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Hartford, CT 06103-3597
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Fax (860) 275-8299
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Direct (860) 275-8345

Also admitted in Massachusetts

June 16, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
231 Kettletown Road, Southbury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 155-foot level on an existing 196-foot tower at 231 Kettletown Road in Southbury, Connecticut (the "Property"). The tower is owned by T-Mobile. Cellco's use of the tower was approved by the Council in 2001. Cellco now intends to modify its facility by removing nine (9) antennas with three (3) model BXA-70063-4CF, 850 MHz antennas; three (3) model HBXX-6516DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6516DS-VTM, 2100 MHz antennas, all at the same 155-foot level on the tower. Cellco also intends to install six (6) coaxial cable diplexers. Included in Attachment 1 are specifications for Cellco's replacement antennas and coaxial cable diplexers.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Ed Edelson, First Selectman for the Town of Southbury. The Town of Southbury is the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's new antennas will be installed at a height of 155 feet on the 196-foot tower.

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A Cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Ed Edelson, Southbury First Selectman
Sandy M. Carter

ATTACHMENT 1

Amphenol ANTENNA SOLUTIONS

BXA-70063-4CF-EDIN-X

X-Pol | FET Panel | 63° | 13.0 dBd

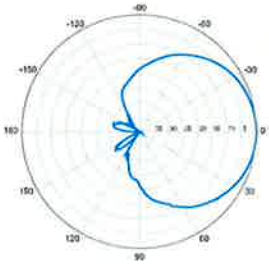
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	17°	15°
Gain	12.5 dBd (14.6 dBi)	13.0 dBd (15.1 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-16.3 dB	-22.1 dB
Front-to-back ratio (+/-30°)	-36.1 dB	-34.9 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1205 x 285 x 133 mm	47.4 x 11.2 x 5.2 in
Depth with z-brackets	173 mm	6.8 in
Weight without mounting brackets	4.5 kg	9.9 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.34 m² Side: 0.16 m²	Front: 3.7 ft² Side: 1.7 ft²
Wind load @ 161 km/hr (100 mph)	Front: 498 N Side: 260 N	Front: 111 lbf Side: 55 lbf

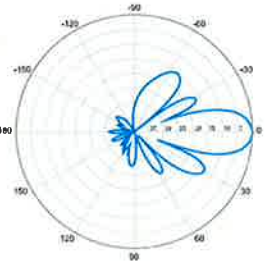
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting & Downtilt Bracket Kit	36210006	40-115 mm 1.57-4.5 in	4.1 kg 9 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-4CF-EDIN-X-FP		

BXA-70063-4CF-EDIN-X



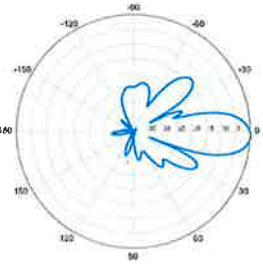
Horizontal | 750 MHz

BXA-70063-4CF-EDIN-0



0° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-2

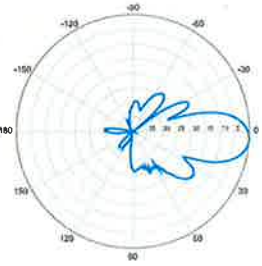


2° | Vertical | 750 MHz

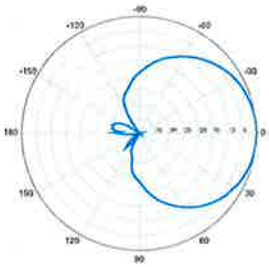
BXA-70063-4CF-EDIN-3

3° | Vertical | 750 MHz

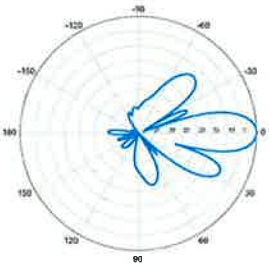
BXA-70063-4CF-EDIN-4



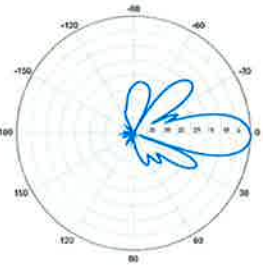
4° | Vertical | 750 MHz



Horizontal | 850 MHz

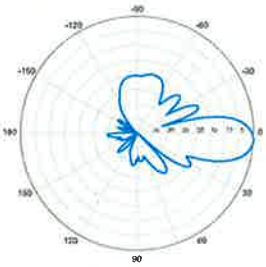


0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

3° | Vertical | 850 MHz

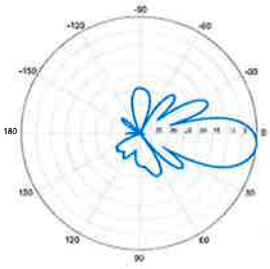


4° | Vertical | 850 MHz

BXA-70063-4CF-EDIN-X

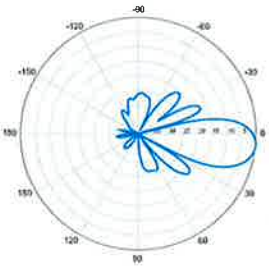
X-Pol | FET Panel | 63° | 13.0 dBd

BXA-70063-4CF-EDIN-5



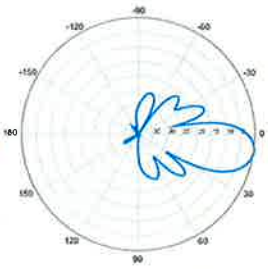
5° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-6



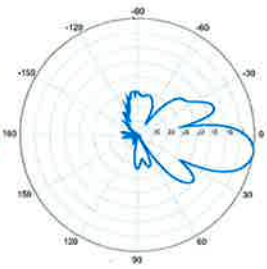
6° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-8



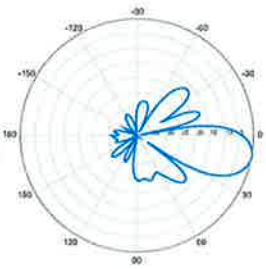
8° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-9

