weight of Ice Only	None					13	1		
4	x-dir NESC Heavy Wind	None					13			
5	x-dir NESC Extreme Wind	None					13			
6	z-dir NESC Heavy Wind	None					13	1		
7	z-dir NESC Extreme Wind	None					13	1		

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	x-dir NESC Heavy Wind	Yes			1	1.5	2	1.5	3	1.5	4	2.5								
2	x-dir NESC Extreme Wind	Yes			1	1	2	1	5	1										
3	z-dir NESC Heavy Wind	Yes			1	1.5	2	1.5	3	1.5	6	2.5								
4	z-dir NESC Extreme Wind	Yes			1	1	2	1	7	1										
5	Self Weight				1	1														

Joint Reactions

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
No Data to Print ...							

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N2	-.298	1.171	-.298	-.798	0	.48
2	1	N1	-.298	.479	.298	-.798	0	-.338
3	1	Totals:	-.595	1.65	0			
4	1	COG (ft):	X: -.357	Y: -.014	Z: .967			

Joint Reactions

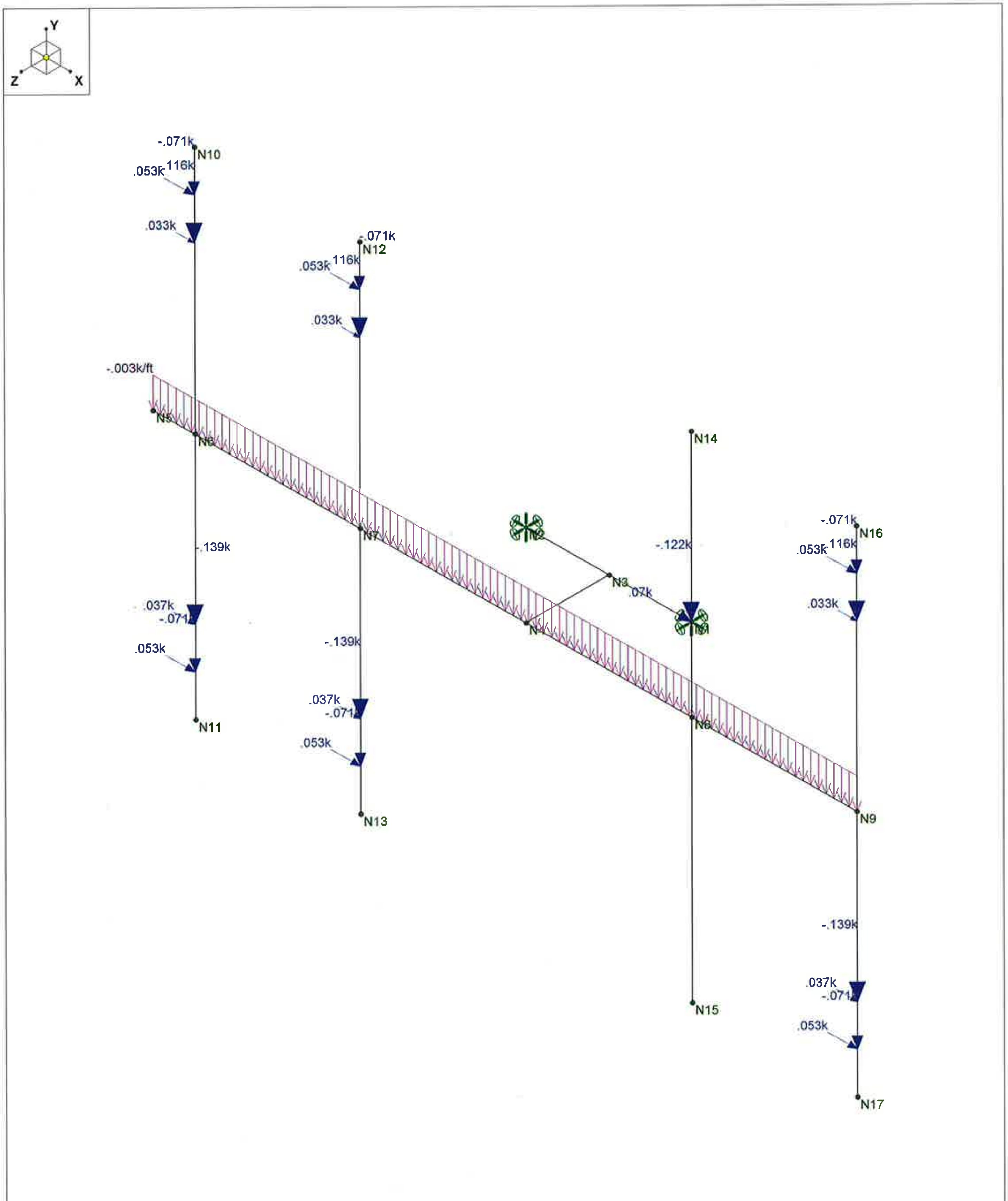
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	N2	-.911	.498	-.911	-.369	0	.214
2	2	N1	-.911	.276	.911	-.369	0	-.168
3	2	Totals:	-1.821	.774	0			
4	2	COG (ft):	X: -.36	Y: -.058	Z: .953			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	N2	0	1.196	-.429	-.818	0	.485
2	3	N1	0	.454	-.208	-.818	0	-.332
3	3	Totals:	0	1.65	-.638			
4	3	COG (ft):	X: -.357	Y: -.014	Z: .967			

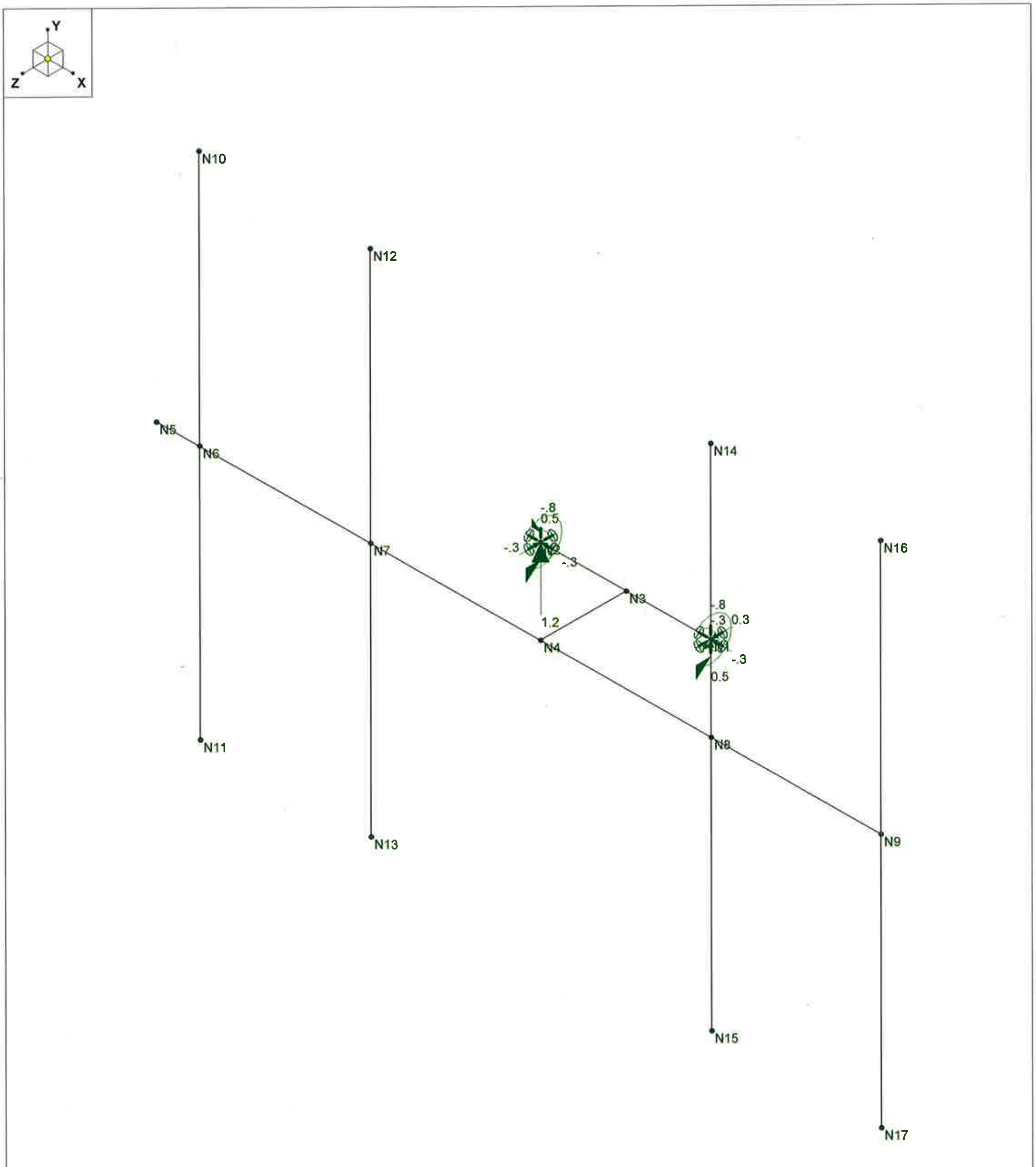
Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N2	0	.562	-1.299	-.42	0	.227
2	4	N1	0	.212	-.633	-.42	0	-.155
3	4	Totals:	0	.774	-1.932			
4	4	COG (ft):	X: -.36	Y: -.058	Z: .953			

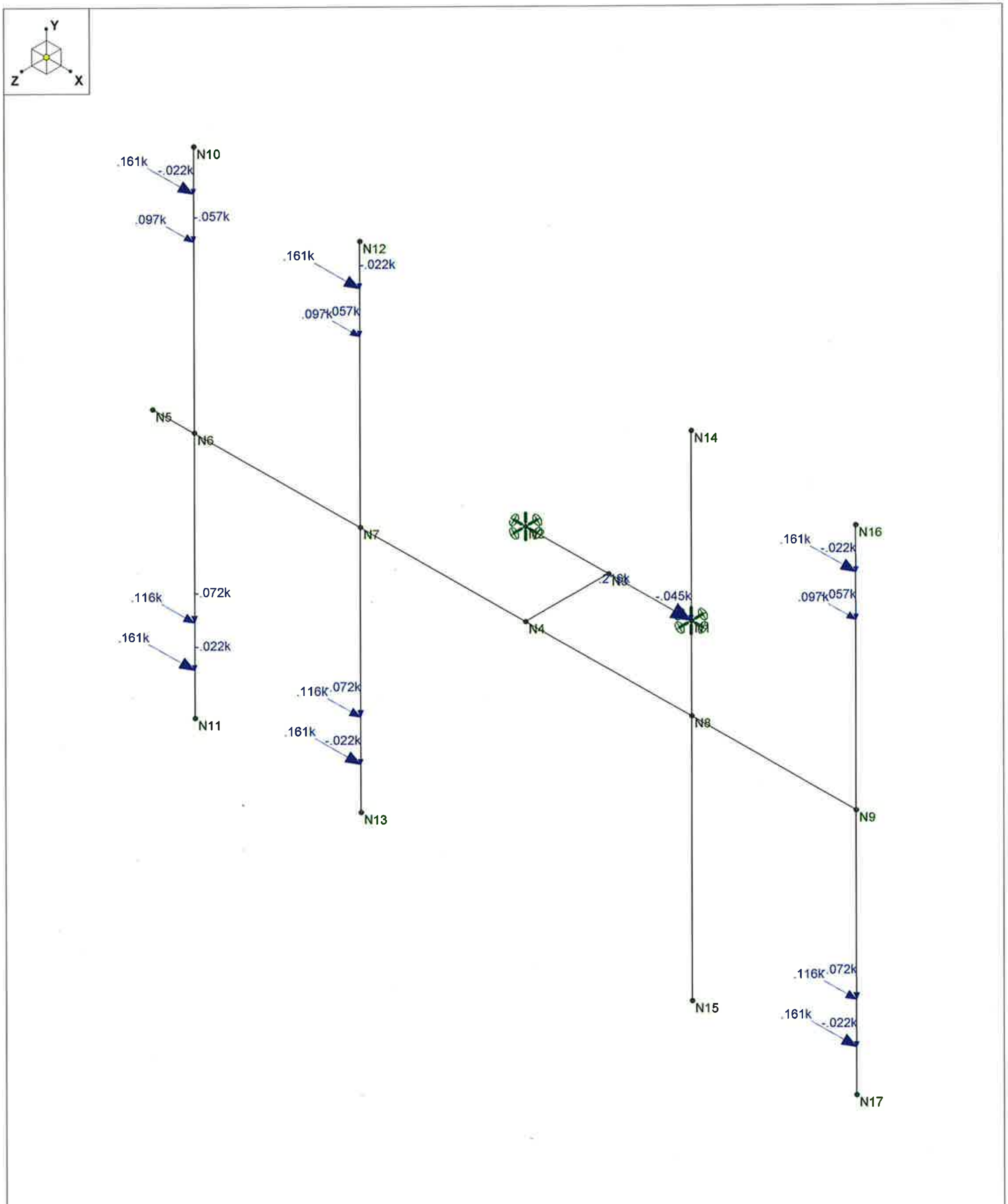


Loads: LC 1, x-dir NESC Heavy Wind

CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:12 AM
15240.000 - Trumbull 4	LC # 1 Loads	Antenna Mast - NESC.r3d

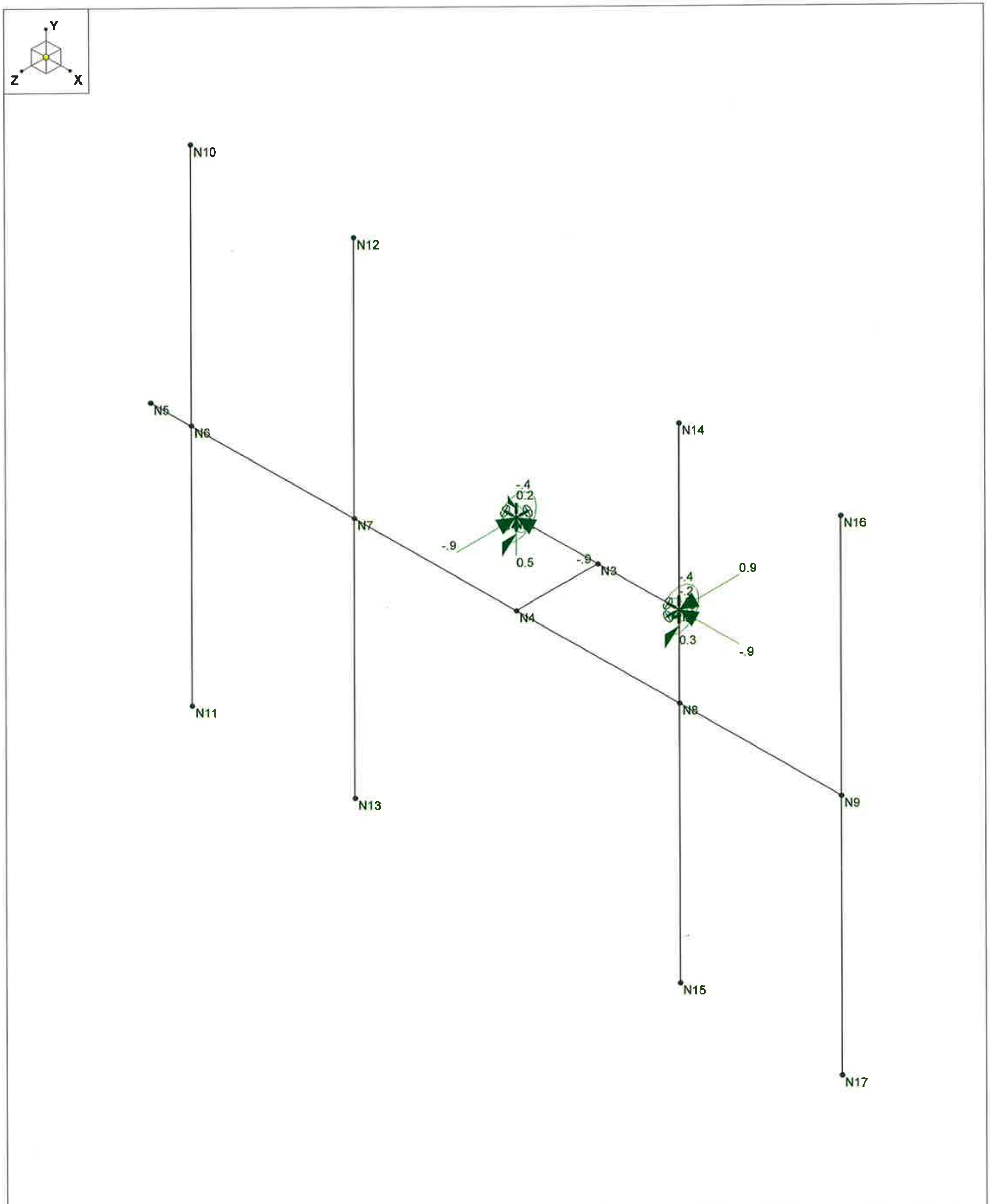


CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:14 AM
15240.000 - Trumbull 4	LC # 1 Reactions	Antenna Mast - NESC.r3d

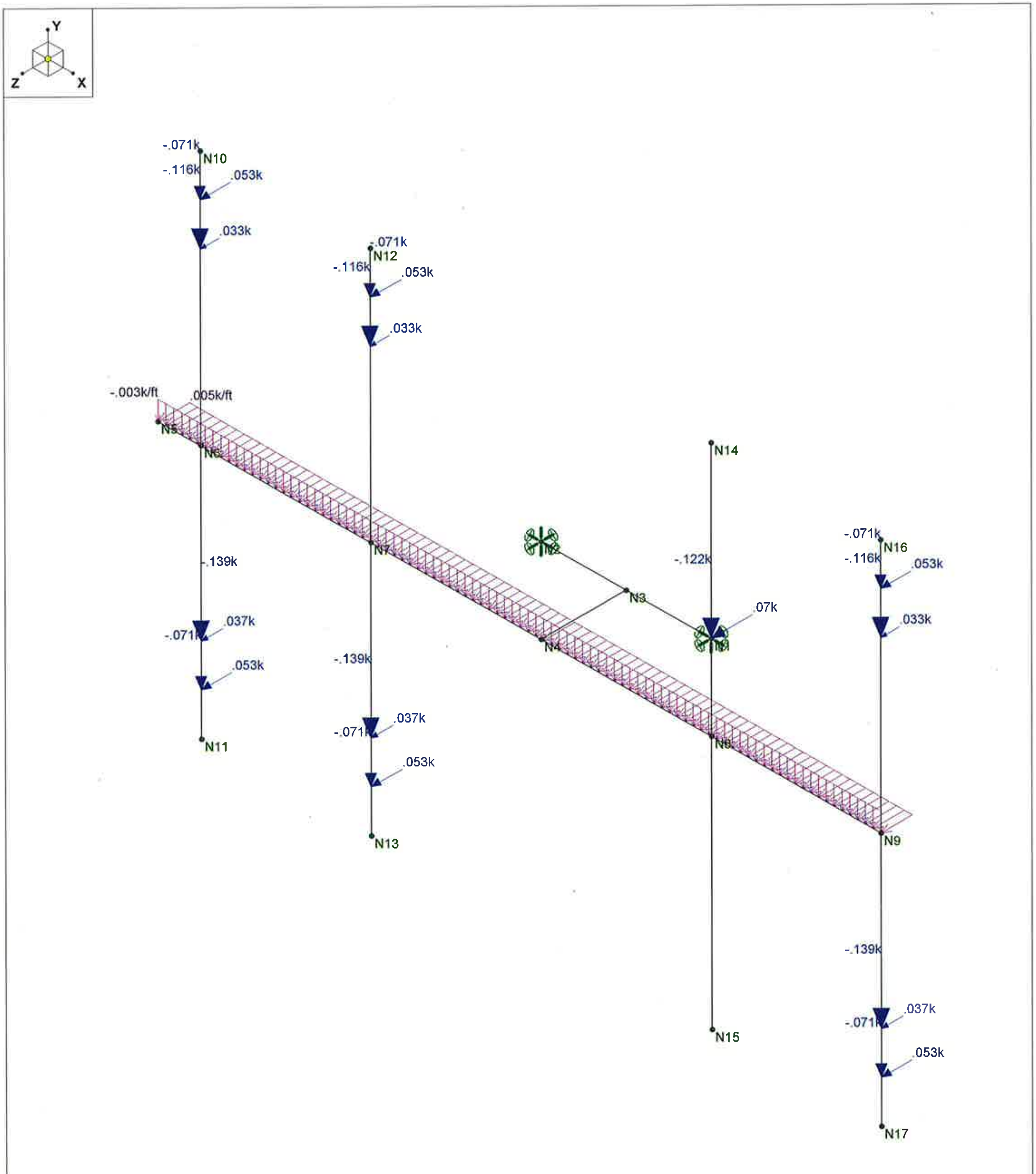


Loads: LC 2, x-dir NESC Extreme Wind

CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:13 AM
15240.000 - Trumbull 4	LC # 2 Loads	Antenna Mast - NESC.r3d