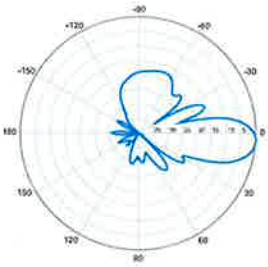


9° | Vertical | 750 MHz

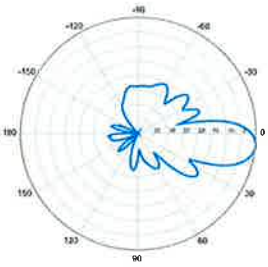
BXA-70063-4CF-EDIN-10



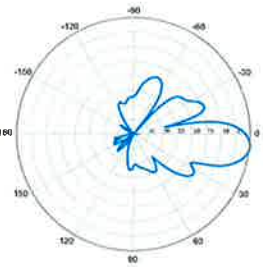
10° | Vertical | 750 MHz



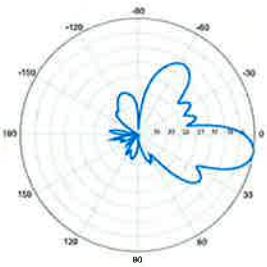
5° | Vertical | 850 MHz



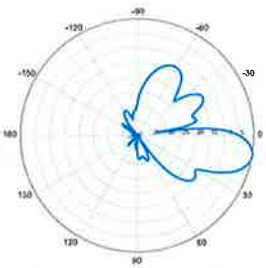
6° | Vertical | 850 MHz



8° | Vertical | 850 MHz

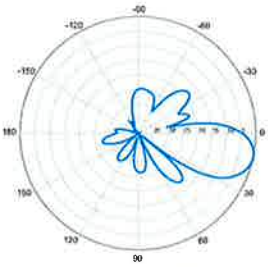


9° | Vertical | 850 MHz



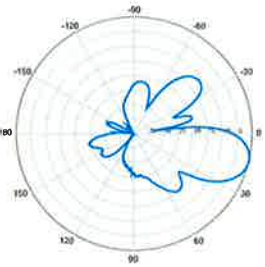
10° | Vertical | 850 MHz

BXA-70063-4CF-EDIN-12

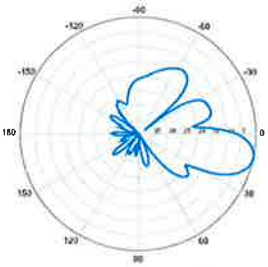


12° | Vertical | 750 MHz

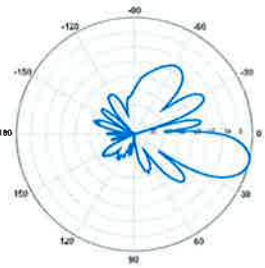
BXA-70063-4CF-EDIN-14



14° | Vertical | 750 MHz



12° | Vertical | 850 MHz



14° | Vertical | 850 MHz

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 17.0	0 ° | 17.1	0 ° | 17.4
	5 ° | 17.3	5 ° | 17.4	5 ° | 17.7
	10 ° | 17.0	10 ° | 17.0	10 ° | 17.2
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® single band, quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports, all types	4

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female

Product Specifications

HBXX-6516DS-VTM

RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
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

600899A-2 — 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.

DPX-02x

Diplexer | 700 / AWS | Single and Dual Units | Outdoor

- Suitable for UMTS and LTE systems
- DC/AISG bypass with built-in lightning protection
- Suitable for BTS or antenna-end of the feeder
- Single or dual units available for indoor or outdoor use

Ordering Options	
DPX-027	Single unit, no DC/AISG bypass, with single wall/pole mounting kit
DPX-021	Single unit, DC/AISG bypass COM to 1800/2100 only, with single wall/pole mounting kit
DPX-023	Single unit, DC/AISG bypass COM to 800/900 only, with single wall/pole mounting kit
DPX-025	Single unit, DC/AISG bypass COM to both ports, with single wall/pole mounting kit
DPX-028	Dual unit, no DC/AISG bypass with dual wall/pole mounting kit
DPX-022	Dual unit, DC/AISG bypass COM to 1800/2100 only, dual wall/pole mounting kit
DPX-024	Dual unit, DC/AISG bypass COM to 800/900 only, with dual wall/pole mounting kit
DPX-026	Dual unit, DC/AISG bypass COM to both ports, with dual wall/pole mounting kit
Electrical Specifications	
700 MHz Channel	
Pass-band	698-960 MHz
Insertion loss	0.2 dB max, 0.11 dB typical
Return loss all ports	20 dB min
Phase linearity variation	0.1° max over any 180 kHz within the pass-band
Group delay variation	0.1 ns max over any 180 kHz within the pass-band
AWS Channel	
Pass-band	1710-2170 MHz
Insertion loss	0.2 dB max, 0.12 dB typical
Return loss all ports	20 dB min
Phase linearity variation	1° max over any 180 kHz
Group delay variation	0.1 ns max over any 180 kHz within the pass-band
General Characteristics	
Maximum average input power	500 W
Maximum PEP input power	5000 W
Isolation 698-960 port to 1710-2170 port	50 dB min
Intermodulation	< -155 dBc all ports (2 x 43 dBm carriers)
DC/AISG paths	Factory configured, see **Ordering Options** listed above
DC current rating	2A continuous, 4A peak
Voltage drop through device	0.1V max at 2A
Environmental Characteristics	
Operating temperature	-40° to +65° C / -40° to +149° F
Environmental sealing	IP67, ETSI EN 300 019 class 4.1
Lightning protection	5kA (8/20us) on all ports

DPX-02x Single Unit

DPX-02x Dual Unit

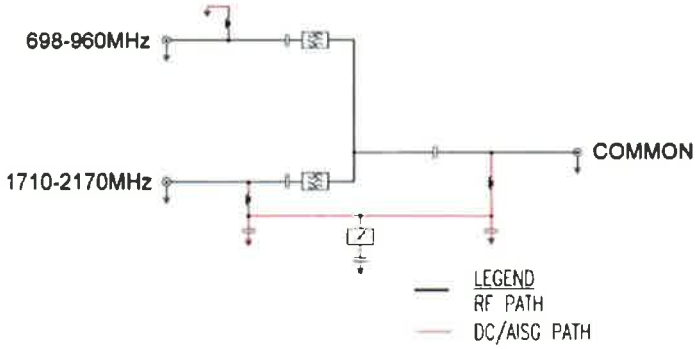
Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product.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

DPX-02x

Diplexer | 700 / AWS | Single and Dual Units | Outdoor

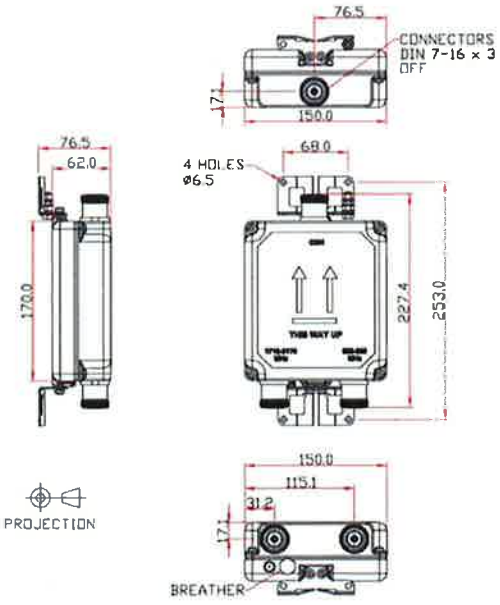
Mechanical Characteristics	
Dimensions of Single Unit - height x width x depth	170 x 150 x 62 mm / 6.7 x 5.9 x 2.4 in (excludes mounting kits and connectors)
Dimensions of Dual Unit - height x width x depth	170 x 150 x 97.5 mm / 6.7 x 5.9 x 3.8 in (excludes mounting kits and connectors)
Finish	Painted, light grey (RAL7035)
Weight	3 kg / 6.6 lbs
Connectors	3 / 7-16 DIN / Female / Long-neck
Mounting	Wall or pole mount
RoHS Compliance	Yes