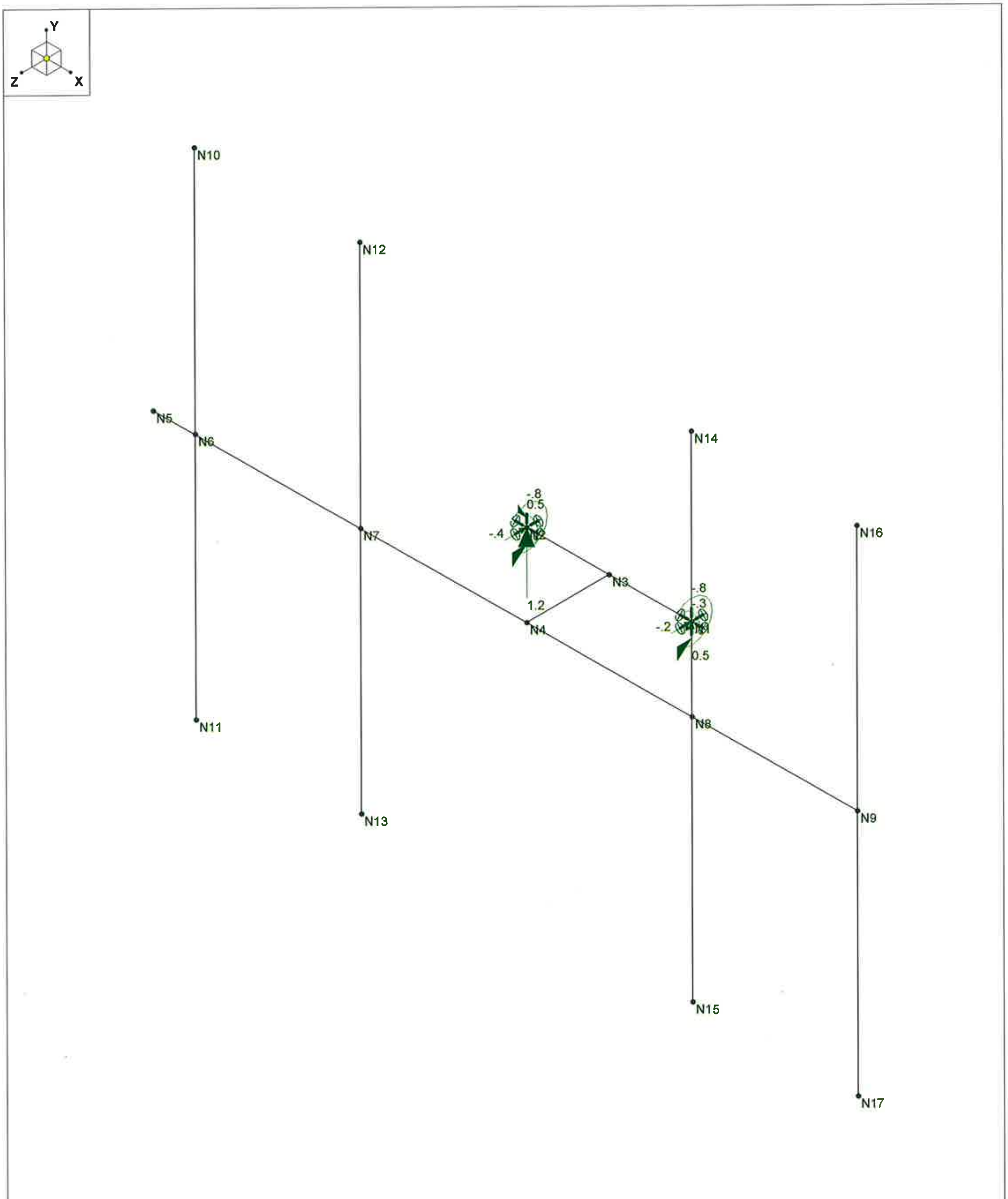


CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:14 AM
15240.000 - Trumbull 4	LC # 2 Reactions	Antenna Mast - NESC.r3d

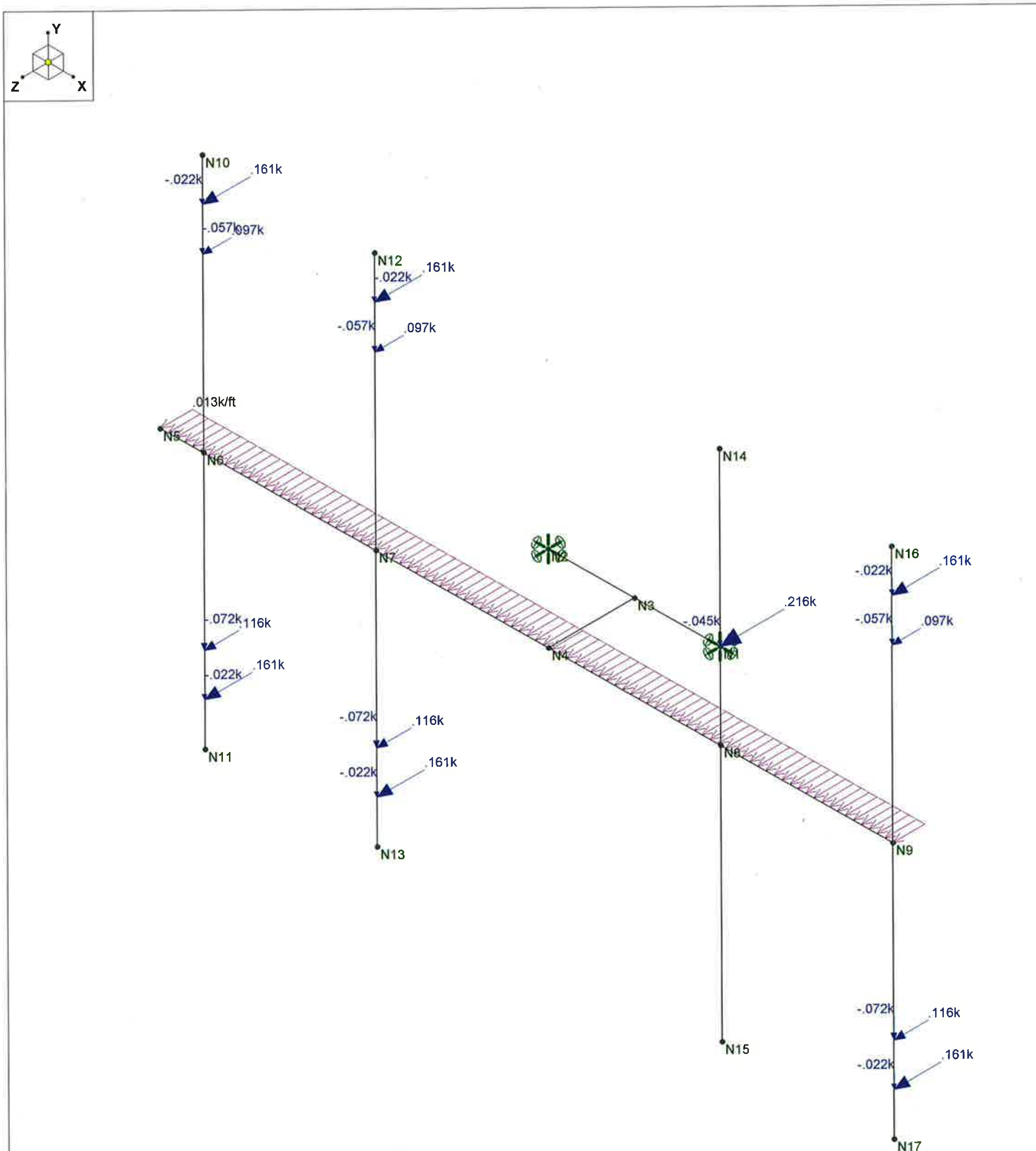


Loads: LC 3, z-dir NESC Heavy Wind

CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:13 AM
15240.000 - Trumbull 4	LC # 3 Loads	Antenna Mast - NESC.r3d

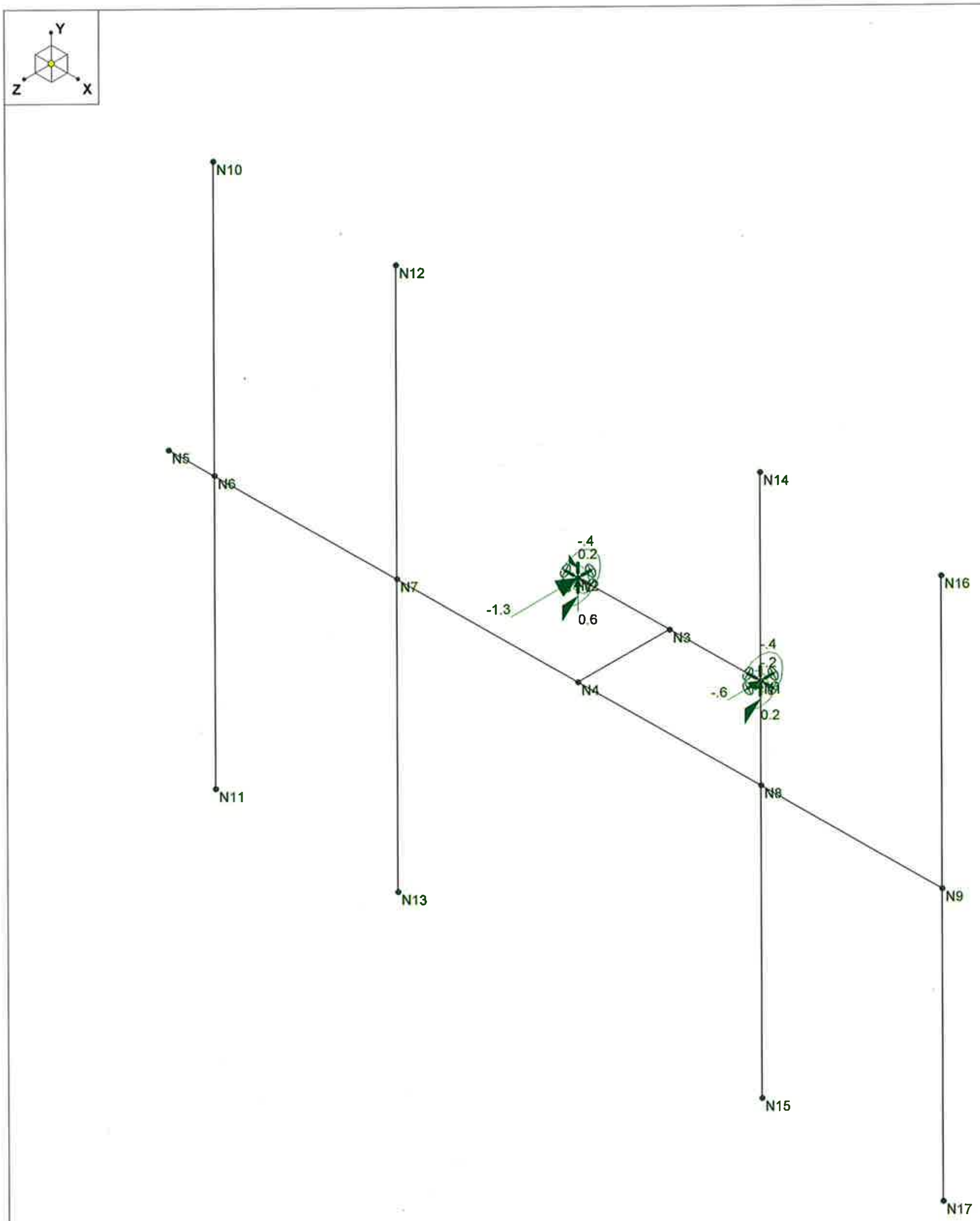


CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:15 AM
15240.000 - Trumbull 4	LC # 3 Reactions	Antenna Mast - NESC.r3d



Loads: LC 4, z-dir NESC Extreme Wind

CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast	
tjl, cfc		Dec 23, 2015 at 11:13 AM
15240.000 - Trumbull 4	LC # 4 Loads	Antenna Mast - NESC.r3d



CENTEK Engineering, Inc.		
tjl, cfc	Tower # 845 - Verizon Mast	Dec 23, 2015 at 11:15 AM
15240.000 - Trumbull 4	LC # 4 Reactions	Antenna Mast - NESC.r3d

Title :	Pole #845 - Verizon Trumbull 4	**Job #**	15240.000
Dsgnr:	TJL	**Date:**	11:00AM, 2 NOV 15
Description :	Pole Section Properties		
Scope :	Verizon Antenna Installation on Eversource Pole		

Built-Up Section Properties

Description Pole #845 Section Properties @ Top

General Information

	Type...					X cg	Y cg
#1	Rectangular	Height	0.1875 in	Width	13.0000 in	0.0000 in	10.4238 in
#2	Rectangular	Height	0.1875 in	Width	13.0000 in	0.0000 in	-10.4238 in

Steel Shapes

#1: Name **W21x44** Angle **0** deg
Location of Centroid from Datum
Xcg **3.250** in Ycg **0.000** in

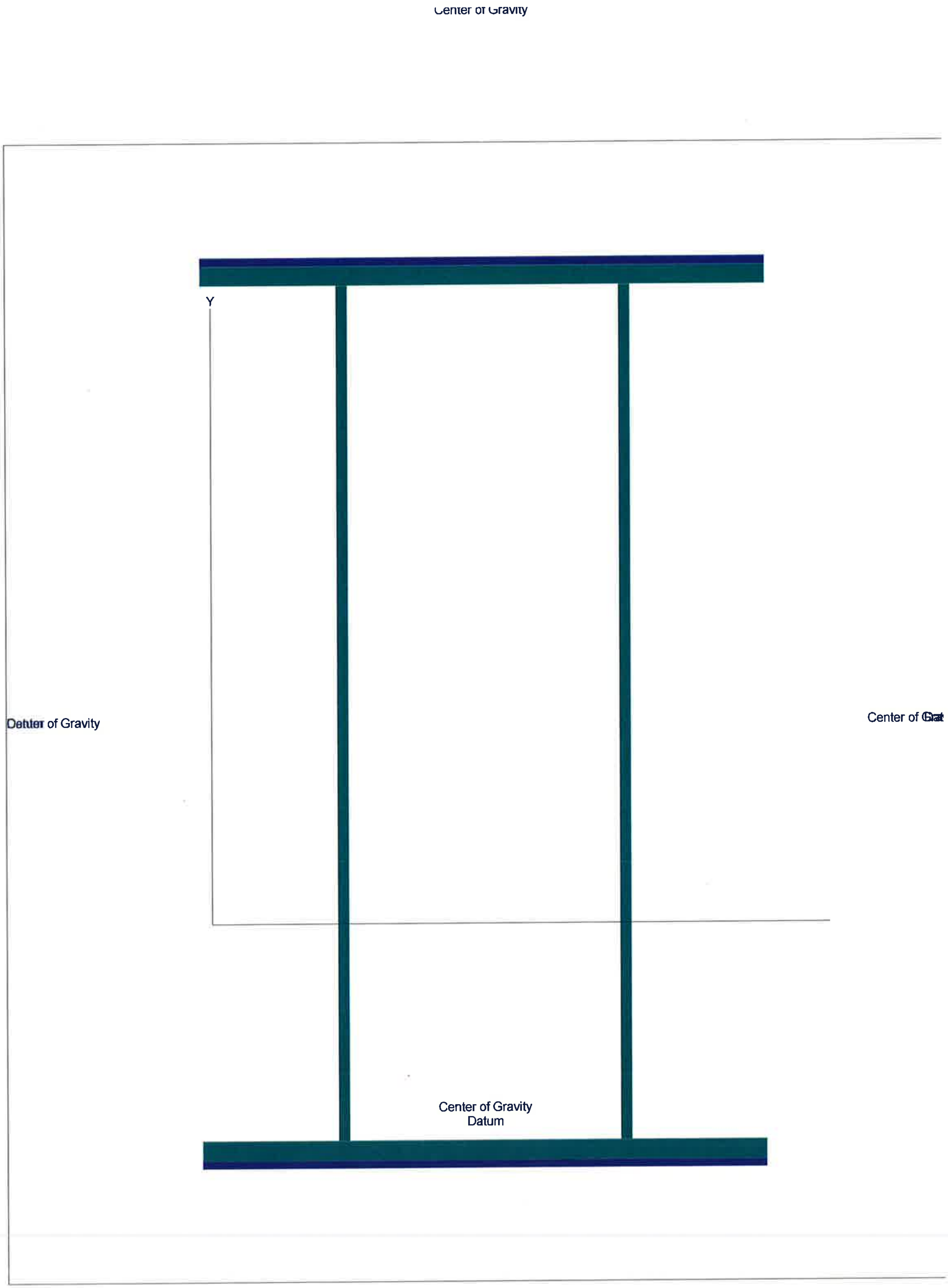
Depth	20.6600 in	Ixx	843.0000 in4
Width	6.5000 in	Iyy	20.7000 in4
Area	13.0000 in2	Xbar	3.250 in
		Ybar	10.330 in

#2: Name **W21x44** Angle **0** deg
Location of Centroid from Datum
Xcg **-3.250** in Ycg **0.000** in

Depth	20.6600 in	Ixx	843.0000 in4
Width	6.5000	Iyy	20.7000 in4
Area	13.0000 in2	Xbar	3.250 in
		Ybar	10.330 in

Summary

Total Area	30.8750 in2	Ixx	2,215.710 in4	r xx	8.4714 in
		Iyy	384.681 in4	r yy	3.5298 in
X cg Dist.	0.0000 in	Edge Distances from CG...			
Y cg Dist.	0.0000 in	+X	6.5000 in	S left	59.1817 in3
		-X	-6.5000 in	S right	59.1817 in3
		+Y	10.5176 in	S top	210.6679 in3
		-Y	-10.5176 in	S bottom	210.6679 in3


Center of Gravity
Y
Center of Gravity
Center of Gravity
Datum

Built-Up Section Properties

Description Pole #845 Section Properties @ Base

General Information

	Type...					X cg	Y cg
#1	Rectangular	Height	0.5000 in	Width	54.0000 in	0.0000 in	10.5800 in
#2	Rectangular	Height	0.5000 in	Width	54.0000 in	0.0000 in	-10.5800 in

Steel Shapes

#1: Name **W21x44** Angle **0** deg
Location of Centroid from Datum
Xcg **23.750** in Ycg **0.000** in

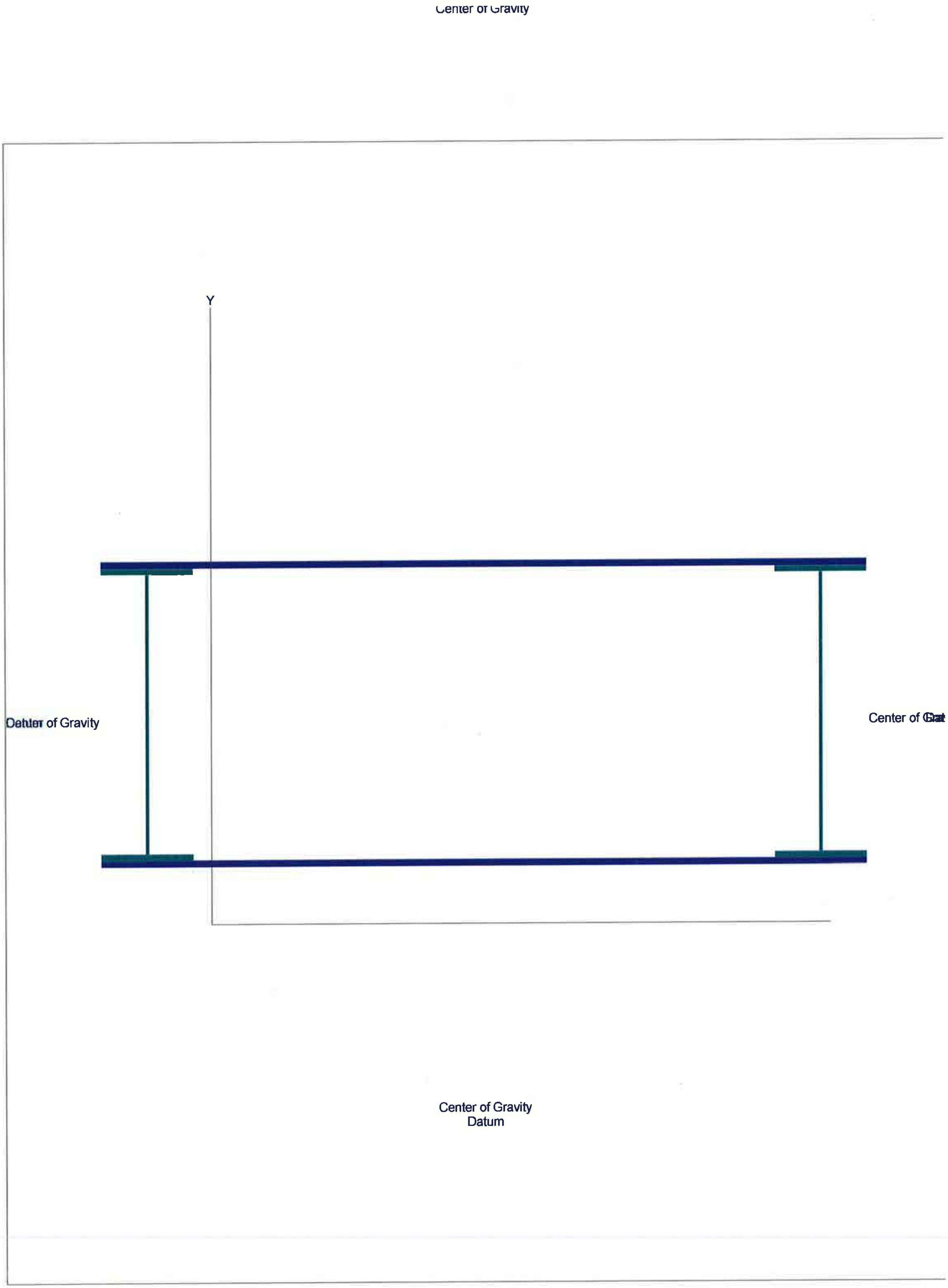
Depth	20.6600 in	Ixx	843.0000 in4
Width	6.5000 in	Iyy	20.7000 in4
Area	13.0000 in2	Xbar	3.250 in
		Ybar	10.330 in

#2: Name **W21x44** Angle **0** deg
Location of Centroid from Datum
Xcg **-23.750** in Ycg **0.000** in

Depth	20.6600 in	Ixx	843.0000 in4
Width	6.5000	Iyy	20.7000 in4
Area	13.0000 in2	Xbar	3.250 in
		Ybar	10.330 in

Summary

Total Area	80.0000 in2	Ixx	7,731.691 in4	r xx	9.8309 in
		Iyy	27,829.025 in4	r yy	18.6511 in
X cg Dist.	0.0000 in	Edge Distances from CG...			
Y cg Dist.	0.0000 in	+X	27.0000 in	S left	1,030.7046 in3
		-X	-27.0000 in	S right	1,030.7046 in3
		+Y	10.8300 in	S top	713.9142 in3
		-Y	-10.8300 in	S bottom	713.9142 in3


Center of Gravity
Y
Center of Gravity
Datum

Basic Components

Heavy Wind Pressure =	$p := 4.00$	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	$V := 110$	mph	(User Input NESC 2007 Figure 250-2(e))
Radial Ice Thickness =	$Ir := 0.50$	in	(User Input)
Radial Ice Density =	$Id := 56.0$	pcf	(User Input)

Factors for Extreme Wind Calculation

Elevation of Top of Pole Above Grade = $TME := 150$ ft (User Input)

Multiplier Gust Response Factor = $m := 1.25$ (User Input - Only for NESC Extreme wind case)

NESC Factor = $kv := 1.43$ (User Input from NESC 2007 Table 250-3 equation)

Importance Factor = $I := 1.0$ (User Input from NESC 2007 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(0.67 \cdot \frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.267$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.295$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.796$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.837$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 32.8$ psf (NESC 2007 Section 250.C.2)

Shape Factors

NUS Design Criteria Issued April 12, 2007

Shape Factor for Round Members = $Cd_R := 1.3$ (User Input)
Shape Factor for Flat Members = $Cd_F := 1.6$ (User Input)
Shape Factor for Coax Cables Attached to Outside of Pole = $Cd_{coax} := 1.6$ (User Input)

Overload Factors

NU Design Criteria Table

Overload Factors for Wind Loads:

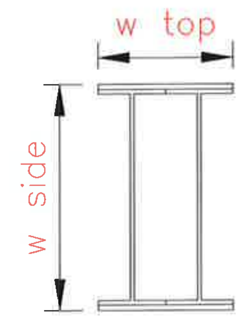
NESC Heavy Loading = **2.5** (User Input) Apply in Risa-3D Analysis
NESC Extreme Loading = **1.0** (User Input) Apply in Risa-3D Analysis

Overload Factors for Vertical Loads:

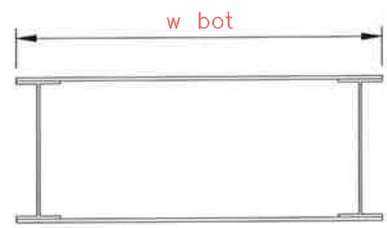
NESC Heavy Loading = **1.5** (User Input) Apply in Risa-3D Analysis
NESC Extreme Loading = **1.0** (User Input) Apply in Risa-3D Analysis

Development of Wind & Ice Load on Pole

Pole Data:



Shape =	Flat	
Width Side =	$W_{side} := 21.7$	in
Width Top =	$W_{top} := 13$	in
Width Bottom =	$W_{bot} := 54$	in
Length =	$L := 150$	ft
Area Top =	$A_{top} := 30.9$	sq in
Area Bottom =	$A_{bot} := 80.0$	sq in
Weight of Steel =	$W_{steel} := 490$	pcf
Area Ice Top =	$Ai_{top} := 40$	sq in
Area Ice Bottom =	$Ai_{bot} := 82$	sq in



Gravity Loads (without ice)

Weight Pole Top =	$Wt_{top} := \frac{A_{top}}{144} \cdot W_{steel} = 105$	plf	BLC 2
Weight Pole Bottom =	$Wt_{bot} := \frac{A_{bot}}{144} \cdot W_{steel} = 272$	plf	BLC 2

Gravity Loads (ice only)

Weight of Ice on Pole Top =	$W_{ICE.top} := Id \cdot \frac{Ai_{top}}{144} = 16$	plf	BLC 3
Weight of Ice on Pole Bottom =	$W_{ICE.bot} := Id \cdot \frac{Ai_{bot}}{144} = 32$	plf	BLC 3

Wind Load (NESC Extreme)

Pole Projected Surface Area Top =	$A_{top} := \frac{W_{top}}{12} = 1.083$	sq ft/ft	
Pole Projected Surface Area Bottom =	$A_{bot} := \frac{W_{bot}}{12} = 4.5$	sq ft/ft	
Pole Projected Surface Area Side =	$A_{side} := \frac{W_{side}}{12} = 1.808$	sq ft/ft	
Total Pole Wind Force Top =	$qz \cdot Cd_F \cdot A_{top} = 57$	plf	BLC 7
Total Pole Wind Force Bottom =	$qz \cdot Cd_F \cdot A_{bot} = 236$	plf	BLC 7
Total Pole Wind Force Side =	$qz \cdot Cd_F \cdot A_{side} = 95$	plf	BLC 5

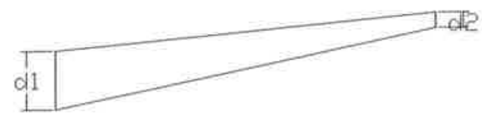
Wind Load (NESE Heavy)

Pole Projected Surface Area w/ Ice Top =	$AICE_{top} := \frac{(W_{top} + 2 \cdot Ir)}{12} = 1.167$	sq ft/ft	
Pole Projected Surface Area w/ Ice Bottom =	$AICE_{bot} := \frac{(W_{bot} + 2 \cdot Ir)}{12} = 4.583$	sq ft/ft	
Pole Projected Surface Area w/ Ice Side =	$AICE_{side} := \frac{(W_{side} + 2 \cdot Ir)}{12} = 1.892$	sq ft/ft	
Total Pole Wind Force w/ Ice Top =	$p \cdot Cd_F \cdot AICE_{top} = 7$	plf	BLC 6
Total Pole Wind Force w/ Ice Bottom =	$p \cdot Cd_F \cdot AICE_{bot} = 29$	plf	BLC 6
Total Pole Wind Force w/ Ice Side =	$p \cdot Cd_F \cdot AICE_{side} = 12$	plf	BLC 4

Development of Wind & Ice Load on Pole Arms

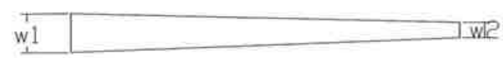
ARM Data:

Shape = Flat



Depth of Arm at Top = $ARM_{d1} := 12$

Depth of Arm at Bottom = $ARM_{d2} := 4$



Width of Arm at Top = $ARM_{W1} := 8$

Width of Arm at Bottom = $ARM_{W2} := 4$

Thickness of Arm Wall = $ARM_t := 0.25$

Gravity Loads (without ice)

Arm Area Top = $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2ARM_t) \cdot (ARM_{d1} - 2ARM_t)]$

Arm Area Bottom = $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2ARM_t) \cdot (ARM_{d2} - 2ARM_t)]$

Weight Arm Top = $Wt_{top} := \frac{A_{armtop}}{144} \cdot W_{steel} = 33$ plf **BLC 2**

Weight Arm Bottom = $Wt_{bot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$ plf **BLC 2**

Gravity Loads (ice only)

Arm Area w/ Ice Top = $Ai_{armtop} := (ARM_{d1} + 2 \cdot Ir) \cdot (ARM_{W1} + 2 \cdot Ir) - ARM_{d1} \cdot ARM_{W1} = 21$

Arm Area w/ Ice Bottom = $Ai_{armbot} := (ARM_{d2} + 2 \cdot Ir) \cdot (ARM_{W2} + 2 \cdot Ir) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top = $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 8$ plf **BLC 3**

Weight of Ice on Arm Bottom = $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$ plf **BLC 3**

Wind Load (NESC Extreme)

Arm Projected Surface Area Top =	$A_{top} := \frac{ARM_{d1}}{12} = 1$	sq ft/ft	
Arm Projected Surface Area Bottom =	$A_{bot} := \frac{ARM_{d2}}{12} = 0.333$	sq ft/ft	
Total Arm Wind Force Top =	$qz \cdot Cd_F \cdot A_{top} = 53$	plf	BLC 7
Total Arm Wind Force Bottom =	$qz \cdot Cd_F \cdot A_{bot} = 18$	plf	BLC 7

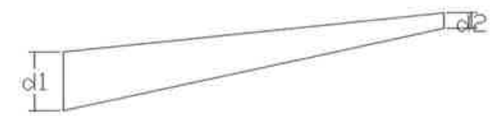
Wind Load (NESE Heavy)

Arm Projected Surface Area w/ Ice Top =	$AICE_{top} := \frac{(ARM_{d1} + 2 \cdot Ir)}{12} = 1.083$	sq ft/ft	
Arm Projected Surface Area w/ Ice Bottom =	$AICE_{bot} := \frac{(ARM_{d2} + 2 \cdot Ir)}{12} = 0.417$	sq ft/ft	
Total Arm Wind Force w/ Ice Top =	$p \cdot Cd_F \cdot AICE_{top} = 7$	plf	BLC 6
Total Arm Wind Force w/ Ice Bottom =	$p \cdot Cd_F \cdot AICE_{bot} = 3$	plf	BLC 6

Development of Wind & Ice Load on Pole Arms

ARM Data:

Shape = Flat



Depth of Arm at Top = $ARM_{d1} := 15$

Depth of Arm at Bottom = $ARM_{d2} := 4$

Width of Arm at Top = $ARM_{W1} := 10$

Width of Arm at Bottom = $ARM_{W2} := 4$

Thickness of Arm Wall = $ARM_t := 0.25$

Gravity Loads (without ice)

Arm Area Top = $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2ARM_t) \cdot (ARM_{d1} - 2ARM_t)]$

Arm Area Bottom = $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2ARM_t) \cdot (ARM_{d2} - 2ARM_t)]$

Weight Arm Top = $Wt_{top} := \frac{A_{armtop}}{144} \cdot W_{steel} = 42$ plf **BLC 2**

Weight Arm Bottom = $Wt_{bot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$ plf **BLC 2**

Gravity Loads (ice only)

Arm Area w/ Ice Top = $Ai_{armtop} := (ARM_{d1} + 2 \cdot Ir) \cdot (ARM_{W1} + 2 \cdot Ir) - ARM_{d1} \cdot ARM_{W1} = 26$

Arm Area w/ Ice Bottom = $Ai_{armbot} := (ARM_{d2} + 2 \cdot Ir) \cdot (ARM_{W2} + 2 \cdot Ir) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top = $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 10$ plf **BLC 3**

Weight of Ice on Arm Bottom = $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$ plf **BLC 3**

Wind Load (NESC Extreme)

Arm Projected Surface Area Top =	$A_{top} := \frac{ARM_{d1}}{12} = 1.25$	sq ft/ft	
Arm Projected Surface Area Bottom =	$A_{bot} := \frac{ARM_{d2}}{12} = 0.333$	sq ft/ft	
Total Arm Wind Force Top =	$qz \cdot Cd_F \cdot A_{top} = 66$	plf	BLC 7
Total Arm Wind Force Bottom =	$qz \cdot Cd_F \cdot A_{bot} = 18$	plf	BLC 7

Wind Load (NESE Heavy)

Arm Projected Surface Area w/ Ice Top =	$AICE_{top} := \frac{(ARM_{d1} + 2 \cdot Ir)}{12} = 1.333$	sq ft/ft	
Arm Projected Surface Area w/ Ice Bottom =	$AICE_{bot} := \frac{(ARM_{d2} + 2 \cdot Ir)}{12} = 0.417$	sq ft/ft	
Total Arm Wind Force w/ Ice Top =	$p \cdot Cd_F \cdot AICE_{top} = 9$	plf	BLC 6
Total Arm Wind Force w/ Ice Bottom =	$p \cdot Cd_F \cdot AICE_{bot} = 3$	plf	BLC 6

Development of Wind & Ice Load on Pole Arms

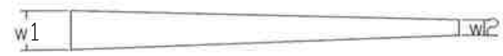
ARM Data:

Shape = Flat

Depth of Arm at Top = $ARM_{d1} := 18$

Depth of Arm at Bottom = $ARM_{d2} := 4$

Width of Arm at Top = $ARM_{W1} := 12$



Width of Arm at Bottom = $ARM_{W2} := 4$

Thickness of Arm Wall = $ARM_t := 0.25$

Gravity Loads (without ice)

Arm Area Top = $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2ARM_t) \cdot (ARM_{d1} - 2ARM_t)]$

Arm Area Bottom = $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2ARM_t) \cdot (ARM_{d2} - 2ARM_t)]$

Weight Arm Top = $Wt_{top} := \frac{A_{armtop}}{144} \cdot W_{steel} = 50$ plf **BLC 2**

Weight Arm Bottom = $Wt_{bot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$ plf **BLC 2**

Gravity Loads (ice only)

Arm Area w/ Ice Top = $Ai_{armtop} := (ARM_{d1} + 2 \cdot Ir) \cdot (ARM_{W1} + 2 \cdot Ir) - ARM_{d1} \cdot ARM_{W1} = 31$

Arm Area w/ Ice Bottom = $Ai_{armbot} := (ARM_{d2} + 2 \cdot Ir) \cdot (ARM_{W2} + 2 \cdot Ir) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top = $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 12$ plf **BLC 3**

Weight of Ice on Arm Bottom = $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$ plf **BLC 3**

Wind Load (NESC Extreme)

Arm Projected Surface Area Top =	$A_{top} := \frac{ARM_{d1}}{12} = 1.5$	sq ft/ft	
Arm Projected Surface Area Bottom =	$A_{bot} := \frac{ARM_{d2}}{12} = 0.333$	sq ft/ft	
Total Arm Wind Force Top =	$qz \cdot Cd_F \cdot A_{top} = 79$	plf	**BLC 7**
Total Arm Wind Force Bottom =	$qz \cdot Cd_F \cdot A_{bot} = 18$	plf	**BLC 7**

Wind Load (NESE Heavy)

Arm Projected Surface Area w/ Ice Top =	$AICE_{top} := \frac{(ARM_{d1} + 2 \cdot Ir)}{12} = 1.583$	sq ft/ft	
Arm Projected Surface Area w/ Ice Bottom =	$AICE_{bot} := \frac{(ARM_{d2} + 2 \cdot Ir)}{12} = 0.417$	sq ft/ft	
Total Arm Wind Force w/ Ice Top =	$p \cdot Cd_F \cdot AICE_{top} = 10$	plf	**BLC 6**
Total Arm Wind Force w/ Ice Bottom =	$p \cdot Cd_F \cdot AICE_{bot} = 3$	plf	**BLC 6**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data: (90-ft to 140-ft)

Coax Type = HELIAX 1-5/8"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.98$ in (User Input)

Coax Cable Length = $L_{coax} := 100$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 1.04$ plf (User Input)

Total Number of Coax = $N_{coax} := 14$ (User Input) (12 T-Mobile & 2 Verizon)

No. of Coax Projecting Outside Face of Pole X-DIR = $NP_{coaxX} := 2$ (User Input)

No. of Coax Projecting Outside Face of Pole Z-DIR = $NP_{coaxZ} := 0$ (User Input)

Wind Load (NESC Extreme)

Coax projected surface area X-DIR = $A_{coaxX} := \frac{(NP_{coaxX} \cdot D_{coax})}{12} = 0.3$ ft

Total Coax Wind Force X-DIR = $F_{coaxX} := qz \cdot Cd_{coax} \cdot A_{coaxX} = 17$ plf BLC 19

Coax projected surface area Z-DIR = $A_{coaxZ} := \frac{(NP_{coaxZ} \cdot D_{coax})}{12} = 0$ ft

Total Coax Wind Force Z-DIR = $F_{coaxZ} := qz \cdot Cd_{coax} \cdot A_{coaxZ} = 0$ plf BLC 21

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice X-DIR = $AICE_{coaxX} := \frac{(NP_{coaxX} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$ ft

Total Coax Wind Force w/ Ice X-DIR = $Fi_{coaxX} := p \cdot Cd_{coax} \cdot AICE_{coaxX} = 3$ plf BLC 18

Coax projected surface area w/ Ice Z-DIR = $AICE_{coaxZ} := \frac{(NP_{coaxZ} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.1$ ft

Total Coax Wind Force w/ Ice Z-DIR = $Fi_{coaxZ} := p \cdot Cd_{coax} \cdot AICE_{coaxZ} = 1$ plf BLC 20

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 15$ plf BLC 16

Gravity Load (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\ 2}\right] = 3.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 21$ plf BLC 17

Development of Wind & Ice Load on Coax Cables

Coax Cable Data: (90-ft to 140-ft)

Coax Type = HELIAX 1-5/8"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.98$ in (User Input)

Coax Cable Length = $L_{coax} := 100$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 1.04$ plf (User Input)

Total Number of Coax = $N_{coax} := 12$ (User Input) (12 T-Mobile)

No. of Coax Projecting Outside Face of Pole X-DIR = $NP_{coaxX} := 2$ (User Input)

No. of Coax Projecting Outside Face of Pole Z-DIR = $NP_{coaxZ} := 0$ (User Input)

Wind Load (NESC Extreme)

Coax projected surface area X-DIR = $A_{coaxX} := \frac{(NP_{coaxX} D_{coax})}{12} = 0.3$ ft

Total Coax Wind Force X-DIR = $F_{coaxX} := qz \cdot Cd_{coax} \cdot A_{coaxX} = 17$ plf **BLC 19**

Coax projected surface area Z-DIR = $A_{coaxZ} := \frac{(NP_{coaxZ} D_{coax})}{12} = 0$ ft

Total Coax Wind Force Z-DIR = $F_{coaxZ} := qz \cdot Cd_{coax} \cdot A_{coaxZ} = 0$ plf **BLC 21**

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice X-DIR = $AICE_{coaxX} := \frac{(NP_{coaxX} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$ ft

Total Coax Wind Force w/ Ice X-DIR = $Fi_{coaxX} := p \cdot Cd_{coax} \cdot AICE_{coaxX} = 3$ plf **BLC 18**

Coax projected surface area w/ Ice Z-DIR = $AICE_{coaxZ} := \frac{(NP_{coaxZ} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.1$ ft

Total Coax Wind Force w/ Ice Z-DIR = $Fi_{coaxZ} := p \cdot Cd_{coax} \cdot AICE_{coaxZ} = 1$ plf **BLC 20**

Gravity Loads (without ice)

Weight of all cables w/o ice = $WT_{coax} := Wt_{coax} \cdot N_{coax} = 12$ plf **BLC 16**

Gravity Load (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\ 2}\right] = 3.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 18$ plf **BLC 17**

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
1	M1	Pole # 845	150												Lateral
2	M2	arm	8.965												Lateral
3	M3	arm	8.965												Lateral
4	M4	arm	11.344												Lateral
5	M5	arm	11.344												Lateral
6	M6	arm	8.697												Lateral
7	M7	arm	8.697												Lateral
8	M8	arm	5.591												Lateral
9	M9	arm	5.591												Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Pole # 845	W21x44	Column	Wide Flan..	A992	Typical	13	20.7	843	.77
2	arm	W8x28	Beam	Wide Flan..	A992	Typical	8.25	21.7	98	.537

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	BOTTO...	TOP-PO...			Pole # 845	Column	Wide Flange	A992	Typical
2	M2	ARM1-L...	ARM1			arm	Beam	Wide Flange	A992	Typical
3	M3	ARM1-R...	ARM1			arm	Beam	Wide Flange	A992	Typical
4	M4	ARM2-L...	ARM2			arm	Beam	Wide Flange	A992	Typical
5	M5	ARM2-R...	ARM2			arm	Beam	Wide Flange	A992	Typical
6	M6	ARM3-L...	ARM3			arm	Beam	Wide Flange	A992	Typical
7	M7	ARM3-R...	ARM3			arm	Beam	Wide Flange	A992	Typical
8	M8	ARM4-R...	ARM4			arm	Beam	Wide Flange	A992	Typical
9	M9	ARM4-L...	ARM4			arm	Beam	Wide Flange	A992	Typical
10	M10	N18	N19			RIGID	None	None	RIGID	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From D...
1	BOTTOM-POLE	0	0	0	0	
2	POLE-CONNECTION	0	90	0	0	
3	ARM1-LEFT	-8.88	119.83	0	0	
4	ARM2-LEFT	-11.26	131.83	0	0	
5	ARM3-LEFT	-8.61	143.83	0	0	
6	ARM4-LEFT	-5.54	149.83	0	0	
7	TOP-POLE	0	150	0	0	
8	ARM1-RIGHT	8.88	119.83	0	0	
9	ARM2-RIGHT	11.26	131.83	0	0	
10	ARM3-RIGHT	8.61	143.83	0	0	
11	ARM4-RIGHT	5.54	149.83	0	0	
12	ARM1	0	118.6	0	0	
13	ARM2	0	130.45	0	0	
14	ARM3	0	142.6	0	0	
15	ARM4	0	149.08	0	0	
16	BOTTOM-BRACE	0	138	0	0	
17	TOP-BRACE	0	147	0	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From D...
18	N18	-1	91	0	0	
19	N19	1	91	0	0	
20	N20	0	91	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTTOM-POLE	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	POLE-CONNECTI...							
3	ARM2-LEFT							
4	ARM1-LEFT							

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Joint Loads and Enforced Displacements (BLC 8 : x-direction NESC Heavy Wire Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-1.711
2	ARM4-RIGHT	L	Y	-1.079
3	ARM3-LEFT	L	Y	-4.035
4	ARM3-RIGHT	L	Y	-4.035
5	ARM2-RIGHT	L	Y	-4.035
6	ARM2-LEFT	L	Y	-4.035
7	ARM1-LEFT	L	Y	-4.035
8	ARM1-RIGHT	L	Y	-4.035
9	ARM4-LEFT	L	X	1.107
10	ARM4-RIGHT	L	X	.882
11	ARM3-LEFT	L	X	1.594
12	ARM3-RIGHT	L	X	1.594
13	ARM2-LEFT	L	X	1.594
14	ARM2-RIGHT	L	X	1.594
15	ARM1-LEFT	L	X	1.594
16	ARM1-RIGHT	L	X	1.594