Electrical Block Diagram

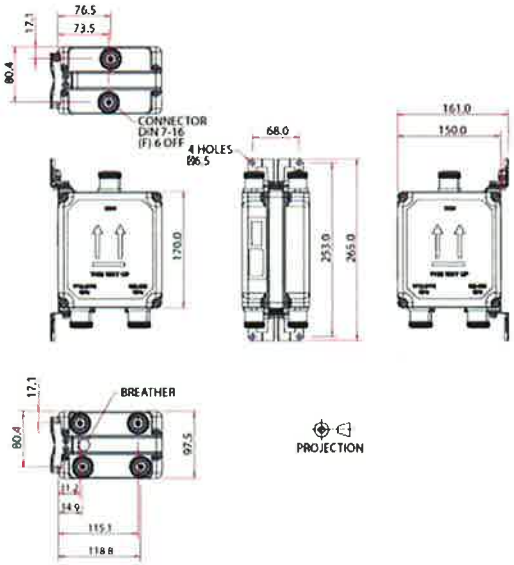


Mechanical Diagram

DPX-02x Single Unit



DPX-02x Dual Unit



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

ATTACHMENT 2

	General	Power	Density					
Site Name: Southbury 2								
Tower Height: 196Ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	185	0.0119	880	0.5867	2.02%	
*AT&T UMTS	2	875	185	0.0184	1900	1.0000	1.84%	
*AT&T GSM	1	283	185	0.0030	880	0.5867	0.51%	
*AT&T GSM	4	525	185	0.0221	1900	1.0000	2.21%	
*AT&T LTE	1	1615	185	0.0170	734	0.4893	3.47%	
*Pocket (now MetroPCS)	3	631	175	0.0222	2130	1.0000	2.22%	
*Sprint	11	333	165	0.0484	1962.5	1.0000	4.84%	
*T-Mobile GSM	8	110	195	0.0083	1945	1.0000	0.83%	
*T-Mobile UMTS	2	622	195	0.0118	2100	1.0000	1.18%	
Verizon	**7**	**286**	**155**	**0.0300**	**1970**	**1.0000**	**3.00%**	
Verizon	**9**	**271**	**155**	**0.0365**	**869**	**0.5793**	**6.30%**	
Verizon	**1**	**1419**	**155**	**0.0212**	**2145**	**1.0000**	**2.12%**	
Verizon	**1**	**649**	**155**	**0.0097**	**698**	**0.4653**	**2.09%**	
								32.62%
* Source: Siting Council								

ATTACHMENT 3

T-Mobile Towers
12920 SE 38th Street
Bellevue, WA 98006
(425) 383-3978

REVIEWED
By JACKIE DONAHUE at 11:26 am, Apr 28, 2014

Chris Scheks
400 N 34th Street, Suite 216
Seattle, WA 98103
(206) 204-7399
cscheks@gpdgroup.com

GPD# 2014790.50
April 25, 2014

STRUCTURAL ANALYSIS REPORT

T-MOBILE DESIGNATION:	**Site Number:**	**CT11126F**
	Site Name:	**SOUTHBURY/I-84 X15/BAGL**
	T-Mobile Project:	**Verizon Co-location**
ANALYSIS CRITERIA:	**Codes:**	**TIA/EIA-222-F & 2013 CTBC** **85-mph fastest-mile with 0" ice** **74-mph fastest-mile with 1/2" ice**
SITE DATA:		**231 Kettleton Rd, Southbury, CT 06488, New Haven County** **Latitude 41° 28' 16.320" N, Longitude 73° 12' 20.020" W** **196' Modified Pirod Monopole**

Mr. Kenny Fann,

GPD is pleased to submit this Structural Analysis Report to determine the structural integrity of the aforementioned tower. The purpose of the analysis is to determine the suitability of the tower with the existing and proposed loading configuration detailed in the analysis report.

Analysis Results

Tower Stress Level with Proposed Equipment:	93.0%	Pass
Foundation Ratio with Proposed Equipment:	74.1%	Pass

We at GPD appreciate the opportunity of providing our continuing professional services to you and T-Mobile Towers. If you have any questions or need further assistance on this or any other projects please do not hesitate to call.

Respectfully submitted,

STATE OF CONNECTICUT JOHN N. KABAK 28336 LICENSED PROFESSIONAL ENGINEER

John Kabak, P.E.
Connecticut #: PEN.0028336

SUMMARY & RESULTS

The purpose of this analysis was to verify whether the existing modified structure is capable of carrying the proposed loading configuration as specified by Verizon to T-Mobile Towers. This report was commissioned by Mr. Kenny Fann of T-Mobile Towers.

Modifications designed by GPD (Project #: 2010293.91, dated 9/14/10) have been considered in this analysis. Modifications included the installation of stiffener plates across flange connections at 20' and 40'.

Modifications designed by GPD (Project #: 2013792.15 Rev 1, dated 10/1/13) have been considered in this analysis. Modifications consisted of reinforcing the pole from 0'-139', adding stiffener plates across the flanges from 20'-120', adding additional anchor rods, and installing a foundation collar with piles to the existing foundation.

The proposed coax shall be installed internal to the monopole in order for the results of this analysis to be valid.

TOWER SUMMARY AND RESULTS

Member	Capacity	Results
Monopole	93.0%	Pass
Flanges	88.9%	Pass
Anchor Rods	92.4%	Pass
Base Plate	89.6%	Pass
Foundation	74.1%	Pass

ANALYSIS METHOD

tnxTower (Version 6.1.4.1), a commercially available software program, was used to create a three-dimensional model of the tower and calculate primary member stresses for various dead, live, wind, and ice load cases. Selected output from the analysis is included in Appendix B. The following table details the information provided to complete this structural analysis. This analysis is solely based on this information and is being completed without the benefit of a detailed site visit.

DOCUMENTS PROVIDED

Document	Remarks	Source
Structural Analysis Worksheet	CT11126F VERIZON MOD 3 SAW, dated 4/2/14	T-Mobile
Tower Design	PiROD, File #: A-115080, dated 3/26/99	T-Mobile
Foundation Design	PiROD, File #: A-115080, dated 3/26/99	T-Mobile
Geotechnical Report	Dr. Clarence Welti, dated 10/7/98	T-Mobile
Modification Drawings	GPD Project #: 2010293.91, dated 9/14/10	GPD
Modification Drawings	GPD Project #: 2013792.15 Rev. 1, dated 10/1/13	GPD
Previous Structural Analysis	GPD Project #: 2013792.15 Rev. 1, dated 10/1/13	GPD

ASSUMPTIONS

This structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the tower. This analysis is from information supplied, and therefore, its results are based on and are as accurate as that supplied data. GPD has made no independent determination, nor is it required to, of its accuracy. The following assumptions were made for this structural analysis.

1. The tower member sizes and shapes are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and as stated in the materials section.
2. The antenna configuration is as supplied and/or as modeled in the analysis. It is assumed to be complete and accurate. All antennas, mounts, coax and waveguides are assumed to be properly installed and supported as per manufacturer requirements.
3. Some assumptions are made regarding antennas and mount sizes and their projected areas based on best interpretation of data supplied and of best knowledge of antenna type and industry practice.
4. All mounts, if applicable, are considered adequate to support the loading. No actual analysis of the mount(s) is performed. This analysis is limited to analyzing the tower only.
5. The soil parameters are as per data supplied or as assumed and stated in the calculations.
6. Foundations are properly designed and constructed to resist the original design loads indicated in the documents provided.
7. The tower and structures have been properly maintained in accordance with TIA Standards and/or with manufacturer's specifications.
8. All welds and connections are assumed to develop at least the member capacity unless determined otherwise and explicitly stated in this report.
9. All prior structural modifications are assumed to be as per data supplied/available and to have been properly installed.
10. Loading interpreted from photos is accurate to $\pm 5'$ AGL, antenna size accurate to ± 3.3 sf, and coax equal to the number of existing antennas without reserve.
11. The locations of the coax are assumed. If the coax layout differs in the field, contact the engineer immediately. See Appendix C for the coax layout
12. The proposed coax shall be installed internal to the monopole in order for the results of this analysis to be valid.
13. All existing loading was obtained from the most recent structural analysis by GPD (Project #: 2013792.15 Rev. 1, dated 10/1/13) and is assumed to be accurate.
14. The proposed loading is taken from the provided Structural Analysis Worksheet titled: CT11126F VERIZON MOD 3 SAW, dated 4/2/14, and is assumed to be accurate.
15. Appurtenance azimuths have not been provided and have been assumed.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and GPD Group should be allowed to review any new information to determine its effect on the structural integrity of the tower.