Joint Loads and Enforced Displacements (BLC 9 : x-driection NESC Extreme Wire Lo)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-.528
2	ARM4-RIGHT	L	Y	-.267
3	ARM3-LEFT	L	Y	-1.824
4	ARM3-RIGHT	L	Y	-1.824
5	ARM2-LEFT	L	Y	-1.824
6	ARM2-RIGHT	L	Y	-1.824
7	ARM1-RIGHT	L	Y	-1.824
8	ARM1-LEFT	L	Y	-1.824
9	ARM4-LEFT	L	X	1.137
10	ARM4-RIGHT	L	X	.593
11	ARM3-LEFT	L	X	2.318

Joint Loads and Enforced Displacements (BLC 9 : x-driection NESC Extreme Wire Lo) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
12	ARM3-RIGHT	L	X	2.318
13	ARM2-RIGHT	L	X	2.318
14	ARM2-LEFT	L	X	2.318
15	ARM1-LEFT	L	X	2.318
16	ARM1-RIGHT	L	X	2.318

Joint Loads and Enforced Displacements (BLC 10 : z-direction NESC Heavy Wire Lo)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-1.711
2	ARM4-RIGHT	L	Y	-1.079
3	ARM3-LEFT	L	Y	-4.035
4	ARM3-RIGHT	L	Y	-4.035
5	ARM2-LEFT	L	Y	-4.035
6	ARM2-RIGHT	L	Y	-4.035
7	ARM1-LEFT	L	Y	-4.035
8	ARM1-RIGHT	L	Y	-4.035

Joint Loads and Enforced Displacements (BLC 11 : z-direction NESC Extreme Wire Lo)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-.528
2	ARM4-RIGHT	L	Y	-.267
3	ARM3-LEFT	L	Y	-1.824
4	ARM3-RIGHT	L	Y	-1.824
5	ARM2-LEFT	L	Y	-1.824
6	ARM2-RIGHT	L	Y	-1.824
7	ARM1-LEFT	L	Y	-1.824
8	ARM1-RIGHT	L	Y	-1.824

Joint Loads and Enforced Displacements (BLC 12 : x-direction NESC Heavy Mast Reac)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	X	1.276
2	BOTTOM-BRACE	L	X	-.779
3	BOTTOM-BRACE	L	Y	-3.487
4	BOTTOM-BRACE	L	Mz	2.359
5	N18	L	X	.298
6	N19	L	X	.298
7	N18	L	Z	.298
8	N19	L	Z	-.298
9	N18	L	Y	-.302
10	N19	L	Y	.247

Joint Loads and Enforced Displacements (BLC 13 : x-direction NESC Extreme Mast Re)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	X	4.583
2	BOTTOM-BRACE	L	X	-2.773
3	BOTTOM-BRACE	L	Y	-1.533
4	BOTTOM-BRACE	L	Mz	8.414
5	N18	L	X	.911
6	N19	L	X	.911
7	N18	L	Z	.911

Joint Loads and Enforced Displacements (BLC 13 : x-direction NESC Extreme Mast Re) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
8	N19	L	Z	-.911
9	N18	L	Y	-.106
10	N19	L	Y	.07

Joint Loads and Enforced Displacements (BLC 14 : z-direction NESC Heavy Mast Reac)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	Z	1.276
2	BOTTOM-BRACE	L	Z	-.779
3	BOTTOM-BRACE	L	Y	-3.487
4	BOTTOM-BRACE	L	Mx	-2.359
5	N18	L	Z	.319
6	N19	L	Z	.319
7	N18	L	Y	-.322
8	N19	L	Y	.267

Joint Loads and Enforced Displacements (BLC 15 : z-direction NESC Extreme Mast Re)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	BOTTOM-BRACE	L	Mx	-8.414
2	BOTTOM-BRACE	L	Y	-1.533
3	BOTTOM-BRACE	L	Z	-2.773
4	TOP-BRACE	L	Z	4.583
5	N18	L	Z	.966
6	N19	L	Z	.966
7	N18	L	Y	-.157
8	N19	L	Y	.121

Member Distributed Loads (BLC 2 : Weight Pole and Arms)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.272	-.105	0	0
2	M9	Y	-.013	-.033	0	0
3	M8	Y	-.013	-.033	0	0
4	M6	Y	-.013	-.042	0	0
5	M7	Y	-.013	-.042	0	0
6	M3	Y	-.013	-.042	0	0
7	M2	Y	-.013	-.042	0	0
8	M4	Y	-.013	-.05	0	0
9	M5	Y	-.013	-.05	0	0

Member Distributed Loads (BLC 3 : Weight of Ice Only on Pole and A)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.032	-.016	0	0
2	M9	Y	-.004	-.008	0	0
3	M8	Y	-.004	-.008	0	0
4	M6	Y	-.004	-.01	0	0
5	M7	Y	-.004	-.01	0	0
6	M3	Y	-.004	-.01	0	0
7	M2	Y	-.004	-.01	0	0
8	M4	Y	-.004	-.012	0	0
9	M5	Y	-.004	-.012	0	0

Member Distributed Loads (BLC 4 : x-direction NESC Heavy Wind on P)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.012	.012	0	0

Member Distributed Loads (BLC 5 : x-direction NESC Extreme Wind on)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.095	.095	0	0

Member Distributed Loads (BLC 6 : z-direction NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.029	.007	0	0
2	M8	Z	.003	.007	0	0
3	M9	Z	.003	.007	0	0
4	M7	Z	.003	.009	0	0
5	M6	Z	.003	.009	0	0
6	M3	Z	.003	.009	0	0
7	M2	Z	.003	.009	0	0
8	M5	Z	.003	.01	0	0
9	M4	Z	.003	.01	0	0

Member Distributed Loads (BLC 7 : z-direction NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.236	.057	0	0
2	M8	Z	.018	.053	0	0
3	M9	Z	.018	.053	0	0
4	M7	Z	.018	.066	0	0
5	M6	Z	.018	.066	0	0
6	M2	Z	.018	.066	0	0
7	M3	Z	.018	.066	0	0
8	M5	Z	.018	.079	0	0
9	M4	Z	.018	.079	0	0

Member Distributed Loads (BLC 16 : Weight of Coax Cables)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.015	-.015	0	90
2	M1	Y	-.012	-.012	90	150

Member Distributed Loads (BLC 17 : Weight of Ice on Coax Cables)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.021	-.021	0	90
2	M1	Y	-.018	-.018	90	150

Member Distributed Loads (BLC 18 : x-direction NESC Heavy Coax)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.003	.003	0	0

Member Distributed Loads (BLC 19 : x-direction NESC Extreme Coax)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.017	.017	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Grav...	Joint	Point	Distrib...	Area(...	Surfac...
1	Self Weight (Not Used)	None								
2	Weight Pole and Arms	None						9		
3	Weight of Ice Only on Pole and A	None						9		
4	x-direction NESC Heavy Wind o...	None						1		
5	x-direction NESC Extreme Wind ...	None						1		
6	z-direction NESC Heavy Wind	None						9		
7	z-direction NESC Extreme Wind	None						9		
8	x-direction NESC Heavy Wire Lo...	None				16				
9	x-driection NESC Extreme Wire ...	None				16				
10	z-direction NESC Heavy Wire Lo	None				8				
11	z-direction NESC Extreme Wire ...	None				8				
12	x-direction NESC Heavy Mast R...	None				10				
13	x-direction NESC Extreme Mast ...	None				10				
14	z-direction NESC Heavy Mast R...	None				8				
15	z-direction NESC Extreme Mast ...	None				8				
16	Weight of Coax Cables	None						2		
17	Weight of Ice on Coax Cables	None						2		
18	x-direction NESC Heavy Coax	None						1		
19	x-direction NESC Extreme Coax	None						1		
20	z-direction NESC Heavy Coax	None								
21	z-direction NESC Extreme Coax	None								

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	x-direction NESC Heavy W...	Yes			2	1.5	3	1.5	4	2.5	8	1	12	1	16	1.5	17	1.5	18	2.5
2	x-direction NESC Extreme ...	Yes			2	1	5	1	9	1	13	1	16	1	19	1				
3	z-direction NESC Heavy W...	Yes			2	1.5	3	1.5	6	2.5	10	1	14	1	16	1.5	17	1.5	20	2.5
4	z-direction NESC Extreme ...	Yes			2	1	7	1	11	1	15	1	16	1	21	1				

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTTOM-PO...	max	0	4	89.573	1	0	1	0	1	0	3	3788.091	2
2		min	-35.945	2	45.596	2	-28.809	4	-2178.682	4	-1.822	2	-4.074	3
3	Totals:	max	0	4	89.573	1	0	1						
4		min	-35.945	2	45.596	2	-28.809	4						

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTTOM-POLE	-18.2	89.573	0	0	-.596	2102.132
2	1	Totals:	-18.2	89.573	0			
3	1	COG (ft):	X: -.045	Y: 91.522	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTTOM-POLE	-35.945	45.596	0	0	-1.822	3788.091
2	2	Totals:	-35.945	45.596	0			
3	2	COG (ft):	X: -.036	Y: 87.52	Z: 0			

Joint Reactions

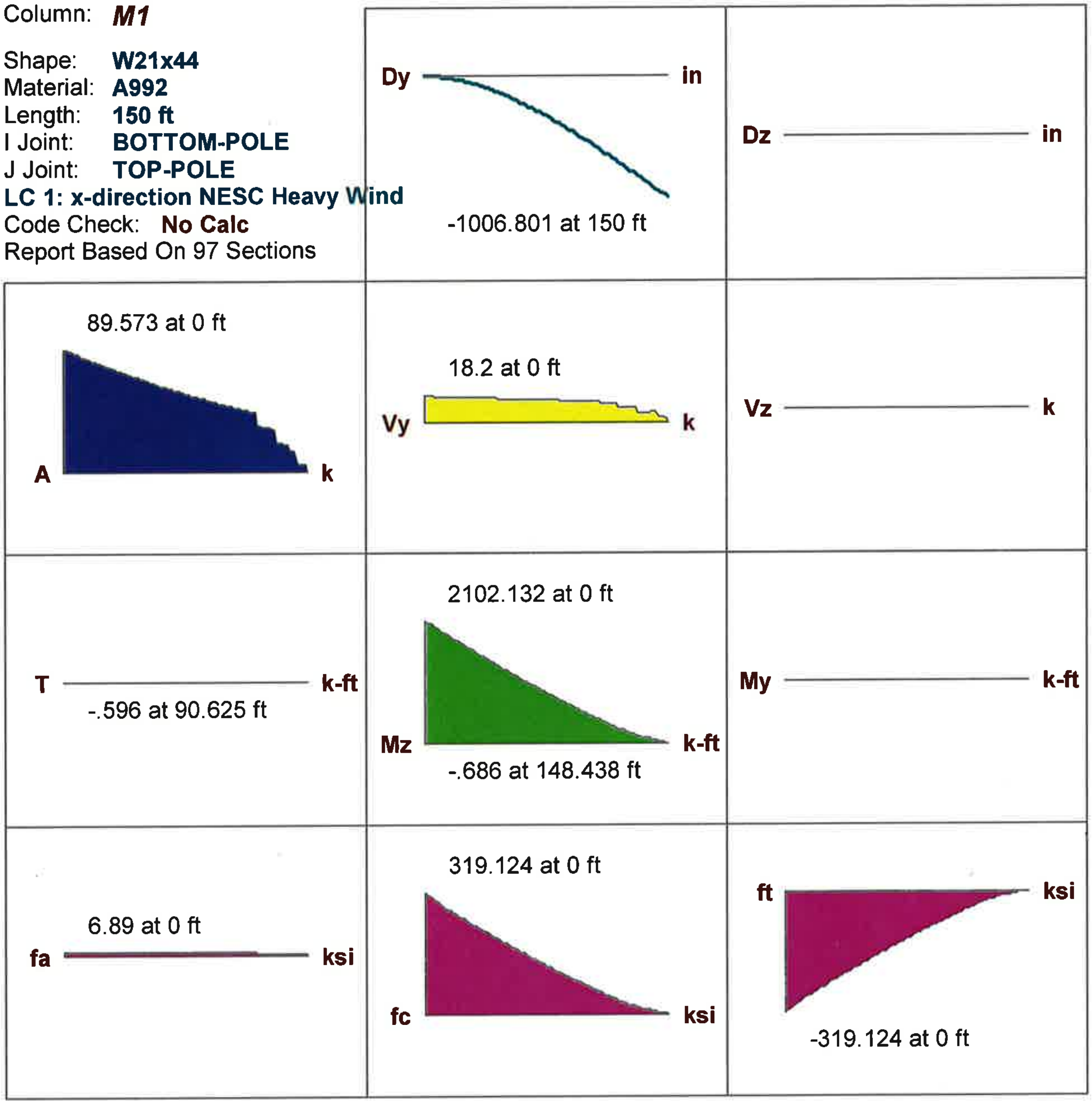
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTTOM-POLE	0	89.573	-8.958	-680.608	0	-4.074
2	3	Totals:	0	89.573	-8.958			
3	3	COG (ft):	X: -.046	Y: 91.522	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	BOTTOM-POLE	0	45.596	-28.809	-2178.682	0	-1.717
2	4	Totals:	0	45.596	-28.809			
3	4	COG (ft):	X: -.038	Y: 87.52	Z: 0			

Column: ***M1***

Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 1: x-direction NESC Heavy Wind
Code Check: **No Calc**
Report Based On 97 Sections



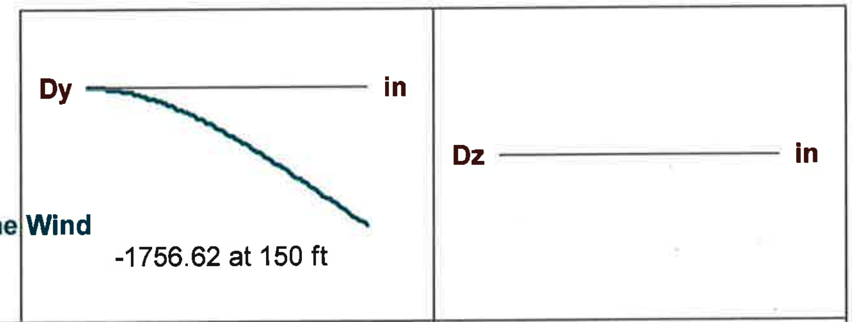
AISC 9th: ASD Code Check

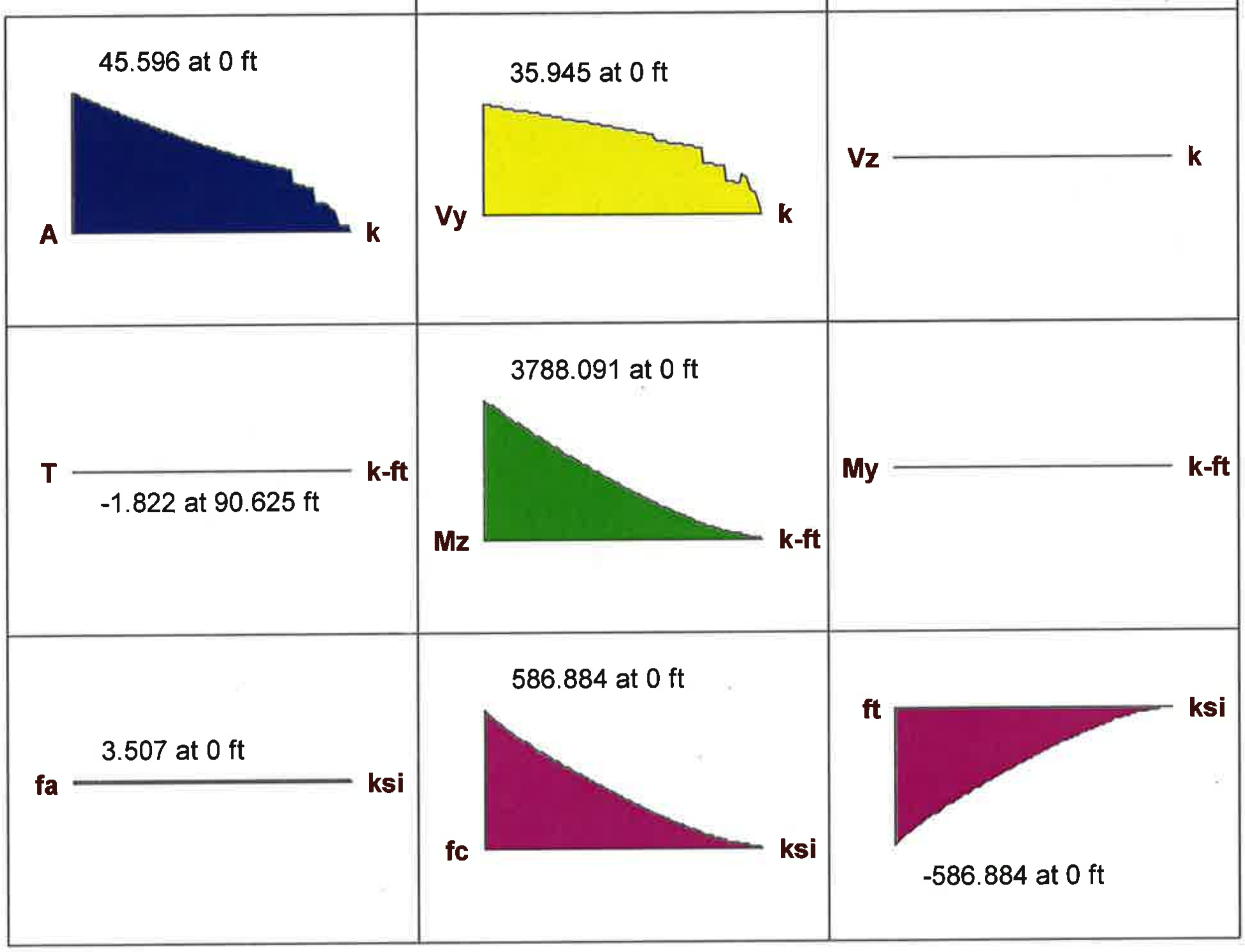
- Compressive stress fa exceeds F'e (Euler buckling) -

Max Defl Ratio **L/2**

Column: ***M1***

Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 2: x-direction NESC Extreme Wind
Code Check: **No Calc**
Report Based On 97 Sections





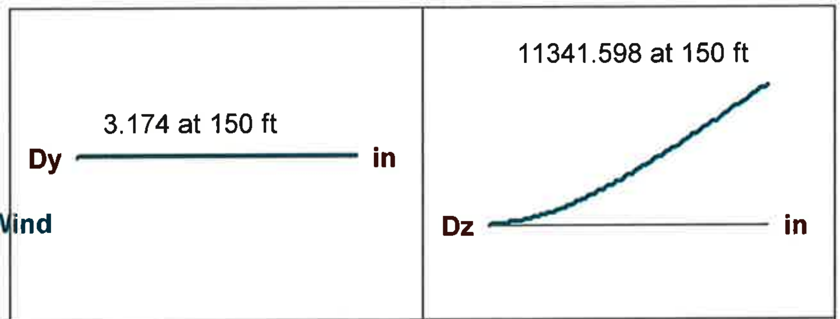
AISC 9th: ASD Code Check

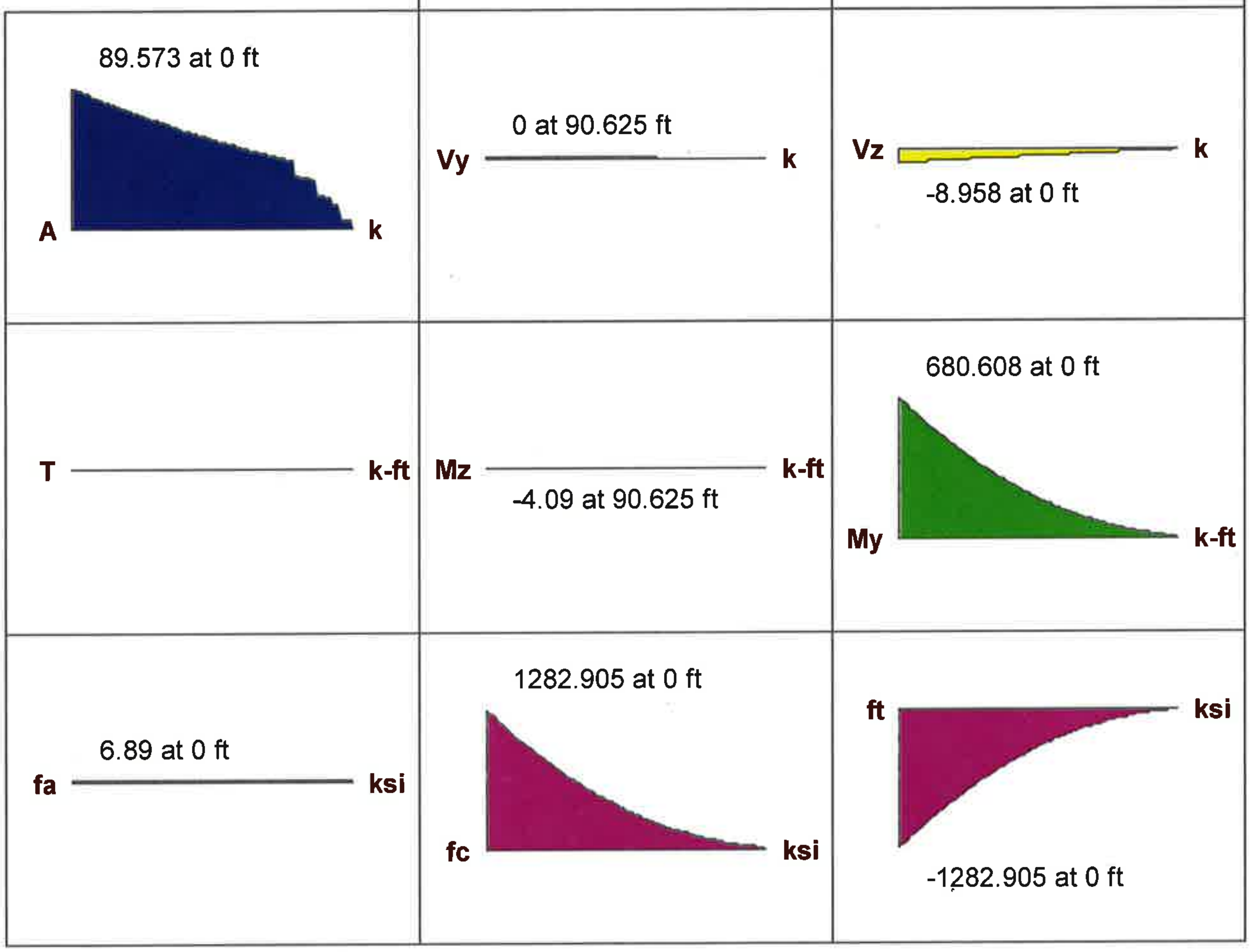
- Compressive stress fa exceeds F'e (Euler buckling) -