DISCLAIMER OF WARRANTIES

GPD GROUP has not performed a site visit to the tower to verify the member sizes or antenna/coax loading. If the existing conditions are not as represented on the tower elevation contained in this report, we should be contacted immediately to evaluate the significance of the discrepancy. This is not a condition assessment of the tower or foundation. This report does not replace a full tower inspection. The tower and foundations are assumed to have been properly fabricated, erected, maintained, in good condition, twist free, and plumb.

The engineering services rendered by GPD GROUP in connection with this Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. All tower components have been assumed to only resist dead loads when no other loads are applied. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

GPD GROUP does not analyze the fabrication of the structure (including welding). It is not possible to have all the very detailed information needed to perform a thorough analysis of every structural sub-component and connection of an existing tower. GPD GROUP provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc. The purpose of this report is to assess the feasibility of adding appurtenances usually accompanied by transmission lines to the structure.

It is the owner's responsibility to determine the amount of ice accumulation in excess of the specified code recommended amount, if any, that should be considered in the structural analysis.

The attached sketches are a schematic representation of the analyzed tower. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions, proper fit, and clearance in the field. Any mentions of structural modifications are reasonable estimates and should not be used as a precise construction document. Precise modification drawings are obtainable from GPD GROUP, but are beyond the scope of this report.

Towers are designed to carry gravity, wind, and ice loads. All members, legs, diagonals, struts, and redundant members provide structural stability to the tower with little redundancy. Absence or removal of a member can trigger catastrophic failure unless a substitute is provided before any removal. Legs carry axial loads and derive their strength from shorter unbraced lengths by the presence of redundant members and their connection to the diagonals with bolts or welds. If the bolts or welds are removed without providing any substitute to the frame, the leg is subjected to a higher unbraced length that immediately reduces its load carrying capacity. If a diagonal is also removed in addition to the connection, the unbraced length of the leg is greatly increased, jeopardizing its load carrying capacity. Failure of one leg can result in a tower collapse because there is no redundancy. Redundant members and diagonals are critical to the stability of the tower.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

GPD GROUP makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD GROUP will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of GPD GROUP pursuant to this report will be limited to the total fee received for preparation of this report.

APPENDIX A

Tower Analysis Summary Form

Tower Analysis Summary Form

General Info

Site Name	SOUTHBURY/ I-84 X15/ BAGL
Site Number	CT11126F
Proposed Carrier	Verizon Wireless
Date of Analysis	April 25, 2014
Company Performing Analysis	GPD

The information contained in this summary report is not to be used independently from the PE stamped tower analysis.

Tower Info	Description	Date
Tower Type (G, SST, MP)	MP	
Tower Height (top of steel AGL)	196'	
Tower Manufacturer	PiROD	
Tower Model	n/a	
Tower Design	PiROD, File #: A-115080	3/26/1999
Foundation Design	PiROD, File #: A-115080	3/26/1999
Geotech Report	Dr. Clarence Welti	10/7/1998
Modification Drawings	GPD Project #: 2010293.91	9/14/2010
Modification Drawings	GPD Project #: 2013792.15 Rev. 1	10/1/2013
Previous Structural Analysis	GPD Project #: 2013792.15 Rev. 1	10/1/2013
Foundation Mapping	n/a	

Design Parameters

Design Code Used	TIA/EIA-222-F 2006 IBC & 2013 CTBC
Location of Tower (County, State)	New Haven, CT
Basic Wind Speed (mph)	85 (fastest-mile)
Ice Thickness (in)	0.5
Structure Classification (I, II, III)	
Exposure Category (B, C, D)	
Topographic Category (1 to 5)	

Analysis Results (% Maximum Usage)

Existing/Reserved + Proposed Condition	
Tower (%)	93.0%
Tower Base (%)	92.4%
Foundation (%)	74.1%
Foundation Adequate?	Yes

Modifications designed by GPD (Project #: 2010293.91, dated 9/14/10) have been considered in this analysis.

Modifications designed by GPD (Project #: 2013792.15, dated 7/29/13) have been considered in this analysis.

Steel Yield Strength (ksi)

Pole	42
Flange Plate	36
Flange Bolts	A325
Base Plate	36
Anchor Rods	A354-BD

Existing / Reserved Loading

Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Internal/External
T-Mobile	195	195	9	Panel	Ericsson	AIR 21		1	Unknown	LP Platform	12	Unknown	1-5/8"	Internal
T-Mobile	195	195	3	Panel	Ericsson	AIR 33				on the same mount	2	Hybrid	1-5/8"	Internal
T-Mobile	195	195	3	TMA	RFS	ATMAA1412D				on the same mount				
T-Mobile	194	195	1	DC Box	Raycap	DC6-48-60-18-8F				on the same mount				
AT&T Mobility	185	185	3	Panel	Powerwave	7770		1	Unknown	LP Platform	12	Unknown	1-1/4"	Internal
AT&T Mobility	185	185	2	Panel	KMW	AM-X-CD-16-65-005T RET				on the same mount	2	DC Cable	3/8"	Internal
AT&T Mobility	185	185	1	Panel	KMW	AM-X-CD-17-65-00t-RET				on the same mount	1	Fiber Cable	7/16"	Internal
AT&T Mobility	185	185	6	TMA	Powerwave	TT19-08B9111-001				on the same mount				
AT&T Mobility	185	185	6	Diplexer	Powerwave	LGP21901				on the same mount				
AT&T Mobility	185	185	6	RRU	Ericsson	RRUS 11				on the same mount				
AT&T Mobility	185	185	1	Raycap	DC Box	DC6-48-60-18-8F				on the same mount				
Pocket	175	175	3	Panel	RFS	APXV18-206517S-C				Flush Mounted	6	Unknown	1-5/8"	External
Sprint	165	165	9	Panel	Decibel	DB980E (90E-M)		1	Unknown	LP Platform	12	Unknown	1-5/8"	Internal
Verizon Wireless	155	155	6	Panel	Decibel	DB950F85E-M		1	Unknown	LP Platform	12	Unknown	1-5/8"	External
Verizon Wireless	155	155	6	Panel	Decibel	DB844H90EX-Y				on the same mount				
T-Mobile	91	91	1	Dish	Unknown	2' MW Dish		1	Unknown	MW Collar Mount	1	Unknown	1-5/8"	Internal
Sprint	75	75	1	Panel	Pctel	TMG-HR-26N GPS		1	Unknown	Pipe Mount	1	Unknown	7/8"	External

Note: Verizon Wireless's existing/reserved loading configuration shall be replaced by the proposed loading configuration. All other existing/reserved equipment loading shall remain as shown.

Proposed Loading

Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Internal/External
Verizon Wireless	155	155	6	Panel	Commscope	HBXX 6516DS				on the existing mount	12	Unknown	1-5/8"	External
Verizon Wireless	155	155	2	Panel	Swedcom	SLCP2X6014				on the existing mount				
Verizon Wireless	155	155	4	Panel	Amphenol	BXA 70063/4CF				on the existing mount				
Verizon Wireless	155	155	6	Diplexers	Amphenol	DPX 021				on the existing mount				
Verizon Wireless	155	155	6	Diplexers	RFS	FD9R6004/2C-3L				on the existing mount				

Note: The proposed coax shall be installed flush to the monopole in a 6 on 6 configuration in order for the results of this analysis to be valid.