Max Defl Ratio **L/1**

Column: ***M1***

Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 3: z-direction NESC Heavy Wind
Code Check: **No Calc**
Report Based On 97 Sections





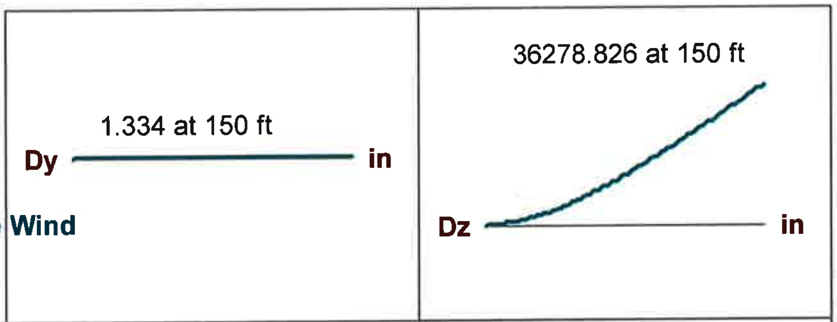
AISC 9th: ASD Code Check

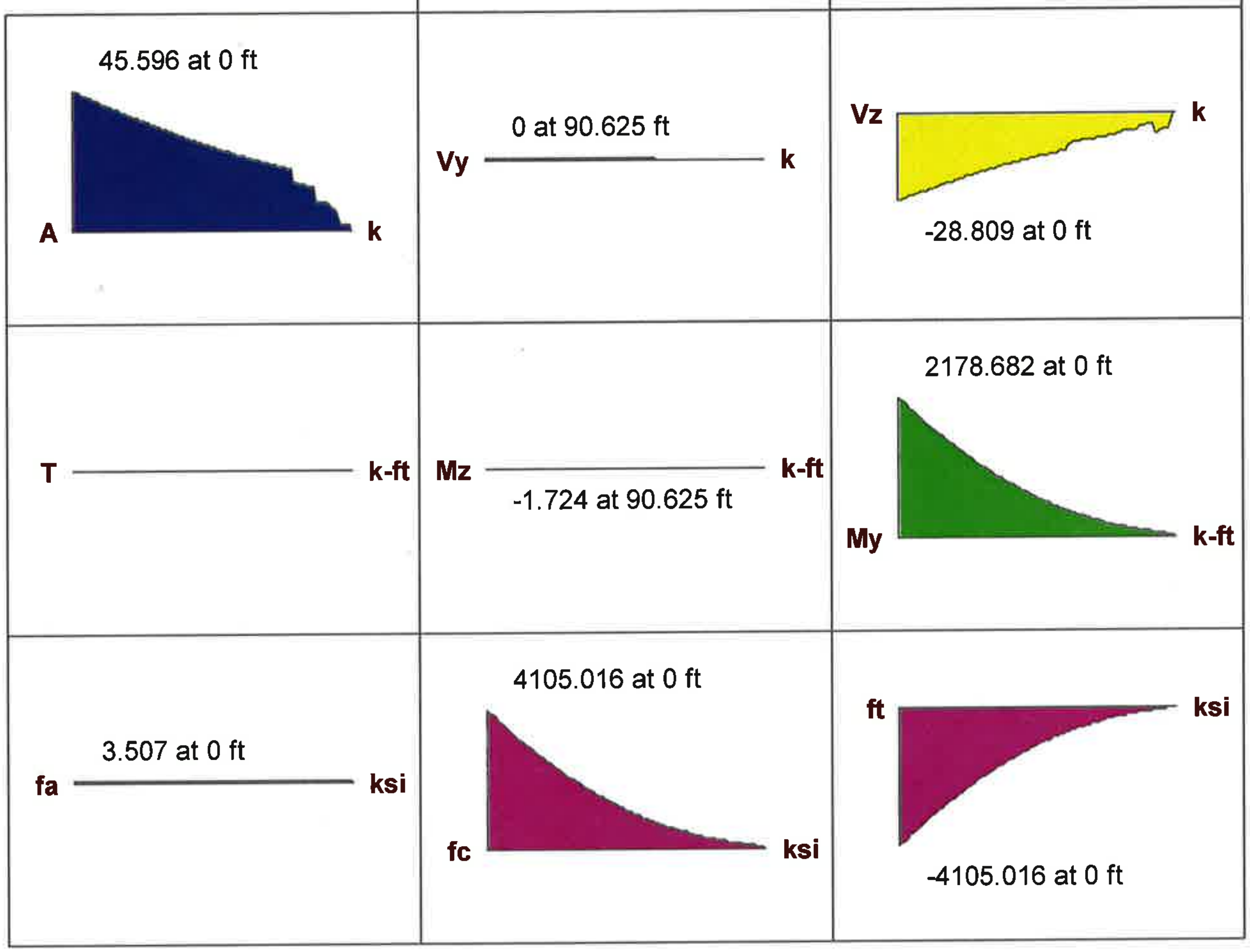
- Compressive stress fa exceeds F'e (Euler buckling) -

Max Defl Ratio **L/1**

Column: ***M1***

Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 4: z-direction NESC Extreme Wind
Code Check: **No Calc**
Report Based On 97 Sections

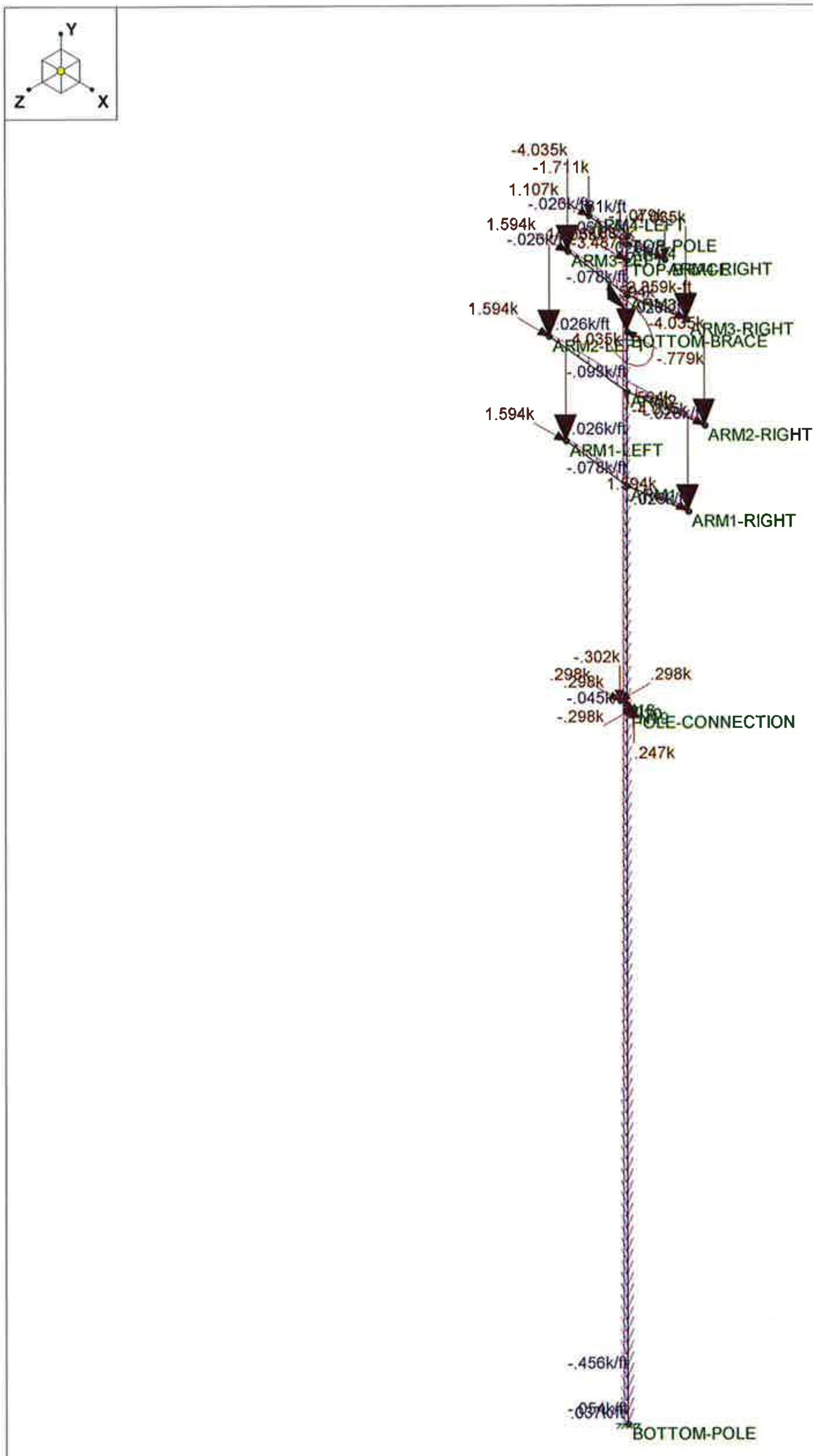




AISC 9th: ASD Code Check

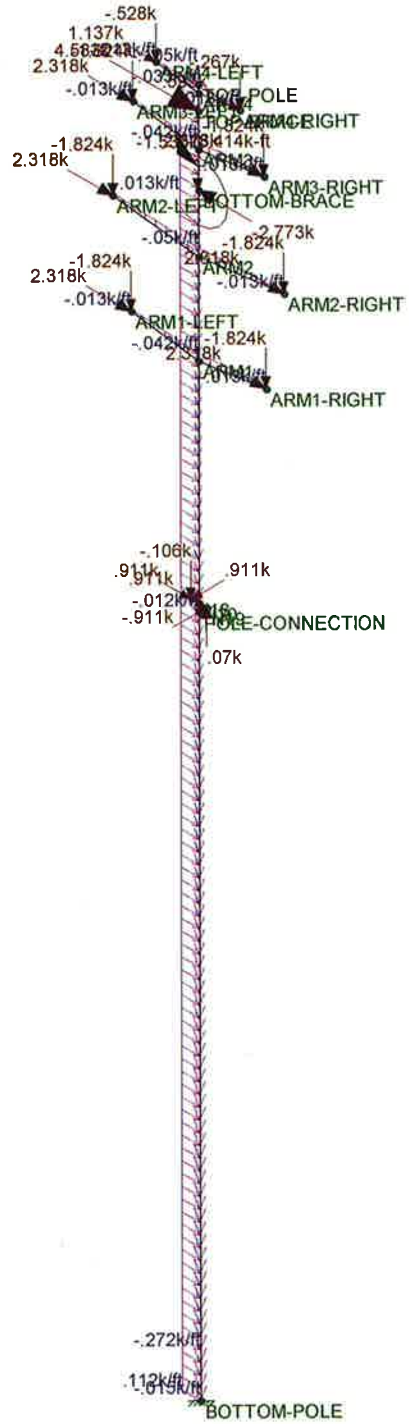
- Compressive stress fa exceeds F'e (Euler buckling) -

Max Defl Ratio **L/1**



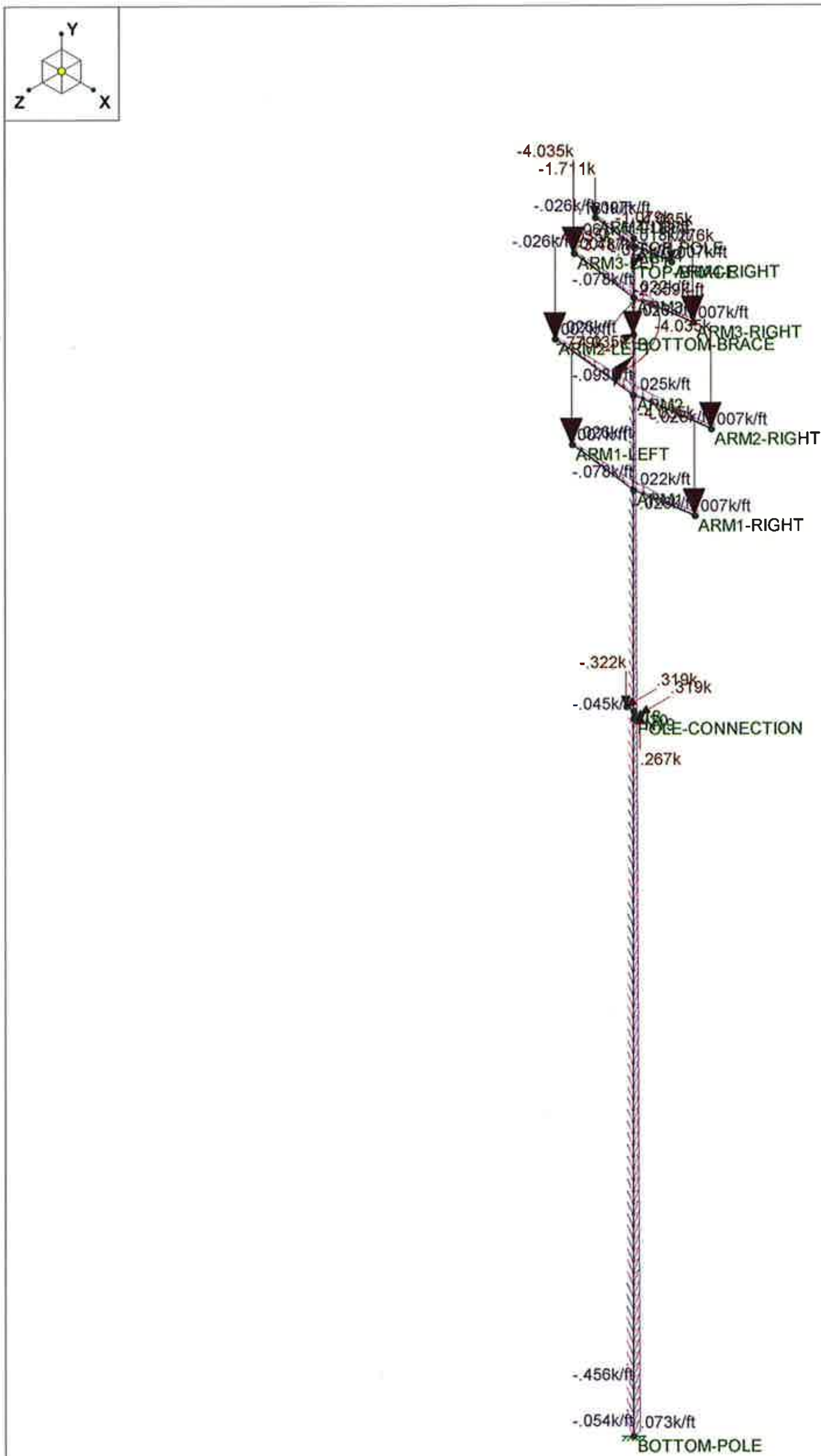
Loads: LC 1, x-direction NESC Heavy Wind

Centek		
TJL	Pole # 845	Dec 23, 2015 at 11:26 AM
15240.000 - Trumbull 4	LC #1 Loads	NESC-Pole.r3d



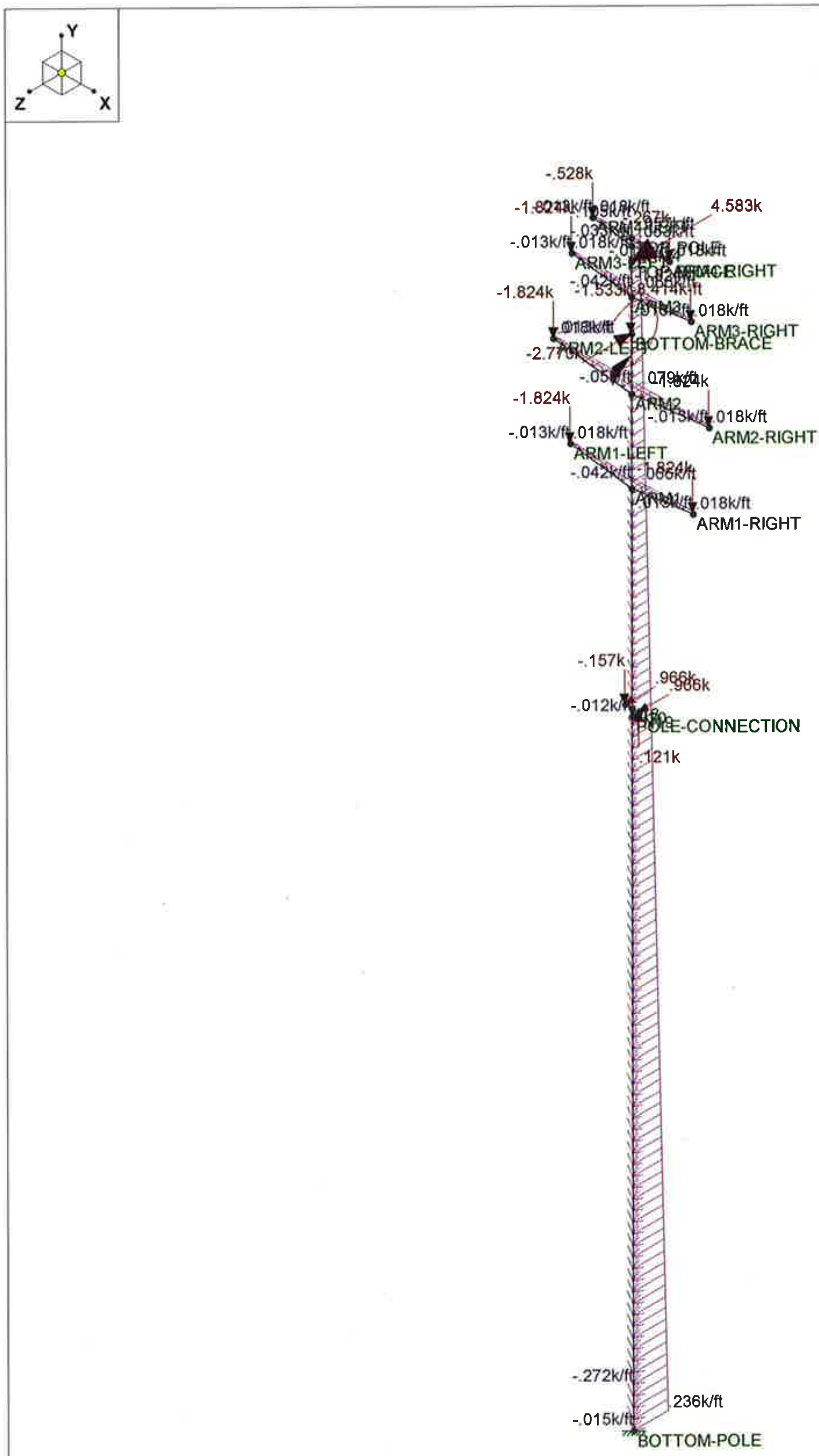
Loads: LC 2, x-direction NESC Extreme Wind

Centek		
TJL	Pole # 845	Dec 23, 2015 at 11:26 AM
15240.000 - Trumbull 4	LC #2 Loads	NESC-Pole.r3d



Loads: LC 3, z-direction NESC Heavy Wind

Centek		
TJL	Pole # 845	Dec 23, 2015 at 11:26 AM
15240.000 - Trumbull 4	LC #3 Loads	NESC-Pole.r3d



Loads: LC 4, z-direction NESC Extreme Wind

Centek		
TJL	Pole # 845	Dec 23, 2015 at 11:27 AM
15240.000 - Trumbull 4	LC #4 Loads	NESC-Pole.r3d

Pole Analysis:

Pole Properties:

Wide Flange Moment of Inertia Iy =	$I_{yy} := 20.7 \cdot in^4$	(User Input)
Wide Flange Moment of Inertia Ix =	$I_{xx} := 843 \cdot in^4$	(User Input)
Wide Flange Area =	$A_{wf} := 13.0 \cdot in^2$	(User Input)
Flange Width =	$b_f := 6.5 \cdot in$	(User Input)
Wide Flange Depth =	$d_{wf} := 20.7 \cdot in$	(User Input)
Tower Width Top =	$W_{TTop} := 13 \cdot in$	(User Input)
Tower Width Base =	$W_{TBase} := 54 \cdot in$	(User Input)
Plate Thickness Top =	$Plt_{tTop} := 0.1875 \cdot in$	(User Input)
Plate Thickness Base =	$Plt_{tBase} := 0.5 \cdot in$	(User Input)
Length of Pole =	$L_{pole} := 150 \cdot ft$	(User Input)
Nominal Bending Stress =	$F_b := 60 \cdot ksi$	(User Input)
Modulus of Elasticity =	$E := 29000 \cdot ksi$	(User Input)

Member Forces:

Bending Moment x-direction Top =	$M_{xtop} := 0 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment x-direction Midspan =	$M_{xmid} := 1415 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment x-direction Bottom =	$M_{xbot} := 3788 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment y-direction Top =	$M_{ytop} := 0 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment y-direction Midspan =	$M_{ymid} := 598 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment y-direction Bottom =	$M_{ybot} := 2179 kip \cdot ft$	(User Input from RISA-3D)
Axial Force Top =	$P_{top} := 0 \cdot kip$	(User Input from RISA-3D)
Axial Force Bottom =	$P_{bot} := 46 \cdot kip$	(User Input from RISA-3D)

Increment Length =	$lc := 5 \cdot ft$	(User Input)
Number of Increments =	$N := \frac{L_{pole}}{lc}$	(User Input)

$$d_i := \begin{array}{|l} x \leftarrow (lc \cdot i) \\ d \leftarrow (L_{pole} - x) \end{array}$$

Distance Above Ground Level =

$$d_i = \begin{pmatrix} 150 \\ 145 \\ 140 \\ 135 \\ 130 \\ 125 \\ 120 \\ 115 \\ 110 \\ 105 \\ 100 \\ 95 \\ 90 \\ 85 \\ 80 \\ 75 \\ 70 \\ 65 \\ 60 \\ 55 \\ 50 \\ 45 \\ 40 \\ 35 \\ 30 \\ 25 \\ 20 \\ 15 \\ 10 \\ 5 \\ 0 \end{pmatrix} ft$$

Bending Moment x-direction @ 5' Increments =

$$M_{x_i} := \begin{array}{|l} \Delta M_x \leftarrow \frac{(M_{xmid} - M_{xtop})}{0.5 \cdot L_{pole}} \cdot \left(d_i - \frac{L_{pole}}{2}\right) \text{ if } d_i > \frac{L_{pole}}{2} \\ \Delta M_x \leftarrow \frac{(M_{xbot} - M_{xmid})}{0.5 \cdot L_{pole}} \cdot d_i \text{ if } d_i \le \frac{L_{pole}}{2} \\ M_x \leftarrow M_{xmid} - \Delta M_x \text{ if } d_i > \frac{L_{pole}}{2} \\ M_x \leftarrow M_{xbot} - \Delta M_x \text{ if } d_i \le \frac{L_{pole}}{2} \end{array}$$

$$M_{x_i} = \begin{pmatrix} 0 \\ 94 \\ 189 \\ 283 \\ 377 \\ 472 \\ 566 \\ 660 \\ 755 \\ 849 \\ 943 \\ 1038 \\ 1132 \\ 1226 \\ 1321 \\ 1415 \\ 1573 \\ 1731 \\ 1890 \\ 2048 \\ 2206 \\ 2364 \\ 2522 \\ 2681 \\ 2839 \\ 2997 \\ 3155 \\ 3313 \\ 3472 \\ 3630 \\ 3788 \end{pmatrix} \cdot kip \cdot ft$$

Bending Moment y-direction @ 5' Increments =

$$M_{y_i} := \begin{array}{|l} \Delta M_y \leftarrow \frac{(M_{ymid} - M_{ytop})}{0.5 \cdot L_{pole}} \cdot \left(d_i - \frac{L_{pole}}{2}\right) \text{ if } d_i > \frac{L_{pole}}{2} \\ \Delta M_y \leftarrow \frac{(M_{ybot} - M_{ymid})}{0.5 \cdot L_{pole}} \cdot d_i \text{ if } d_i \le \frac{L_{pole}}{2} \\ M_y \leftarrow M_{ymid} - \Delta M_y \text{ if } d_i > \frac{L_{pole}}{2} \\ M_y \leftarrow M_{ybot} - \Delta M_y \text{ if } d_i \le \frac{L_{pole}}{2} \end{array}$$

$$M_{y_i} = \begin{pmatrix} 0 \\ 40 \\ 80 \\ 120 \\ 159 \\ 199 \\ 239 \\ 279 \\ 319 \\ 359 \\ 399 \\ 439 \\ 478 \\ 518 \\ 558 \\ 598 \\ 703 \\ 809 \\ 914 \\ 1020 \\ 1125 \\ 1230 \\ 1336 \\ 1441 \\ 1547 \\ 1652 \\ 1757 \\ 1863 \\ 1968 \\ 2074 \\ 2179 \end{pmatrix} \cdot kip \cdot ft$$

Tower Width =

$$W_{Tx_i} := \left| \begin{array}{l} \Delta W_{T.x} \leftarrow \dfrac{\left(W_{TBase} - W_{TTop}\right)}{L_{pole}} \cdot d_i \\ W_{Tx} \leftarrow W_{TBase} - \Delta W_{T.x} \end{array} \right.$$

Plate Thickness =

$$Plt_{t_i} := \left| \begin{array}{l} \Delta Plt_t \leftarrow \dfrac{\left(Plt_{tBase} - Plt_{tTop}\right)}{L_{pole}} \cdot d_i \\ Plt_t \leftarrow Plt_{tBase} - \Delta Plt_t \end{array} \right.$$

Plate Area =

$$Plt_{A_i} := W_{Tx_i} \cdot Plt_{t_i}$$

$$W_{Tx_i} = \begin{pmatrix} 1.083 \\ 1.197 \\ 1.311 \\ 1.425 \\ 1.539 \\ 1.653 \\ 1.767 \\ 1.881 \\ 1.994 \\ 2.108 \\ 2.222 \\ 2.336 \\ 2.45 \\ 2.564 \\ 2.678 \\ 2.792 \\ 2.906 \\ 3.019 \\ 3.133 \\ 3.247 \\ 3.361 \\ 3.475 \\ 3.589 \\ 3.703 \\ 3.817 \\ 3.931 \\ 4.044 \\ 4.158 \\ 4.272 \\ 4.386 \\ 4.5 \end{pmatrix} ft \qquad Plt_{t_i} = \begin{pmatrix} 0.187 \\ 0.198 \\ 0.208 \\ 0.219 \\ 0.229 \\ 0.24 \\ 0.25 \\ 0.26 \\ 0.271 \\ 0.281 \\ 0.292 \\ 0.302 \\ 0.313 \\ 0.323 \\ 0.333 \\ 0.344 \\ 0.354 \\ 0.365 \\ 0.375 \\ 0.385 \\ 0.396 \\ 0.406 \\ 0.417 \\ 0.427 \\ 0.438 \\ 0.448 \\ 0.458 \\ 0.469 \\ 0.479 \\ 0.49 \\ 0.5 \end{pmatrix} \cdot in \qquad Plt_{A_i} = \begin{pmatrix} 2.4 \\ 2.8 \\ 3.3 \\ 3.7 \\ 4.2 \\ 4.8 \\ 5.3 \\ 5.9 \\ 6.5 \\ 7.1 \\ 7.8 \\ 8.5 \\ 9.2 \\ 9.9 \\ 10.7 \\ 11.5 \\ 12.3 \\ 13.2 \\ 14.1 \\ 15 \\ 16 \\ 16.9 \\ 17.9 \\ 19 \\ 20 \\ 21.1 \\ 22.2 \\ 23.4 \\ 24.6 \\ 25.8 \\ 27 \end{pmatrix} \cdot in^2$$

Distance from Wide Flange Centroid to Built-up Section Centroid =

$$d_{x_i} := \frac{W_{Tx_i}}{2} - \frac{b_f}{2}$$

Distance from Plate Centroid to Built-up Section Centroid =

$$d_{y_i} := \frac{Plt_{t_i}}{2} + \frac{d_{wf}}{2}$$

Total Bult-up Section Area =

$$A_{Tot_i} := 2 \cdot \left(Plt_{A_i} + A_{wf}\right)$$

$$d_{x_i} = \begin{pmatrix} 3.25 \\ 3.93 \\ 4.62 \\ 5.3 \\ 5.98 \\ 6.67 \\ 7.35 \\ 8.03 \\ 8.72 \\ 9.4 \\ 10.08 \\ 10.77 \\ 11.45 \\ 12.13 \\ 12.82 \\ 13.5 \\ 14.18 \\ 14.87 \\ 15.55 \\ 16.23 \\ 16.92 \\ 17.6 \\ 18.28 \\ 18.97 \\ 19.65 \\ 20.33 \\ 21.02 \\ 21.7 \\ 22.38 \\ 23.07 \\ 23.75 \end{pmatrix} \cdot in$$

$$d_{y_i} = \begin{pmatrix} 10.44 \\ 10.45 \\ 10.45 \\ 10.46 \\ 10.46 \\ 10.47 \\ 10.47 \\ 10.48 \\ 10.49 \\ 10.49 \\ 10.5 \\ 10.5 \\ 10.51 \\ 10.51 \\ 10.52 \\ 10.52 \\ 10.53 \\ 10.53 \\ 10.54 \\ 10.54 \\ 10.55 \\ 10.55 \\ 10.56 \\ 10.56 \\ 10.57 \\ 10.57 \\ 10.58 \\ 10.58 \\ 10.59 \\ 10.59 \\ 10.6 \end{pmatrix} \cdot in$$

$$A_{Tot_i} = \begin{pmatrix} 30.9 \\ 31.7 \\ 32.6 \\ 33.5 \\ 34.5 \\ 35.5 \\ 36.6 \\ 37.8 \\ 39 \\ 40.2 \\ 41.6 \\ 42.9 \\ 44.4 \\ 45.9 \\ 47.4 \\ 49 \\ 50.7 \\ 52.4 \\ 54.2 \\ 56 \\ 57.9 \\ 59.9 \\ 61.9 \\ 64 \\ 66.1 \\ 68.3 \\ 70.5 \\ 72.8 \\ 75.1 \\ 77.5 \\ 80 \end{pmatrix} \cdot in^2$$

Built of Section Moment of Inertia Ix =

$$I_{x_i} := 2 \cdot \left[I_{yy} + A_{wf} \left(d_{x_i} \right)^2 + \frac{1}{12} \cdot Plt_{t_i} \cdot \left(W_{Tx_i} \right)^3 \right]$$

Built of Section Moment of Inertia Iy =

$$I_{y_i} := 2 \cdot \left[I_{xx} + \frac{1}{12} \cdot W_{Tx_i} \cdot \left(Plt_{t_i} \right)^3 + Plt_{A_i} \cdot \left(d_{y_i} \right)^2 \right]$$

$$I_{x_i} = \begin{pmatrix} 385 \\ 541 \\ 731 \\ 954 \\ 1213 \\ 1508 \\ 1843 \\ 2218 \\ 2636 \\ 3098 \\ 3607 \\ 4165 \\ 4774 \\ 5436 \\ 6156 \\ 6934 \\ 7774 \\ 8678 \\ 9651 \\ 10694 \\ 11811 \\ 13005 \\ 14280 \\ 15639 \\ 17086 \\ 18624 \\ 20258 \\ 21992 \\ 23828 \\ 25773 \\ 27829 \end{pmatrix} \cdot in^4$$

$$I_{y_i} = \begin{pmatrix} 2218 \\ 2307 \\ 2402 \\ 2504 \\ 2613 \\ 2728 \\ 2849 \\ 2977 \\ 3111 \\ 3252 \\ 3400 \\ 3554 \\ 3714 \\ 3882 \\ 4056 \\ 4236 \\ 4423 \\ 4617 \\ 4818 \\ 5025 \\ 5239 \\ 5460 \\ 5687 \\ 5922 \\ 6163 \\ 6411 \\ 6666 \\ 6928 \\ 7196 \\ 7472 \\ 7755 \end{pmatrix} \cdot in^4$$

Built of Section Modulus Sx = $S_{x_i} := \frac{I_{x_i}}{\frac{W_{Tx_i}}{2}}$

Built of Section Modulus Sy = $S_{y_i} := \frac{I_{y_i}}{Plt_{t_i} + \frac{d_{wf}}{2}}$

S_{x_i} = (59, 75, 93, 112, 131, 152, 174, 197, 220, 245, 271, 297, 325, 353, 383, 414, 446, 479, 513, 549, 586, 624, 663, 704, 746, 790, 835, 881, 930, 979, 1031) $\cdot in^3$

S_{y_i} = (210, 219, 228, 237, 247, 258, 269, 281, 293, 306, 319, 334, 348, 364, 380, 396, 413, 431, 449, 468, 488, 508, 528, 549, 571, 594, 617, 640, 665, 689, 715) $\cdot in^3$

S_{x_i} (in^3)	S_{y_i} (in^3)
59	210
75	219
93	228
112	237
131	247
152	258
174	269
197	281
220	293
245	306
271	319
297	334
325	348
353	364
383	380
414	396
446	413
479	431
513	449
549	468
586	488
624	508
663	528
704	549
746	571
790	594
835	617
881	640
930	665
979	689
1031	715

Bending Stress x-direction @ 5' Increments = $fb_{x_i} := \frac{M_{x_i}}{S_{x_i}}$

Bending Stress y-direction @ 5' Increments = $fb_{y_i} := \frac{M_{y_i}}{S_{y_i}}$

$$fb_{x_i} = \begin{pmatrix} 0 \\ 15 \\ 24.4 \\ 30.4 \\ 34.5 \\ 37.2 \\ 39.1 \\ 40.3 \\ 41.1 \\ 41.6 \\ 41.8 \\ 41.9 \\ 41.8 \\ 41.6 \\ 41.4 \\ 41 \\ 42.3 \\ 43.4 \\ 44.2 \\ 44.8 \\ 45.2 \\ 45.5 \\ 45.6 \\ 45.7 \\ 45.7 \\ 45.5 \\ 45.4 \\ 45.1 \\ 44.8 \\ 44.5 \\ 44.1 \end{pmatrix} \cdot ksi$$

$$fb_{y_i} = \begin{pmatrix} 0 \\ 2.2 \\ 4.2 \\ 6.1 \\ 7.7 \\ 9.3 \\ 10.7 \\ 11.9 \\ 13.1 \\ 14.1 \\ 15 \\ 15.8 \\ 16.5 \\ 17.1 \\ 17.6 \\ 18.1 \\ 20.4 \\ 22.5 \\ 24.4 \\ 26.1 \\ 27.7 \\ 29.1 \\ 30.3 \\ 31.5 \\ 32.5 \\ 33.4 \\ 34.2 \\ 34.9 \\ 35.5 \\ 36.1 \\ 36.6 \end{pmatrix} \cdot ksi$$

Maximum Bending Stress x-direction = $f_{bxmax} := 45.7 \cdot ksi$

Percent Stressed = $\frac{f_{bxmax}}{F_b} = 76.2 \cdot \%$

Bending_Check_x := $if\left(f_{bxmax} < F_b, \text{"OK"}, \text{"NG"}\right)$

Bending_Check_x = "OK"

Maximum Bending Stress y-direction = $f_{bymax} := 36.6 \cdot ksi$

Percent Stressed = $\frac{f_{bymax}}{F_b} = 61 \cdot \%$

Bending_Check_y := $if\left(f_{bymax} < F_b, \text{"OK"}, \text{"NG"}\right)$

Bending_Check_y = "OK"

Flange Bolts and Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 1030·ft·kips	(Input From Risa-3D)
Shear Force =	Shear := 26·kips	(Input From Risa-3D)
Axial Force =	Axial := 24.5·kips	(Input From Risa-3D)

Flange Bolt Data:

Use ASTM A490

Number of Flange Bolts =	N := 24	(User Input)
Bolt Ultimate Strength =	F_u := 150·ksi	(User Input)
Bolt Yield Strength =	F_y := 125·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 0.875·in	(User Input)
Threads per Inch =	n := 9	(User Input)

Flange Plate Data:

Use ASTM A36

Plate Yield Strength =	Fy_{bp} := 36·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 2.0·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 2.0in$ (User Input)

$d_2 := 7.0in$ (User Input)

$d_3 := 12.0in$ (User Input)

$d_4 := 15.5in$ (User Input)

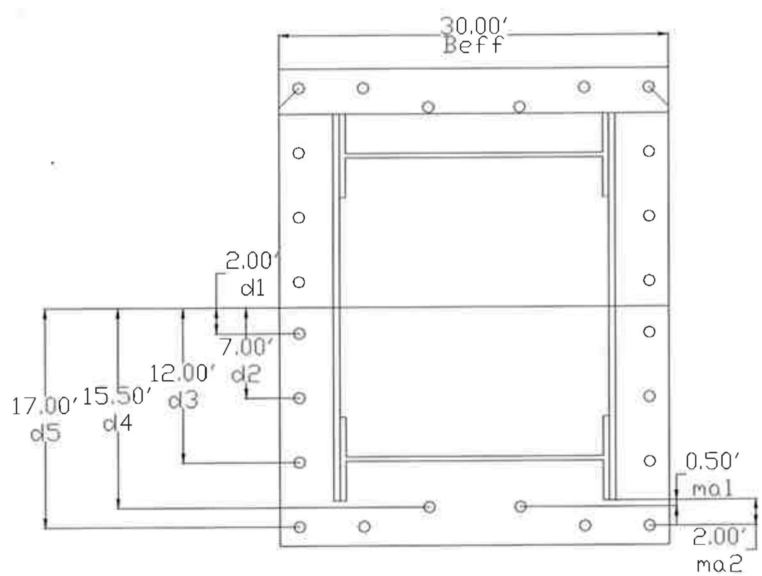
$d_5 := 17.0in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 0.5in$ (User Input)

$ma_2 := 2.0in$ (User Input)

Effective Width of Flange Plate for Bending = $B_{eff} := 30.0in$ (User Input)



FLANGE BOLT AND PLATE GEOMETRY

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 8\right] = 4.061 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.601 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.462 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.767 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.192 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^{\ 3}}{32} = 0.044 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_5}{I_p} - \frac{Axial}{N} = 50.7 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 0.75 \cdot A_g \cdot F_u = 67.6 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} \cdot 100 = 75$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Gross}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Flange Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_4}{I_p} + \frac{Axial}{N} = 48.2 \cdot kips$

$C_2 := \frac{OM \cdot d_5}{I_p} + \frac{Axial}{N} = 52.8 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot \left(2C_1 \cdot ma_1 + 4 \cdot C_2 \cdot ma_2\right)}{B_{eff} \cdot t_{bp}^{\;2}} = 23.51 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 0.9 \cdot Fy_{bp} = 32.4 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 72.6$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition2 = "Ok"

Flange Bolts and Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 409 \cdot ft \cdot kips$	(Input From Risa-3D)
Shear Force =	$Shear := 12.5 \cdot kips$	(Input From Risa-3D)
Axial Force =	$Axial := 24.5 \cdot kips$	(Input From Risa-3D)

Flange Bolt Data:

Use ASTM A490

Number of Flange Bolts =	$N := 24$	(User Input)
Bolt Ultimate Strength =	$F_u := 150 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 125 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Flange Bolts =	$D := 0.875 \cdot in$	(User Input)
Threads per Inch =	$n := 9$	(User Input)

Flange Plate Data:

Use ASTM A36

Plate Yield Strength =	$Fy_{bp} := 36 \cdot ksi$	(User Input)
Flange Plate Thickness =	$t_{bp} := 2.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 3.5in$ (User Input)

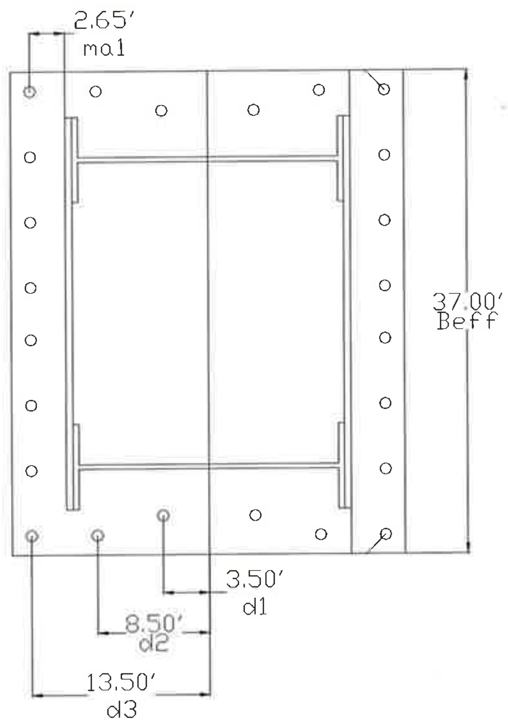
$d_2 := 8.5in$ (User Input)

$d_3 := 13.5in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.65in$ (User Input)

Effective Width of Flange Plate for Bending = $B_{eff} := 37.0in$ (User Input)



FLANGE BOLT AND PLATE GEOMETRY

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 16\right] = 3.254 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.601 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.462 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.767 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.192 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.044 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_3}{I_p} - \frac{Axial}{N} = 19.3 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := (.75 A_g \cdot F_u) = 67.6 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} \cdot 100 = 28.6$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Gross}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Flange Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 21.4 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (8C_1 \cdot ma_1)}{B_{eff} t_{bp}^{\ 2}} = 18.38 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 0.9 \cdot Fy_{bp} = 32.4 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 56.7$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

Condition2 = "Ok"

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 3788 \cdot ft \cdot kips$	(Input From Risa3D)
Shear Force =	$Shear := 36 \cdot kips$	(Input From Risa3D)
Axial Force =	$Axial := 45.6 \cdot kips$	(Input From Risa3D)

Anchor Bolt Data:

Use ASTM A615 Grade 60

Number of Anchor Bolts =	$N := 26$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 90 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 60 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Base Plate Data:

Use ASTM A572 Grade 42

Plate Yield Strength =	$Fy_{bp} := 42 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 7.5in$ (User Input)

$d_2 := 15.0in$ (User Input)

$d_3 := 22.5in$ (User Input)

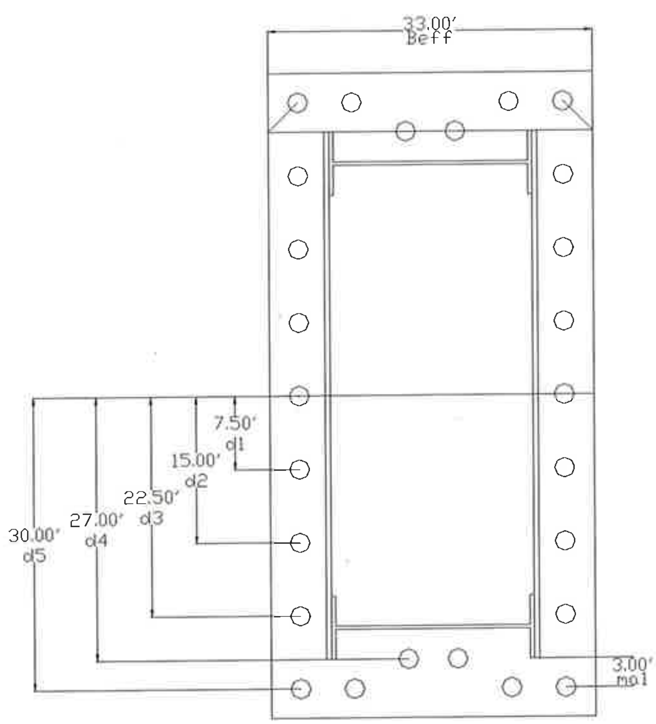
$d_4 := 27.0in$ (User Input)