APPENDIX B

tnxTower Output File

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Feed Line/Linear Appurtenances - Entered As Area

Description	*Face or Leg*	*Allow Shield*	*Component Type*	*Placement* *ft*	*Total Number*		C_AA_A *ft²/ft*	*Weight* *plf*
PiROD Climbing Rungs	C	No	CaAa (Out Of Face)	196.00 - 8.00	1	No Ice	0.05	3.80
						1/2" Ice	0.13	5.44
						1" Ice	0.20	7.08
						2" Ice	0.36	10.36
						4" Ice	0.67	16.92
Safety Line 3/8	C	No	CaAa (Out Of Face)	196.00 - 8.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	195.00 - 8.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
1-5/8" Hybrid Cable	C	No	Inside Pole	195.00 - 8.00	2	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
LDF6-50A (1-1/4 FOAM)	A	No	Inside Pole	185.00 - 8.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
100266(7/16")	A	No	Inside Pole	185.00 - 8.00	1	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
						2" Ice	0.00	0.08
						4" Ice	0.00	0.08
3/8" DC Cable	A	No	Inside Pole	185.00 - 8.00	2	No Ice	0.00	0.10
						1/2" Ice	0.00	0.10
						1" Ice	0.00	0.10
						2" Ice	0.00	0.10

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						4" Ice	0.00	0.10
LDF7-50A (1-5/8 FOAM)	A	No	CaAa (Out Of Face)	175.00 - 8.00	1	No Ice	0.20	0.82
						1/2" Ice	0.30	2.33
						1" Ice	0.40	4.46
						2" Ice	0.60	10.54
						4" Ice	1.00	30.04
LDF7-50A (1-5/8 FOAM)	A	No	CaAa (Out Of Face)	175.00 - 8.00	5	No Ice	0.00	0.82
						1/2" Ice	0.00	2.33
						1" Ice	0.00	4.46
						2" Ice	0.00	10.54
						4" Ice	0.00	30.04
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	165.00 - 8.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
LDF7-50A (1-5/8 FOAM)	B	No	CaAa (Out Of Face)	155.00 - 8.00	2	No Ice	0.20	0.82
						1/2" Ice	0.30	2.33
						1" Ice	0.40	4.46
						2" Ice	0.60	10.54
						4" Ice	1.00	30.04
LDF7-50A (1-5/8 FOAM)	B	No	CaAa (Out Of Face)	155.00 - 8.00	10	No Ice	0.00	0.82
						1/2" Ice	0.00	2.33
						1" Ice	0.00	4.46
						2" Ice	0.00	10.54
						4" Ice	0.00	30.04
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	91.00 - 8.00	1	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
LDF5-50A (7/8 FOAM)	C	No	CaAa (Out Of Face)	75.00 - 8.00	1	No Ice	0.00	0.33
						1/2" Ice	0.00	1.30
						1" Ice	0.00	2.88
						2" Ice	0.00	7.88
						4" Ice	0.00	25.20
4" x 1-1/4" Mod Plate	A	No	CaAa (Out Of Face)	22.00 - 18.00	2	No Ice	0.00	17.01
						1/2" Ice	0.00	18.19
						1" Ice	0.00	19.71
						2" Ice	0.00	23.80
						4" Ice	0.00	36.11
4" x 1-1/4" Mod Plate	B	No	CaAa (Out Of Face)	22.00 - 18.00	2	No Ice	0.00	17.01
						1/2" Ice	0.00	18.19
						1" Ice	0.00	19.71
						2" Ice	0.00	23.80
						4" Ice	0.00	36.11
4" x 1-1/4" Mod Plate	C	No	CaAa (Out Of Face)	22.00 - 18.00	2	No Ice	0.00	17.01
						1/2" Ice	0.00	18.19
						1" Ice	0.00	19.71
						2" Ice	0.00	23.80
						4" Ice	0.00	36.11
4" x 1-1/4" Mod Plate	A	No	CaAa (Out Of Face)	42.00 - 38.00	2	No Ice	0.00	17.01
						1/2" Ice	0.00	18.19
						1" Ice	0.00	19.71
						2" Ice	0.00	23.80
						4" Ice	0.00	36.11
4" x 1-1/4" Mod Plate	B	No	CaAa (Out Of Face)	42.00 - 38.00	2	No Ice	0.00	17.01
						1/2" Ice	0.00	18.19
						1" Ice	0.00	19.71
						2" Ice	0.00	23.80
						4" Ice	0.00	36.11

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
4" x 1-1/4" Mod Plate	C	No	CaAa (Out Of Face)	42.00 - 38.00	2	No Ice	0.00	17.01
						1/2" Ice	0.00	18.19
						1" Ice	0.00	19.71
						2" Ice	0.00	23.80
						4" Ice	0.00	36.11
6" x 1-1/2" Mod Plate	A	No	CaAa (Out Of Face)	24.00 - 16.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	B	No	CaAa (Out Of Face)	24.00 - 16.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	C	No	CaAa (Out Of Face)	24.00 - 16.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	A	No	CaAa (Out Of Face)	44.00 - 36.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	B	No	CaAa (Out Of Face)	44.00 - 36.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	C	No	CaAa (Out Of Face)	44.00 - 36.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	A	No	CaAa (Out Of Face)	64.00 - 56.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	B	No	CaAa (Out Of Face)	64.00 - 56.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18
6" x 1-1/2" Mod Plate	C	No	CaAa (Out Of Face)	64.00 - 56.00	2	No Ice	0.00	30.63
						1/2" Ice	0.00	32.57
						1" Ice	0.00	34.51
						2" Ice	0.00	38.40
						4" Ice	0.00	46.18