$d_5 := 30in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3.0in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 33.0in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 8\right] = 1.327 \times 10^4 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_5}{I_p} - \frac{Axial}{N} = 101 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL} := (A_n \cdot F_y) = 194.9 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL}} \cdot 100 = 51.9$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_5}{I_p} + \frac{Axial}{N} = 104.5 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot \left(4C_1 \cdot ma_1\right)}{B_{eff} t_{bp}^{\,2}} = 25.35 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := Fy_{bp} = 42 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 60.3$

Condition3 = Condition2 := if$\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

Condition2 = "Ok"

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 2179 \cdot ft \cdot kips$	(Input From RISA-3D)
Shear Force =	$Shear := 28.8 \cdot kips$	(Input From Risa-3D)
Axial Force =	$Axial := 45.6 \cdot kips$	(Input From Risa-3D)

Anchor Bolt Data:

Use ASTM A615 Grade 60

Number of Anchor Bolts =	$N := 26$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 90 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 60 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Base Plate Data:

Use ASTM A572 Grade 42

Plate Yield Strength =	$Fy_{bp} := 42 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 2.5in$ (User Input)

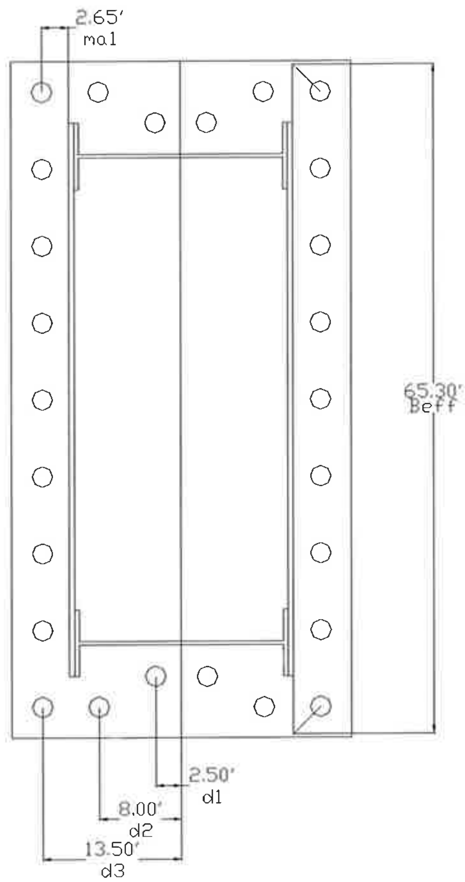
$d_2 := 8.0in$ (User Input)

$d_3 := 13.5in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.65in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 65.3in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 18\right] = 3.562 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_3}{I_p} - \frac{Axial}{N} = 97.4 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL} := (A_n \cdot F_y) = 194.9 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL}} \cdot 100 = 50$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 100.869 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (9C_1 \cdot ma_1)}{B_{eff} t_{bp}^2} = 24.56 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := Fy_{bp} = 42 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 58.5$

Condition3 = $Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

Condition3 = "Ok"

Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 3788 \cdot ft \cdot kips \cdot 1.1 = 4167 \cdot ft \cdot kips$	(User Input)
Shear Force =	$Shear := 36 \cdot kip \cdot 1.1 = 39.6 \cdot kips$	(User Input)
Axial Force =	$Axial := 45.6 \cdot kip \cdot 1.1 = 50.16 \cdot kips$	(User Input)
Tower Height =	$H_t := 150 \cdot ft$	(User Input)

Footing Data:

Overall Depth of Footing =	$D_f := 16 \cdot ft$	(User Input)
Length of Pier =	$L_p := 14 \cdot ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)
Width of Pier =	$W_{p1} := 7.5 \cdot ft$	(User Input)
Width of Pier =	$W_{p2} := 4 \cdot ft$	(User Input)
Thickness of Footing =	$T_f := 2.5 \cdot ft$	(User Input)
Width of Footing =	$W_{f1} := 22 \cdot ft$	(User Input)
Width of Footing =	$W_{f2} := 18 \cdot ft$	(User Input)

Material Properties:

Concrete Compressive Strength =	$f_c := 3500 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 6000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Coefficient of Lateral Soil Pressure = $K_p := \dfrac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}) = 150 \cdot \text{pcf}$

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}) = 120 \cdot \text{pcf}$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 4.86 \cdot \text{ksf}$

$P_{top} := \text{if}\left[n < (D_f - T_f), P_{pt}, P_{pn}\right] = 4.86 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 5.76 \cdot \text{ksf}$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 5.31 \cdot \text{ksf}$

$T_p := \text{if}\left[n < (D_f - T_f), T_f, (D_f - n)\right] = 2.5$

$A_p := W_{f2} \cdot T_p = 45$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 238.95 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := (W_{f1} \cdot W_{f2} \cdot T_f + W_{p1} \cdot W_{p2} \cdot L_p) \cdot \gamma_c = 211.5 \cdot \text{kip}$

Weight of Soil Above Footing = $WT_{s1} := \left[(W_{f1} \cdot W_{f2} - W_{p1} \cdot W_{p2}) \cdot (L_p - L_{pag} - n)\right] \cdot \gamma_s = 592.92 \cdot \text{kip}$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left[\frac{(L_p - L_{pag})^2 \cdot \tan(\Phi_s)}{2} \cdot W_{f2}\right] \cdot \gamma_s = 113.64 \cdot \text{kip}$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[(L_p - L_{pag})^3 \cdot \frac{\tan(\Phi_s)}{3}\right] \cdot \gamma_s = 113.64 \cdot \text{kips}$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 854.58 \cdot \text{kip}$

Resisting Moment = $M_r := (WT_{tot}) \cdot \frac{W_{f1}}{2} + S_u \cdot \frac{T_f}{3} + \left[(WT_{s2} + WT_{s3}) \cdot \left(W_{f1} + \frac{D_f \tan(\Phi_s)}{3}\right)\right] = 15299 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 4820 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 3.17$

Factor of Safety Required = $FS_{req} := 1$

OverTurning_Moment_Check := if($FS \geq FS_{req}$, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_{f1} \cdot W_{f2} = 396$

Section Modulus of Mat = $S := \frac{W_{f1}^{2} \cdot W_{f2}}{6} = 1452 \cdot ft^{3}$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 5.478 \cdot ksf$

Max_Pressure_Check := if$(P_{max} < q_s$,"Okay","No Good")

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -1.162 \cdot ksf$

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

Min_Pressure_Check = "No Good"

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 5.64$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_{f2} \cdot \left(\frac{W_{f1}}{2} - e\right)} = 5.906 \cdot ksf$

$q_{adj} := \text{if}(P_{min} < 0, P_a, P_{max}) = 5.906 \cdot ksf$

Pressure_Check := if$(q_{adj} < q_s$,"Okay","No Good")

Pressure_Check = "Okay"

Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 2179 \cdot ft \cdot kips \cdot 1.1 = 2397 \cdot ft \cdot kips$	(User Input)
Shear Force =	$Shear := 28.8 \cdot kip \cdot 1.1 = 31.68 \cdot kips$	(User Input)
Axial Force =	$Axial := 45.6 \cdot kip \cdot 1.1 = 50.16 \cdot kips$	(User Input)
Tower Height =	$H_t := 150 \cdot ft$	(User Input)

Footing Data:

Overall Depth of Footing =	$D_f := 16 \cdot ft$	(User Input)
Length of Pier =	$L_p := 14 \cdot ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)
Width of Pier =	$W_{p1} := 7.5 \cdot ft$	(User Input)
Width of Pier =	$W_{p2} := 4 \cdot ft$	(User Input)
Thickness of Footing =	$T_f := 2.5 \cdot ft$	(User Input)
Width of Footing =	$W_{f1} := 18 \cdot ft$	(User Input)
Width of Footing =	$W_{f2} := 22 \cdot ft$	(User Input)

Material Properties:

Concrete Compressive Strength =	$f_c := 3500 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 6000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Coefficient of Lateral Soil Pressure = $K_p := \dfrac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}) = 150 \cdot \text{pcf}$

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}) = 120 \cdot \text{pcf}$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 4.86 \cdot \text{ksf}$

$P_{top} := \text{if}\left[n < (D_f - T_f), P_{pt}, P_{pn}\right] = 4.86 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 5.76 \cdot \text{ksf}$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 5.31 \cdot \text{ksf}$

$T_p := \text{if}\left[n < (D_f - T_f), T_f, (D_f - n)\right] = 2.5$

$A_p := W_{f2} \cdot T_p = 55$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 292.05 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := (W_{f1} \cdot W_{f2} \cdot T_f + W_{p1} \cdot W_{p2} \cdot L_p) \cdot \gamma_c = 211.5 \cdot \text{kip}$

Weight of Soil Above Footing = $WT_{s1} := \left[(W_{f1} \cdot W_{f2} - W_{p1} \cdot W_{p2}) \cdot (L_p - L_{pag} - n)\right] \cdot \gamma_s = 592.92 \cdot \text{kip}$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left[\frac{(L_p - L_{pag})^2 \cdot \tan(\Phi_s)}{2} \cdot W_{f2}\right] \cdot \gamma_s = 138.893 \cdot \text{kip}$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[(L_p - L_{pag})^3 \cdot \frac{\tan(\Phi_s)}{3}\right] \cdot \gamma_s = 113.64 \cdot \text{kips}$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 854.58 \cdot \text{kip}$

Resisting Moment = $M_r := (WT_{tot}) \cdot \frac{W_{f1}}{2} + S_u \cdot \frac{T_f}{3} + \left[(WT_{s2} + WT_{s3}) \cdot \left(W_{f1} + \frac{D_f \tan(\Phi_s)}{3}\right)\right] = 13258 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 2920 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 4.54$

Factor of Safety Required = $FS_{req} := 1$

OverTurning_Moment_Check := if(FS ≥ FS_{req}, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_{f1} \cdot W_{f2} = 396$

Section Modulus of Mat = $S := \frac{W_{f1}^{2} \cdot W_{f2}}{6} = 1188 \cdot ft^{3}$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 4.616 \cdot ksf$

Max_Pressure_Check := if($P_{max} < q_s$, "Okay", "No Good")

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.3 \cdot ksf$

Min_Pressure_Check := if[($P_{min} \geq 0$)·($P_{min} < q_s$), "Okay", "No Good"]

Min_Pressure_Check = "No Good"

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 3.416$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_{f2} \cdot \left(\frac{W_{f1}}{2} - e\right)} = 4.638 \cdot ksf$

$q_{adj} :=$ if($P_{min} < 0, P_a, P_{max}$) $= 4.638 \cdot ksf$

Pressure_Check := if($q_{adj} < q_s$, "Okay", "No Good")

Pressure_Check = "Okay"

Site Name	TRUMBULL 4, CT	**Site #**	5-0142
Latitude	41-13-53.64 N	**Longitude**	73-11-24.00 W
98 Rocky Hill Rd - RRH's on Top		**GEL (Feet)**	155

700 MHz LTE Site Info	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QUANTITY PER FACE	1		1		1	
ORIENTATION	10		130		260	
DOWN TILT (ELEC + MECH)	2 Elec + 0 Mech		6 Elec + 0 Mech		4 Elec + 0 Mech	
RAD CTR (FT AGL)	TBD		TBD		TBD	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1			DB-T1-6Z-8AB-0Z		

2100 MHz LTE Site Info	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QUANTITY PER FACE	*0 (shared w/ LTE 700)*		*0 (shared w/ LTE 700)*		*0 (shared w/ LTE 700)*	
ORIENTATION	10		130		260	
DOWN TILT (ELEC + MECH)	2 Elec + 0 Mech		4 Elec + 0 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	TBD		TBD		TBD	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X90-AWS	1	ALU RRH_2X90-AWS	1	ALU RRH_2X90-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

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

TX / RX FREQUENCIES			**TX POWER OUTPUT**	
Cellular A-Band	**PCS F / AWS-Band**	**700 Mhz C - Block**	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-2155	TX - 746-757	PCS LTE RRH (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-1755	RX - 776-787	700 MHz / 2100 MHz (Watts)	60

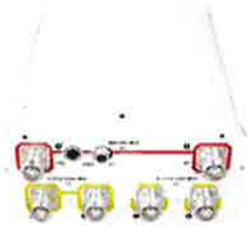
ALPHA				**BETA**				**GAMMA**			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/ WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ ORANGE	A6	700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

RF ENGINEER	**RF MANAGER**	**RF INITIALS**	**DATE**
Prepared By: Ryan Ulanday	Alex Restrepo	RU	10/13/2015

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.



SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2 x 1710–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

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

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**	**1710–1880**	**1850–1990**	**1920–2180**	**2300–2360**
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**	**1710–1880**	**1850–1990**	**1920–2180**	**2300–2360**
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6 7 ° | 14.6 14 ° | 14.2	0 ° | 14.5 7 ° | 14.4 14 ° | 13.6	0 ° | 17.4 3 ° | 17.5 7 ° | 17.4	0 ° | 17.8 3 ° | 17.9 7 ° | 17.9	0 ° | 18.1 3 ° | 18.3 7 ° | 18.2	0 ° | 18.2 3 ° | 18.4 7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2360 MHz | 698 – 896 MHz

Mechanical Specifications

Product Specifications

COMMSCOPE®

POWERED BY ANDREW

SBNHH-1D65B

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h | 150.0 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	1828.0 mm | 72.0 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

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

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

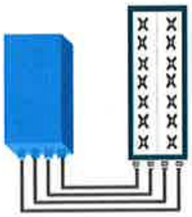
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

TECHNICAL SPECIFICATIONS

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

VZW Network Equipment Reporting Form (NERF)

Vendor		Model		Function	
	Alcatel-Lucent		B66a RRH 4Tx/4Rx 4x45W or 2x 90W (SW selectable)		RRH for distributed architecture with a CPRI interface between digital and RF processing components. The RRH has 4 Tx ports and 4 Rx ports. Can be SW configured for 2 Tx with 90W rf per port or 4 Tx with 45W rf per port. The RRH has passive cooling only.

*1)Equipment Configuration	*2)Heat Release @50°F Intake Temp [W]		*3)Airflow Rate @ 100% Activity Rate [cfm]		*4)Dimensions [in]		Non-Thermal Data		
	100% Activity	50% Activity	Nominal (70°F)	Max (95°F)	External (WxDxH)	Clear (F/R/S)	Installed Weight [lb]	*5)Sound @ Nominal [L_{WAd}]	*6)Name Plate [W]
Minimum			N/A Convection cooled	N/A Convection cooled	w/o Solar Shield W = 11.4in D = 6.7in H = 25.2in (W=290mm) (D=170mm) (H=640mm)	Front: 12" Rear: 7.5" Right: 12" Left: 12" Top: 12" Bottom: 24"			
Typical			N/A Convection cooled	N/A Convection cooled	with Solar Shield W = 12in D = 7.6in H = 25.8in (W=304mm) (D=193mm) (H=655mm)		62lb 72 lb(w mounting brackets)	N/A Convection cooled	
Full	825W (add 60W for AISG)	TBD	N/A Convection cooled	N/A Convection cooled	N/A			N/A Convection cooled	

*7)Equipment EC-Class	N/A Convection cooled	*10)Fan Speed	N/A Convection cooled	*13)Fan Hot-Swap	N/A Convection cooled	*16)Environ. Tests	N/A Convection cooled	*18)Temp. Rise [°F]	N/A Convection cooled
*8)Non-Optimal EC-Class	N/A Convection cooled	*11)Fan Logic	N/A Convection cooled	*14)Shut-Down	N/A Convection cooled	*17)Allow. Max [°F]	N/A Convection cooled	*19)Rec. Max [°F]	N/A Convection cooled
*9)Exhaust Openings	N/A Convection cooled	*12)Fan Alarm	N/A Convection cooled	*15)Temp. Access	N/A Convection cooled	*17)Allow. Min [°F]	N/A Convection cooled	*19)Rec. Min [°F]	N/A Convection cooled

Power Reporting

Power Input	-48V	No. Power Supplies	N/A (Customer provided power plant)	Number of Inputs per Power Supply	1
*24)Maximum Demand (total system in Watts)	825W (add 60W for AISG)	Maximum Input (each power supply in Watts)	N/A (Customer provided power plant)	Maximum Output (each power supply in Watts)	58W (to AISG port, 29V/2A)
Power Supply Connection Type	DC entry via Conduit Box	Power Supply Make & Model	N/A (Customer provided power plant)		
Input Protection	no input fuse	Input Protection Make & Model	N/A (Customer provided power plant)		
Redundancy Scheme	N/A				
Nominal Voltage	-48VDC	Maximum Voltage	-57V	Minimum Voltage	-38V
*25)Max Current at Nominal Voltage	17.2A (add 1.2A if AISG port loaded 2A*29V)	*25)Max Current at Maximum Voltage	14.5A (add 1A if AISG port loaded 2A*29V)	*25)Max Current at Minimum Voltage	21.7A (add 1.5A if AISG port loaded 2A*29V)

Return completed forms to Engineering and Operations Support (EOS)
Richard.damiano@verizonwireless.com

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

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

Features/Benefits

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

Technical Specifications

Mechanical Specifications

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

Electrical Specifications

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

* This data is provisional and subject to change.

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

GEOTECHNICAL ENGINEERING

227 Williams Street • P.O. Box 397
Glastonbury, CT 06033
(860) 633-4623 / FAX (860) 657-2514

July 7, 2009

Mr. Jason Mead, Structural Engineer
Natcomm, Inc.
63-2 North Branford Road
Branford, CT 06405

Re: CL&P Tower - Pole #845, Rocky Hill Terrace, Trumbull, CT - Geotechnical Study to Evaluate the Existing Monopole Foundation for Supporting Additional Loads

Dear Mr. Mead:

1.0 Herewith is the data from the test boring taken at the above referenced site. One boring was drilled thru the existing tower foundation and to the depth of 24 feet. The boring was cored 5 feet into the bedrock. The boring was located about 4 feet from the existing foundation pier. *The boring was drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

2.0 The **Subject Project** will include placing the additional loading on the existing CL&P transmission pole. The existing monopole and foundation will be analyzed for the increased loads. The top of the existing monopole is 150± feet above the ground surface elevation. Based on the CL&P foundation plan dated October 1, 1975, the existing foundation consist of a 18' x 22' x 2.5' thick footing supporting a 4' x 7.5' x 14' high pier. The pier extends about 6" above the existing grades, which places the bottom of foundation at 16± feet below the existing ground surface. The test boring, which was taken thru the tower foundation, confirmed the depth and thickness of the foundation.

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

FILL; Fine to coarse SAND, some Gravel and Cobbles, little Silt to 13.5 feet, medium compact

Concrete Foundation from 13.5 to 16 feet

Fine to coarse SAND and GRAVEL, few Cobbles, little Silt to the top of bedrock at 19 feet, dense

Bedrock; Granitic Gneiss

3.1 The **Ground Water Table** was not evident above the bedrock at the completion of the boring. For design it should be assumed that the high water table could be at 16 feet below grade.

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

5.0 Based on the test boring the existing foundation is atop 3 feet of sand and gravel overlying the bedrock. Resistance to uplift and shear forces would be provided by the weight of the foundation and soil backfill. The allowable bearing pressure used to evaluate the existing foundation can be 3 Tons/sf.

5.1 The foundation design parameters used to evaluate the existing mat foundation can be as follows:

Design Parameter	Value
Allowable Bearing Pressure at Existing Foundation Subgrade	3 Tons/sf
Soil Unit Weight of Backfill (0 to 13.5 ft below grade)	125 pcf
Soil Unit Weight (16 to 19 ft below grade)	135 pcf
Internal Friction Angle (0 to 13.5ft below grade)	32°
Internal Friction Angle (16 to 19 feet)	36°
Ultimate Sliding Factor, concrete on soil	0.50
Frost Protection Depth	3.5 feet
Water Table (Design)	16 feet below grade

6.0 The soils at the subject site are generally in OSHA class C which would require excavations that exceed 5 feet high, to have the slopes cut back to 34° from the horizontal.

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

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

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

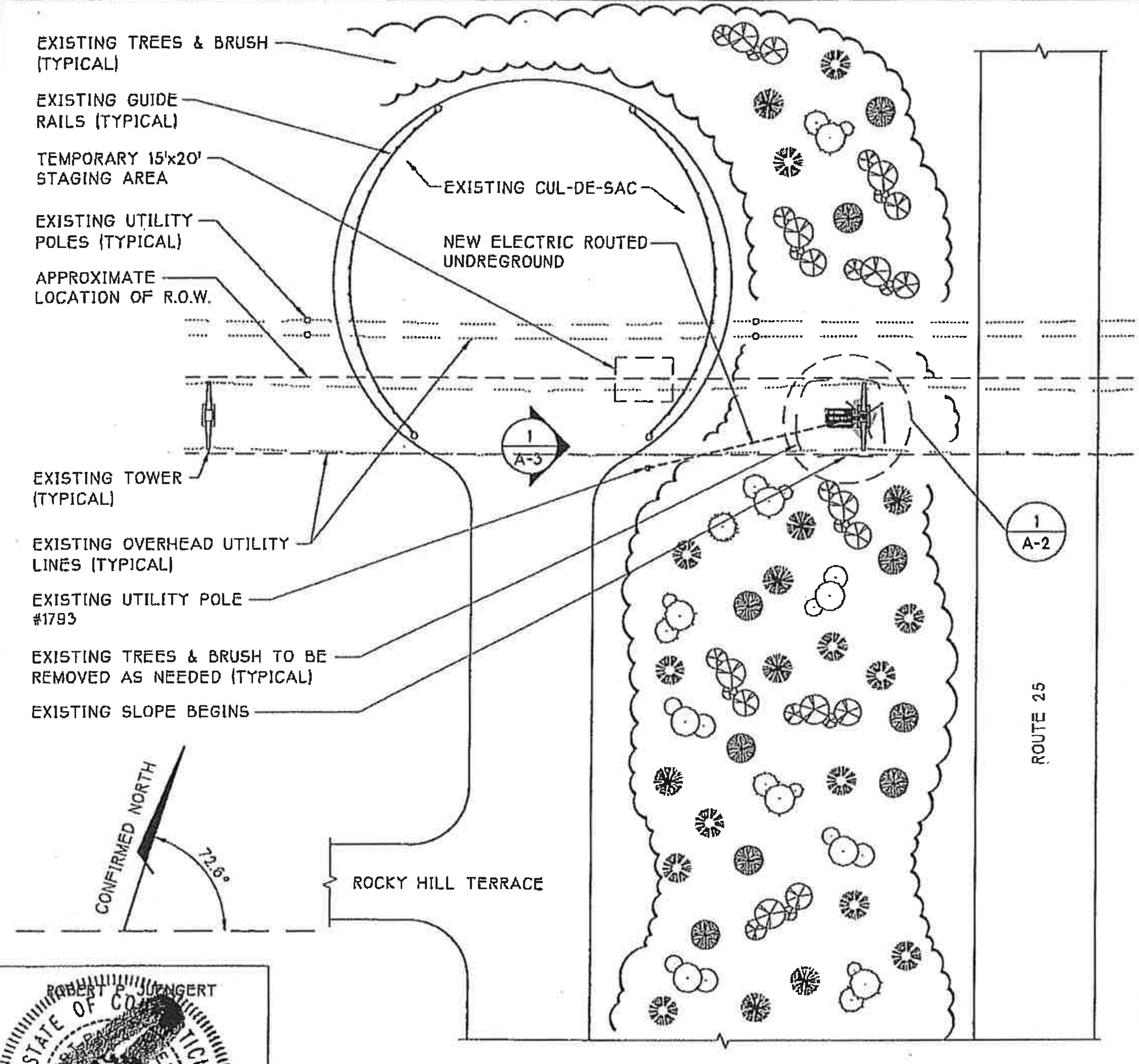
If you have any questions please call me.

Very truly yours,

Max Welti

Max Welti, P. E.

C: \NfmWork\728B\728B_A-1.dwg Thu Sep 03 34:55 1998 DCa



ROBERT P. JUNGERT
STATE OF CONNECTICUT
REGISTERED ARCHITECT
No. 4208
CT- 4208

1 A-1 SITE LAYOUT
SCALE: 1" = 50'-0"

NOTE:
FOR ITEMS SUPPLIED BY OTHERS SEE GENERAL NOTES DRAWING A-14, A-15 & A-16

NOTE:
ALL NEW EQUIPMENT SHALL NOT OBSTRUCT ANY EXISTING EQUIPMENT OR CLIMBING APPARATUS.

ARCNET ARCHITECTS, INC.
670 North Beers Street, Building 2, Holmdel, NJ 07733
Tel: 732.739.3200 Fax: 732.739.0440

Drawing Title: SITE LAYOUT
Client: OCS
Project: CL&P TOWER - POLE #845
Address: ROCKY HILL TERRACE TRUMBULL, C.T.
Approved By:
PROJ. MGR: ________ DATE: ________
R.F. ENGR: ________ DATE: ________
SAC: ________ DATE: ________
OWNER: ________ DATE: ________

Revision No.	Date
REV.1 DCa	7/1/98

Search Area: CL&P-TRUMBULL/MPX49
Site ID No.: CT-11-080B

P.C.	P.C. Chkd	Chkd. by	ARCNET Project No.	Drawn	Date
GMc			A96.506.728B	DCa	5/21/98

Drawing No. A-1

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

CLIENT	PROJECT NAME	LOCATION
NATCOMM, INC.	CL&P TOWER #845	ROCKY HILL TERRACE, TRUMBULL, CT

	AUGER	CASING	SAMPLER	CORE BAR.
TYPE	HSA		SS	NQ
SIZE I.D.	3.75"		1.375"	2.0"
HAMMER WT.			140lbs	
HAMMER FALL			30"	

OFFSET:
LINE & STA.:
N. COORDINATE:
E. COORDINATE:

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

GROUND WATER OBSERVATIONS
AT none FT. AFTER 0 HOURS
AT FT. AFTER HOURS

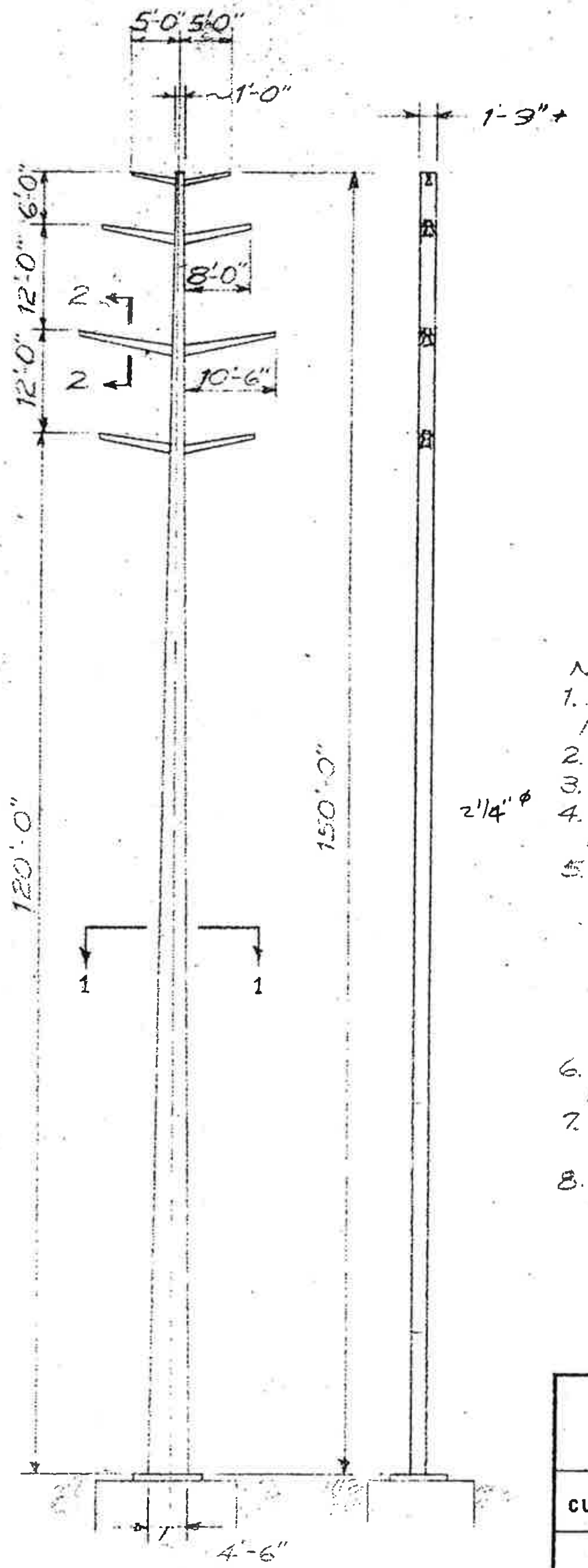
START DATE 7/1/09
FINISH DATE 7/1/09

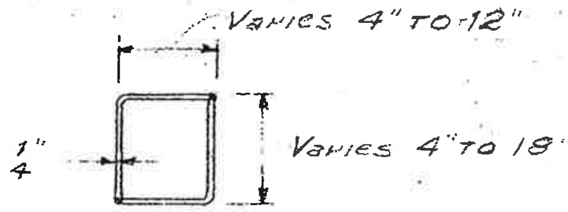
DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
0	1	2-6-7-10	0.00'-2.00'		BR.FINE-CRS.SAND, SOME GRAVEL & COBBLES, LITTLE SILT - FILL	
	2	6-3-2-2	2.00'-4.00'			
	3	6-9-8-8	4.00'-6.00'			
5	4	5-7-7-7	6.00'-8.00'			
	5	6-7-7-18	8.00'-10.00'			
10	6	30-20-7-6	10.00'-12.00'			
	7	7-7-60	12.00'-13.50'			
					CONCRETE FOUNDATION	13.5
15						
					CORED - BR.FINE-CRS.SAND AND GRAVEL, FEW COBBLES, LITTLE SILT	16.0
					CORED BEDROCK - GRANITIC GNEISS RUN#1 19.0'- 24.0' RECOVERED 36" RQD=25%	19.0
20						
					BOTTOM OF BORING @ 24'	24.0
25						
30						
35						

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

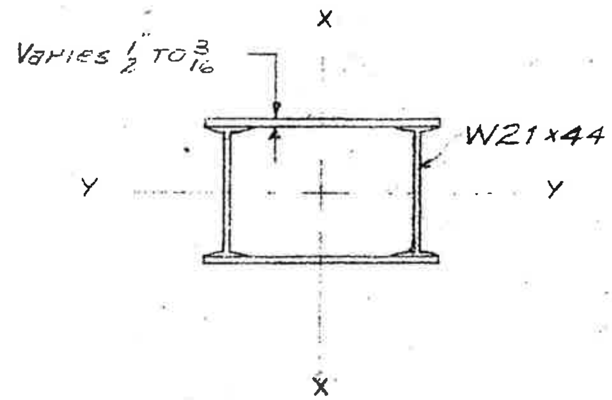
DRILLER: LINDENBERGER
INSPECTOR:

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





SECTION 2-2



SECTION 1-1

NOTES:

1. ALL STEEL ASTM A572 GR.60 EXCEPT AS NOTED.
2. CROSS-ARM STEEL IS ASTM A36.
3. BASE PLATE ASTM A572 GR. 42.
4. ALL ANCHOR BOLTS 18S ASTM A615 GR. 60.
5. WEIGHTS:
   a) POLE - 13.2 TONS
   b) CROSS-ARMS - 1.78^T
   c) BASE PLATE - 0.93^T
   d) ANCHOR BOLTS - 1.38^T
   e) Miscellaneous - 0.25^T
   TOTAL ASSEMBLY WEIGHT - 16.7 TONS
6. CONTROLLING LOAD CONDITION IS N.E.S.C. HEAVY WITH TOP CONDUCTOR BROKEN.
7. MAX. GROUND LINE MOMENTS:
   $M_{x-x} = 2166.2^{1-K}$ $M_{y-y} = 1656.0^{1-K}$
8. POLES ARE ALSO CAPABLE OF RESISTING THE ADDED MOMENTS DUE TO DISPLACED VERTICAL LOADS, WITHOUT EXCEEDING THE YIELD POINT OF THE MATERIAL.

QUOTATION OUTLINE DRAWING

THE FINNEY STEEL POLE CO., INC.
1500 SHAWSHEEN ST. P.O. BOX 306
TEWKSBURY, MASS. 01876

CUSTOMER NORTHEAST UTILITIES P.O.

150' TANGENT POLE - 115 KV.

(2 REQ'D)

JOB NO. 1300.8 DWG NO. B-150-1

	Issue	Rev. 1	Rev. 2	Rev. 3	Rev. 4
DWN	4-14-71				
CKD					
APPD					
SHOP					

K&E ALBANENE® TRACING PAPER B.L.M. 10302

ATTACHMENT 5

	General	Power	Density					
Site Name: Trumbull 4								
Tower Height: 150'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*T-Mobile	8	139	165	0.0158	1945	1.0000	0.16%	
*T-Mobile	2	623	164	0.0179	2100	1.0000	0.18%	
Verizon	**0**	**426**	**90**	**0.0000**	**1970**	**1.0000**	**0.00%**	
Verizon	**0**	**447**	**90**	**0.0000**	**869**	**0.5793**	**0.00%**	
Verizon	**1**	**2240**	**90**	**0.0994**	**2145**	**1.0000**	**9.94%**	
Verizon	**1**	**564**	**90**	**0.0250**	**746**	**0.4973**	**5.03%**	
								15.3%
* Source: Siting Council								

ATTACHMENT 6

Robinson+Cole

KENNETH C. BALDWIN

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

June 2, 2016

Via Certificate of Mailing

Timothy M. Herbst, First Selectman
Town of Trumbull
5866 Main Street
Trumbull, CT 06611

Re: **Proposed Installation of a "Small Cell" Telecommunications Facility on Property at 900 Old Town Road (a/k/a Rocky Hill Road), Trumbull, Connecticut**

Dear First Selectman Herbst:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to file a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing Eversource transmission line tower in the northern-most portion of a 38.62 acre parcel at 900 Old Town Road in Trumbull (the "Property"). The existing transmission line tower is currently used by Eversource and by T-Mobile for telecommunication purposes.

T-Mobile maintains antennas on a mast that extends above the top of the existing tower. Radio equipment associated with T-Mobile's equipment is located in the ground near the base of the tower. Cellco intends to install three (3) antennas and three (3) remote radio heads at the 90 foot level on the tower. Equipment cabinets associated with Cellco's antennas and a diesel fueled back-up generator will be located on a 10'-6" x 16'-6"steel platform also near the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

Robinson+Cole

KENNETH C. BALDWIN

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

June 2, 2016

Via Certificate of Mailing

Joseph P. Ganim, Mayor
City of Bridgeport
Margaret E. Morton Government Center
999 Broad Street
Bridgeport, CT 06604

Re: **Proposed Installation of a "Small Cell" Telecommunications Facility on Property at 900 Old Town Road (a/k/a Rocky Hill Road), Trumbull, Connecticut**

Dear Mayor Ganim:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to file a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing Eversource transmission line tower in the northern-most portion of a 38.62 acre parcel at 900 Old Town Road in Trumbull (the "Property"). The existing transmission line tower is currently used by Eversource and by T-Mobile for telecommunication purposes.

T-Mobile maintains antennas on a mast that extends above the top of the existing tower. Radio equipment associated with T-Mobile's equipment is located in the ground near the base of the tower. Cellco intends to install three (3) antennas and three (3) remote radio heads at the 90 foot level on the tower. Equipment cabinets associated with Cellco's antennas and a diesel fueled back-up generator will be located on a 10'-6" x 16'-6"steel platform also near the base of the tower.

You are receiving this letter because the Eversource tower described above is located within 2,500 feet of the Trumbull-Bridgeport town boundary.

Robinson+Cole

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

Robinson+Cole

KENNETH C. BALDWIN

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

June 2, 2016

Via Certificate of Mailing

Par Old Town LLC
45 Knollwood Road, Suite 305
Elmsford, NY 10523

Re: **Proposed Installation of a "Small Cell" Telecommunications Facility on Property at 900 Old Town Road (a/k/a Rocky Hill Road), Trumbull, Connecticut**

Dear Sir or Madam:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to file a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing Eversource transmission line tower in the northern-most portion of a 38.62 acre parcel at 900 Old Town Road in Trumbull (the "Property"). The existing transmission line tower is currently used by Eversource and by T-Mobile for telecommunication purposes.

T-Mobile maintains antennas on a mast that extends above the top of the existing tower. Radio equipment associated with T-Mobile's equipment is located in the ground near the base of the tower. Cellco intends to install three (3) antennas and three (3) remote radio heads at the 90 foot level on the tower. Equipment cabinets associated with Cellco's antennas and a diesel fueled back-up generator will be located on a 10'-6" x 16'-6"steel platform also near the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

14551561-v1

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

Robinson+Cole

KENNETH C. BALDWIN

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

June 2, 2016

Via Certificate of Mailing

Michael Green
Eversource Energy
107 Selden Street
Berlin, CT 06037

Re: **Proposed Installation of a "Small Cell" Telecommunications Facility on Property at 900 Old Town Road (a/k/a Rocky Hill Road), Trumbull, Connecticut**

Dear Mr. Green:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to file a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing Eversource transmission line tower in the northern-most portion of a 38.62 acre parcel at 900 Old Town Road in Trumbull (the "Property"). The existing transmission line tower is currently used by Eversource and by T-Mobile for telecommunication purposes.

T-Mobile maintains antennas on a mast that extends above the top of the existing tower. Radio equipment associated with T-Mobile's equipment is located in the ground near the base of the tower. Cellco intends to install three (3) antennas and three (3) remote radio heads at the 90 foot level on the tower. Equipment cabinets associated with Cellco's antennas and a diesel fueled back-up generator will be located on a 10'-6" x 16'-6"steel platform also near the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent notice of this filing along with a copy of the Sub-Petition.

14551578-v1

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

ATTACHMENT 7

KENNETH C. BALDWIN

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

June 2, 2016

Via Certificate of Mailing

«Name_and_Address»

Re: **Proposed Installation of a "Small Cell" Telecommunications Facility on Property at 900 Old Town Road (a/k/a Rocky Hill Road), Trumbull, Connecticut**

Dear «Salutation»:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to file a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing Eversource transmission line tower in the northern-most portion of a 38.62 acre parcel at 900 Old Town Road in Trumbull (the "Property"). The existing transmission line tower is currently used by Eversource and by T-Mobile for telecommunication purposes.

T-Mobile maintains antennas on a mast that extends above the top of the existing tower. Radio equipment associated with T-Mobile's equipment is located in the ground near the base of the tower. Cellco intends to install three (3) antennas and three (3) remote radio heads at the 90 foot level on the tower. Equipment cabinets associated with Cellco's antennas and a diesel fueled back-up generator will be located on a 10'-6" x 16'-6"steel platform also near the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

This notice is being sent to you because you are listed as an owner of land that abuts the Property. If you have any questions regarding the Sub-Petition, the Council's process for reviewing the Sub-Petition or the details of the filing itself, please feel free to contact me at the number listed above. You may also contact the Council directly at 860-827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS

ABUTTING PROPERTY OWNERS

ROCKY HILL ROAD, TRUMBULL, CONNECTICUT

TRUMBULL

	Property Address	Owner and Mailing Address
1.	1000 Old Town Road	Eunise and Brunet Riodin 1000 Old Town Road Trumbull, CT 06611
2.	1020 Old Town Road	Cynthia Lewis 1020 Old Town Road Trumbull, CT 06611
3.	1030 Old Town Road	Nicholas S. Komenda and Dania S. Etzold 1030 Old Town Road Trumbull, CT 06611
4.	10 Rocky Hill Road	Alejandra D. and Robert B. Crowle, Jr. 10 Rocky Hill Road Trumbull, CT 06611
5.	14 Rocky Hill Road	Ronald J. Costa 14 Rocky Hill Road Trumbull, CT 06611
6.	20 Rocky Hill Road	Pleasant M. and Elesha L. McGowan 20 Rocky Hill Road Trumbull, CT 06611
7.	24 Rocky Hill Road	Michael J. Masanotti 24 Rocky Hill Road Trumbull, CT 06611
8.	30 Rocky Hill Road	Michael R. Maher and Julia Vigneron Maher 30 Rocky Hill Road Trumbull, CT 06611
9.	27 Rocky Hill Road	Mackajah and Elenor Bell 27 Rocky Hill Road Trumbull, CT 06611

	Property Address	Owner and Mailing Address
10.	33 Rocky Hill Road	Pierrot and Norma Gay Christophe 33 Rocky Hill Road Trumbull, CT 06611
11.	37 Rocky Hill Road	David J. and Jacqueline H. Blackmore 37 Rocky Hill Road Trumbull, CT 06611
12.	41 Rocky Hill Road	Edward Valko 41 Rocky Hill Road Trumbull, CT 06611
13.	45 Rocky Hill Road	Karin Brey 45 Rocky Hill Road Trumbull, CT 06611
14.	46 Rocky Hill Road	Christopher M. Dipallo 46 Rocky Hill Road Trumbull, CT 06611
15.	48 Rocky Hill Road	Chen Shi Jin and He Sai Ying 48 Rocky Hill Road Trumbull, CT 06611
16.	50 Rocky Hill Road	Parinaya Pradhan and Puja Shrestha 50 Rocky Hill Road Trumbull, CT 06611
17.	58 Rocky Hill Road	Robert W. and Lagretta L. Underhill 58 Rocky Hill Road Trumbull, CT 06611
18.	60 Rocky Hill Road	Alvin T. and Margaret Ann Clinkscales 60 Rocky Hill Road Trumbull, CT 06611
19.	5 Rocky Hill Terrace	Jose and Martha Esobar 5 Rocky Hill Terrace Trumbull, CT 06611
20.	73 Rocky Hill Road	Derek and Sherman Mcburnie 73 Rocky Hill Road Trumbull, CT 06611

	Property Address	Owner and Mailing Address
21.	77 Rocky Hill Road	James Allen and Elizabeth M. Genova 77 Rocky Hill Road Trumbull, CT 06611
22.	81 Rocky Hill Road	Wojciech and Lucyna Birnbach 81 Rocky Hill Road Trumbull, CT 06611
23.	2300 Reservoir Avenue	Sacred Heart University Inc. 5151 Park Avenue Fairfield, CT 06825

BRIDGEPORT

24.	840 Old Town Road	City of Bridgeport 45 Lyon Terrace Bridgeport, CT 06604
25.	849 Old Town Road	John L. Carswell P.O. Box 495 Bridgeport, CT 06601
26.	875 Old Town Road	Leonard and Molly Bratchell 875 Old Town Road Bridgeport, CT 06606
27.	903 Old Town Road	Janice Jones 903 Old Town Road Bridgeport, CT 06606
28.	921 Old Town Road	Emily and Yvonne Thompson 921 Old Town Road Bridgeport, CT 06606
29.	951 Old Town Road	Carmen Y. and Richard J. Chang 951 Old Town Road Bridgeport, CT 06606
30.	965 Old Town Road	Yvette Hall 285 Sunshine Circle Bridgeport, CT 06606

31.	979 Old Town Road	Theodore and Lily Poole 979 Old Town Road Bridgeport, CT 06606