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Pirod 16.5' LP Platform	C	None		0.0000	195.00	No Ice	20.80	20.80	1.80
						1/2" Ice	28.10	28.10	2.07
						1" Ice	35.40	35.40	2.33
						2" Ice	50.00	50.00	2.86
						4" Ice	79.20	79.20	3.93
(3) AIR 21 w/ Mount Pipe	A	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	6.85	5.78	0.11
						1/2" Ice	7.41	6.70	0.17
						1" Ice	7.94	7.50	0.24
						2" Ice	9.05	9.14	0.39
						4" Ice	11.38	12.65	0.82
(3) AIR 21 w/ Mount Pipe	B	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	6.85	5.78	0.11
						1/2" Ice	7.41	6.70	0.17
						1" Ice	7.94	7.50	0.24
						2" Ice	9.05	9.14	0.39
						4" Ice	11.38	12.65	0.82
(3) AIR 21 w/ Mount Pipe	C	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	6.85	5.78	0.11
						1/2" Ice	7.41	6.70	0.17
						1" Ice	7.94	7.50	0.24
						2" Ice	9.05	9.14	0.39
						4" Ice	11.38	12.65	0.82
AIR 33 w/ Mount Pipe	A	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	7.13	6.42	0.14
						1/2" Ice	7.93	7.65	0.20
						1" Ice	8.66	8.74	0.27
						2" Ice	10.00	10.60	0.44
						4" Ice	12.84	14.54	0.91
AIR 33 w/ Mount Pipe	B	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	7.13	6.42	0.14
						1/2" Ice	7.93	7.65	0.20
						1" Ice	8.66	8.74	0.27
						2" Ice	10.00	10.60	0.44
						4" Ice	12.84	14.54	0.91
AIR 33 w/ Mount Pipe	C	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	7.13	6.42	0.14
						1/2" Ice	7.93	7.65	0.20
						1" Ice	8.66	8.74	0.27
						2" Ice	10.00	10.60	0.44
						4" Ice	12.84	14.54	0.91
ATMAA1412D	A	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	1.17	0.47	0.02
						1/2" Ice	1.31	0.57	0.02
						1" Ice	1.47	0.69	0.03
						2" Ice	1.81	0.95	0.06
						4" Ice	2.58	1.57	0.14
ATMAA1412D	B	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	1.17	0.47	0.02
						1/2" Ice	1.31	0.57	0.02
						1" Ice	1.47	0.69	0.03
						2" Ice	1.81	0.95	0.06
						4" Ice	2.58	1.57	0.14
ATMAA1412D	C	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	1.17	0.47	0.02
						1/2" Ice	1.31	0.57	0.02
						1" Ice	1.47	0.69	0.03
						2" Ice	1.81	0.95	0.06
						4" Ice	2.58	1.57	0.14
DC4-48-60-8-20F	A	From Centroid-Leg	3.94 -0.69 0.00	-10.0000	195.00	No Ice	1.67	0.69	0.01
						1/2" Ice	1.85	0.81	0.02
						1" Ice	2.03	0.95	0.03
						2" Ice	2.42	1.24	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	3.31	1.94	0.17
PiROD 13' Low Profile Platform (Monopole)	C	None		0.0000	185.00	No Ice	15.70	15.70	1.30
						1/2" Ice	20.10	20.10	1.76
						1" Ice	24.50	24.50	2.23
						2" Ice	33.30	33.30	3.16
						4" Ice	50.90	50.90	5.02
7770.00 w/ 6' Mount Pipe	A	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	6.22	4.35	0.06
						1/2" Ice	6.77	5.20	0.11
						1" Ice	7.30	5.92	0.16
						2" Ice	8.38	7.41	0.30
						4" Ice	10.69	10.76	0.68
7770.00 w/ 6' Mount Pipe	B	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	6.22	4.35	0.06
						1/2" Ice	6.77	5.20	0.11
						1" Ice	7.30	5.92	0.16
						2" Ice	8.38	7.41	0.30
						4" Ice	10.69	10.76	0.68
7770.00 w/ 6' Mount Pipe	C	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	6.22	4.35	0.06
						1/2" Ice	6.77	5.20	0.11
						1" Ice	7.30	5.92	0.16
						2" Ice	8.38	7.41	0.30
						4" Ice	10.69	10.76	0.68
AM-X-CD-16-65-00T-RET w/ 2" x 54" mount pipe	A	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	8.26	5.67	0.06
						1/2" Ice	8.81	6.39	0.12
						1" Ice	9.36	7.12	0.19
						2" Ice	10.50	8.65	0.35
						4" Ice	12.88	12.02	0.78
AM-X-CD-16-65-00T-RET w/ 2" x 54" mount pipe	B	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	8.26	5.67	0.06
						1/2" Ice	8.81	6.39	0.12
						1" Ice	9.36	7.12	0.19
						2" Ice	10.50	8.65	0.35
						4" Ice	12.88	12.02	0.78
AM-X-CD-17-65-00T-RET w/ Mount Pipe	C	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	11.31	9.10	0.11
						1/2" Ice	11.93	10.52	0.19
						1" Ice	12.55	11.60	0.29
						2" Ice	13.88	13.80	0.51
						4" Ice	16.88	18.41	1.13
(2) TT19-08BP111-001	A	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	0.64	0.52	0.02
						1/2" Ice	0.76	0.62	0.02
						1" Ice	0.88	0.74	0.03
						2" Ice	1.14	0.99	0.05
						4" Ice	1.78	1.59	0.12
(2) TT19-08BP111-001	B	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	0.64	0.52	0.02
						1/2" Ice	0.76	0.62	0.02
						1" Ice	0.88	0.74	0.03
						2" Ice	1.14	0.99	0.05
						4" Ice	1.78	1.59	0.12
(2) TT19-08BP111-001	C	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	0.64	0.52	0.02
						1/2" Ice	0.76	0.62	0.02
						1" Ice	0.88	0.74	0.03
						2" Ice	1.14	0.99	0.05
						4" Ice	1.78	1.59	0.12
(2) LGP21901	A	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice	0.27	0.18	0.01
						1/2" Ice	0.34	0.25	0.01
						1" Ice	0.43	0.32	0.01
						2" Ice	0.62	0.49	0.02
						4" Ice	1.10	0.94	0.07
(2) LGP21901	B	From	3.76	-20.0000	185.00	No Ice	0.27	0.18	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
		Centroid-Leg	-1.37 0.00			1/2" Ice 1" Ice 2" Ice 4" Ice	0.34 0.43 0.62 1.10	0.25 0.32 0.49 0.94	0.01 0.01 0.02 0.07
(2) LGP21901	C	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.01 0.02 0.07
(2) RRUS-11	A	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.19 1.35 1.52 1.89 2.72	0.06 0.07 0.10 0.15 0.30
(2) RRUS-11	B	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.19 1.35 1.52 1.89 2.72	0.06 0.07 0.10 0.15 0.30
(2) RRUS-11	C	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.19 1.35 1.52 1.89 2.72	0.06 0.07 0.10 0.15 0.30
DC6-48-60-18-8F Surge Suppression Unit	C	From Centroid-Leg	3.76 -1.37 0.00	-20.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.47 1.67 1.88 2.33 3.38	1.47 1.67 1.88 2.33 3.38	0.02 0.04 0.06 0.11 0.24
Valmont Light Duty Tri-Bracket (1)	C	None		0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.76 2.08 2.40 3.04 4.32	1.76 2.08 2.40 3.04 4.32	0.05 0.07 0.09 0.12 0.18
APXV18-206517S-C w/ Mount Pipe	A	From Leg	0.50 0.00 0.00	-10.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.17 5.62 6.08 7.02 9.12	4.46 5.39 6.20 7.87 11.40	0.05 0.09 0.14 0.26 0.64
APXV18-206517S-C w/ Mount Pipe	B	From Leg	0.50 0.00 0.00	-10.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.17 5.62 6.08 7.02 9.12	4.46 5.39 6.20 7.87 11.40	0.05 0.09 0.14 0.26 0.64
APXV18-206517S-C w/ Mount Pipe	C	From Leg	0.50 0.00 0.00	-10.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.17 5.62 6.08 7.02 9.12	4.46 5.39 6.20 7.87 11.40	0.05 0.09 0.14 0.26 0.64
MTS 12.5' LP Platform	C	None		0.0000	165.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	14.66 18.87 23.08 31.50 48.34	14.66 18.87 23.08 31.50 48.34	1.25 1.48 1.71 2.18 3.10
(3) DB980E (90E-M) w/ Mount Pipe	A	From Centroid-Face	3.94 -0.69 0.00	-10.0000	165.00	No Ice 1/2" Ice 1" Ice	4.04 4.50 4.95	3.62 4.48 5.22	0.03 0.07 0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	5.87	6.74	0.22
						4" Ice	8.05	10.00	0.55
(3) DB980E (90E-M) w/ Mount Pipe	B	From Centroid-Face	3.94 -0.69 0.00	-10.0000	165.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(3) DB980E (90E-M) w/ Mount Pipe	C	From Centroid-Face	3.94 -0.69 0.00	-10.0000	165.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
PiROD 15' Low Profile Platform (Monopole)	C	None		0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	17.30 22.10 26.90 36.50 55.70	17.30 22.10 26.90 36.50 55.70	1.50 2.03 2.56 3.62 5.74
(2) HBXX-6516DS w/Mount Pipe	A	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.24 6.74 7.24 8.27 10.46	4.59 5.31 6.02 7.53 10.75	0.05 0.10 0.16 0.29 0.68
(2) HBXX-6516DS w/Mount Pipe	B	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.24 6.74 7.24 8.27 10.46	4.59 5.31 6.02 7.53 10.75	0.05 0.10 0.16 0.29 0.68
(2) HBXX-6516DS w/Mount Pipe	B	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.24 6.74 7.24 8.27 10.46	4.59 5.31 6.02 7.53 10.75	0.05 0.10 0.16 0.29 0.68
(2) BXA-70063-4CF-EDIN-6 w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.84 6.30 7.24 9.26	3.69 4.29 4.91 6.26 9.29	0.03 0.07 0.12 0.23 0.58
(2) BXA-70063-4CF-EDIN-6 w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.84 6.30 7.24 9.26	3.69 4.29 4.91 6.26 9.29	0.03 0.07 0.12 0.23 0.58
(2) SLCP2x6014 w/ Mount Pipe	C	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.21 7.65 8.10 9.02 10.96	6.66 7.35 8.06 9.52 12.78	0.04 0.10 0.17 0.33 0.76
(2) FD9R6004/2C-3L	A	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	B	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) FD9R6004/2C-3L	C	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) DPX 021 Diplexer	A	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.41 0.50 0.59 0.81 1.36	0.17 0.24 0.31 0.48 0.92	0.01 0.01 0.02 0.03 0.08
(2) DPX 021 Diplexer	B	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.41 0.50 0.59 0.81 1.36	0.17 0.24 0.31 0.48 0.92	0.01 0.01 0.02 0.03 0.08
(2) DPX 021 Diplexer	C	From Centroid-Face	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.41 0.50 0.59 0.81 1.36	0.17 0.24 0.31 0.48 0.92	0.01 0.01 0.02 0.03 0.08
Pipe Mount 3'x4.5"	C	From Leg	0.50 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.93 1.13 1.37 1.89 3.06	0.93 1.13 1.37 1.89 3.06	0.03 0.04 0.05 0.09 0.19
GPS-TMG-HR-26N	C	From Leg	0.50 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.16 0.21 0.28 0.44 0.86	0.16 0.21 0.28 0.44 0.86	0.00 0.00 0.01 0.01 0.05

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
2' MW	C	Paraboloid w/o Radome	From Leg	1.00 0.00 0.00	0.0000		91.00	2.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.14 3.41 3.68 4.21 5.28	0.04 0.07 0.10 0.17 0.35

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.00	Pirod 16.5' LP Platform	33	25.326	1.1832	0.0034	46216
185.00	PiROD 13' Low Profile Platform (Monopole)	33	22.859	1.1656	0.0034	20041
175.00	Valmont Light Duty Tri-Bracket (1)	33	20.452	1.1237	0.0033	11625
165.00	MTS 12.5' LP Platform	33	18.147	1.0647	0.0031	9008

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
155.00	PiROD 15' Low Profile Platform (Monopole)	33	15.975	0.9895	0.0027	7348
91.00	2' MW	28	5.676	0.5680	0.0008	9631
75.00	GPS-TMG-HR-26N	28	3.921	0.4740	0.0006	9705

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	196 - 195 (1)	P18x3/8	1.00	0.00	0.0	25.200	20.7640	-0.09	523.25	0.000
L2	195 - 180 (2)	P24x3/8	15.00	0.00	0.0	25.200	27.8325	-6.69	701.38	0.010
L3	180 - 160 (3)	P30x3/8	20.00	0.00	0.0	25.075	34.9011	-11.19	875.15	0.013
L4	160 - 140 (4)	P36x3/8	20.00	0.00	0.0	23.696	41.9697	-16.88	994.51	0.017
L5	140 - 136 (5)	P42x3/8	4.00	0.00	0.0	22.711	49.0383	-17.75	1113.69	0.016
L6	136 - 120 (6)	P42x3/8 [0.63241]	16.00	0.00	0.0	20.646	82.1881	-22.82	1696.86	0.013
L7	120 - 100 (7)	P48x3/8 [0.595266]	20.00	0.00	0.0	22.139	88.6508	-29.66	1962.64	0.015
L8	100 - 80 (8)	P54x3/8 [0.567552]	20.00	0.00	0.0	22.089	95.2710	-37.09	2104.40	0.018
L9	80 - 60 (9)	P60x3/8 [0.546065]	20.00	0.00	0.0	21.436	101.9940	-45.71	2186.31	0.021
L10	60 - 40 (10)	P60x1/2 [0.673218]	20.00	0.00	0.0	22.903	125.4750	-56.89	2873.70	0.020
L11	40 - 20 (11)	P60x5/8 [0.800428]	20.00	0.00	0.0	21.542	148.8640	-69.89	3206.79	0.022
L12	20 - 0 (12)	P60x5/8 [0.800428]	20.00	0.00	0.0	21.542	148.8640	-81.63	3206.79	0.025

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	196 - 195 (1)	P18x3/8	0.03	0.004	27.720	0.000	0.00	0.000	27.720	0.000
L2	195 - 180 (2)	P24x3/8	111.00	8.229	27.720	0.297	0.00	0.000	27.720	0.000
L3	180 - 160 (3)	P30x3/8	364.88	17.151	25.075	0.684	0.00	0.000	25.075	0.000
L4	160 - 140 (4)	P36x3/8	766.82	24.874	23.696	1.050	0.00	0.000	23.696	0.000
L5	140 - 136 (5)	P42x3/8	857.12	20.335	22.711	0.895	0.00	0.000	22.711	0.000
L6	136 - 120 (6)	P42x3/8 [0.63241]	1239.64	17.765	22.711	0.782	0.00	0.000	22.711	0.000
L7	120 - 100 (7)	P48x3/8 [0.595266]	1766.69	20.429	24.353	0.839	0.00	0.000	24.353	0.000
L8	100 - 80 (8)	P54x3/8 [0.567552]	2350.58	22.397	22.089	1.014	0.00	0.000	22.089	0.000
L9	80 - 60 (9)	P60x3/8 [0.546065]	2991.41	23.894	21.436	1.115	0.00	0.000	21.436	0.000
L10	60 - 40 (10)	P60x1/2 [0.673218]	3685.56	24.032	22.903	1.049	0.00	0.000	22.903	0.000
L11	40 - 20 (11)	P60x5/8 [0.800428]	4424.17	24.418	23.696	1.030	0.00	0.000	23.696	0.000
L12	20 - 0 (12)	P60x5/8 [0.800428]	5198.79	28.694	23.696	1.211	0.00	0.000	23.696	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	196 - 195 (1)	P18x3/8	0.05	0.005	16.800	0.000	0.00	0.000	16.800	0.000
L2	195 - 180 (2)	P24x3/8	10.53	0.757	16.800	0.045	0.69	0.026	16.800	0.002
L3	180 - 160 (3)	P30x3/8	15.69	0.899	16.800	0.054	0.70	0.017	15.644	0.001
L4	160 - 140 (4)	P36x3/8	22.31	1.063	16.800	0.063	0.90	0.015	11.901	0.001
L5	140 - 136 (5)	P42x3/8	22.84	0.931	16.800	0.055	0.92	0.011	9.619	0.001

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L6	136 - 120 (6)	P42x3/8 [0.63241]	24.96	0.607	13.764	0.044	0.97	0.007	13.764	0.001
L7	120 - 100 (7)	P48x3/8 [0.595266]	27.72	0.625	14.759	0.042	1.05	0.006	14.759	0.000
L8	100 - 80 (8)	P54x3/8 [0.567552]	30.63	0.643	15.131	0.042	0.80	0.004	12.136	0.000
L9	80 - 60 (9)	P60x3/8 [0.546065]	33.48	0.657	15.411	0.043	2.74	0.011	10.686	0.001
L10	60 - 40 (10)	P60x1/2 [0.673218]	35.91	0.572	15.475	0.037	2.81	0.009	13.882	0.001
L11	40 - 20 (11)	P60x5/8 [0.800428]	37.93	0.510	14.361	0.035	2.87	0.008	14.361	0.001
L12	20 - 0 (12)	P60x5/8 [0.800428]	39.52	0.531	14.361	0.037	2.91	0.008	14.361	0.001

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	196 - 195 (1)	0.000	0.000	0.000	0.000	0.000	0.000 ✔	1.333	H1-3+VT ✔
L2	195 - 180 (2)	0.010	0.297	0.000	0.045	0.002	0.309 ✔	1.333	H1-3+VT ✔
L3	180 - 160 (3)	0.013	0.684	0.000	0.054	0.001	0.700 ✔	1.333	H1-3+VT ✔
L4	160 - 140 (4)	0.017	1.050	0.000	0.063	0.001	1.071 ✔	1.333	H1-3+VT ✔
L5	140 - 136 (5)	0.016	0.895	0.000	0.055	0.001	0.915 ✔	1.333	H1-3+VT ✔
L6	136 - 120 (6)	0.013	0.782	0.000	0.044	0.001	0.798 ✔	1.333	H1-3+VT ✔
L7	120 - 100 (7)	0.015	0.839	0.000	0.042	0.000	0.856 ✔	1.333	H1-3+VT ✔
L8	100 - 80 (8)	0.018	1.014	0.000	0.042	0.000	1.033 ✔	1.333	H1-3+VT ✔
L9	80 - 60 (9)	0.021	1.115	0.000	0.043	0.001	1.138 ✔	1.333	H1-3+VT ✔
L10	60 - 40 (10)	0.020	1.049	0.000	0.037	0.001	1.071 ✔	1.333	H1-3+VT ✔
L11	40 - 20 (11)	0.022	1.030	0.000	0.035	0.001	1.054 ✔	1.333	H1-3+VT ✔
L12	20 - 0 (12)	0.025	1.211	0.000	0.037	0.001	1.238 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P_{allow} K	% Capacity	Pass Fail
L1	196 - 195	Pole	P18x3/8	1	-0.09	697.49	0.0	Pass
L2	195 - 180	Pole	P24x3/8	2	-6.69	934.94	23.1	Pass
L3	180 - 160	Pole	P30x3/8	3	-11.19	1166.57	52.4	Pass
L4	160 - 140	Pole	P36x3/8	4	-16.88	*	80.2*	Pass
L5	140 - 136	Pole	P42x3/8	5	-17.75	*	68.4*	Pass
L6	136 - 120	Pole	P42x3/8 [0.63241]	6	-22.82	*	60.2*	Pass
L7	120 - 100	Pole	P48x3/8 [0.595266]	7	-29.66	*	71.5*	Pass
L8	100 - 80	Pole	P54x3/8 [0.567552]	8	-37.09	*	80.4*	Pass
L9	80 - 60	Pole	P60x3/8 [0.546065]	9	-45.71	*	87.7*	Pass
L10	60 - 40	Pole	P60x1/2 [0.673218]	10	-56.89	*	82.7*	Pass
L11	40 - 20	Pole	P60x5/8 [0.800428]	11	-69.89	*	79.1*	Pass
L12	20 - 0	Pole	P60x5/8 [0.800428]	12	-81.63	*	93.0*	Pass
							Summary	
						Pole (L12)	93.0*	Pass
						RATING =	**93.0***	**Pass**

*See next page for reinforcement calculations.

Reinforcement 1						
Bottom	Top	QTY	Type	Position	Gap	Ten/Comp
0	136	3	PL1.5x6 S-18	F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C

Reinforcement 2						
Bottom	Top	QTY	Type	Position	Gap	Ten/Comp
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C

Reinforcement 3						
Bottom	Top	QTY	Type	Position	Gap	Ten/Comp
0				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C

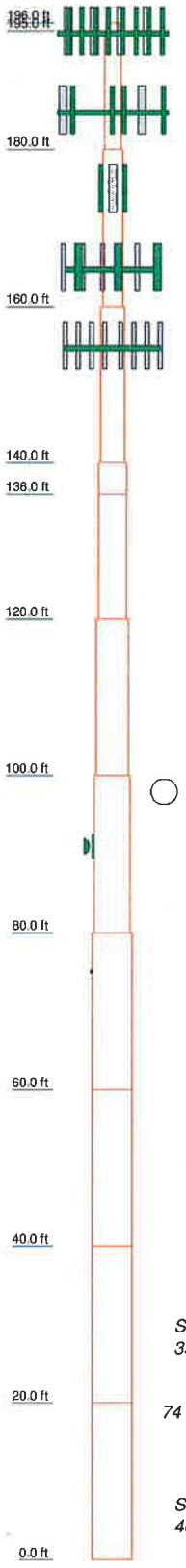
	Bottom Elevation	Top Elevation	Original Thickness	Original Yield Stress	Original Ultimate Stress	Reinforced Shaft Capacity	Reinf. 1 QTY	Reinf. 1 Type	Rein. 1 Capacity	Reinf. 2 QTY	Reinf. 2 Type	Rein. 2 Capacity	Reinf. 3 QTY	Reinf. 3 Type	Rein. 3 Capacity	Control Stress Ratio	Top Height	Section Length	Lap Splice	# of Sides	Top Diameter	Bottom Diameter	Equivalent Shaft Thickness	Equivalent Shaft Fy	Equivalent Weight Mult.
1	195.0000	196.0000	0.3750	42	57	0.0%										0.0%	196.0000	1.0000	0.0000	Round	18.0000	18.0000	0.3750	42.0	1.00
2	180.0000	195.0000	0.3750	42	57	23.1%										23.1%	195.0000	15.0000	0.0000	Round	24.0000	24.0000	0.3750	42.0	1.00
3	160.0000	180.0000	0.3750	42	57	52.4%										52.4%	180.0000	20.0000	0.0000	Round	30.0000	30.0000	0.3750	42.0	1.00
4	140.0000	160.0000	0.3750	42	57	80.2%										80.2%	160.0000	20.0000	0.0000	Round	36.0000	36.0000	0.3750	42.0	1.00
5	136.0000	140.0000	0.3750	42	57	68.4%										68.4%	140.0000	4.0000	0.0000	Round	42.0000	42.0000	0.3750	42.0	1.00
6	120.0000	136.0000	0.3750	42	57	60.2%	3	PL1.5x6.5-18	52.9%							60.2%	136.0000	16.0000	0.0000	Round	42.0000	42.0000	0.6324	34.4	0.95
7	100.0000	120.0000	0.3750	42	57	71.5%	3	PL1.5x6.5-18	60.5%							71.5%	120.0000	20.0000	0.0000	Round	48.0000	48.0000	0.5953	36.9	0.96
8	80.0000	100.0000	0.3750	42	57	80.4%	3	PL1 5x6.5-18	66.2%							80.4%	100.0000	20.0000	0.0000	Round	54.0000	54.0000	0.5676	37.8	0.97
9	60.0000	80.0000	0.3750	42	57	87.7%	3	PL1.5x6.5-18	70.4%							87.7%	80.0000	20.0000	0.0000	Round	60.0000	60.0000	0.5461	38.5	0.98
10	40.0000	60.0000	0.5000	42	57	82.7%	3	PL1.5x6.5-18	70.8%							82.7%	60.0000	20.0000	0.0000	Round	60.0000	60.0000	0.6732	38.7	0.98
11	20.0000	40.0000	0.6250	42	57	79.1%	3	PL1.5x6.5-18	71.9%							79.1%	40.0000	20.0000	0.0000	Round	60.0000	60.0000	0.8004	35.9	0.98
12	0.0000	20.0000	0.6250	42	57	93.0%	3	PL1.5x6.5-18	84.5%							93.0%	20.0000	20.0000	0.0000	Round	60.0000	60.0000	0.8004	35.9	0.98

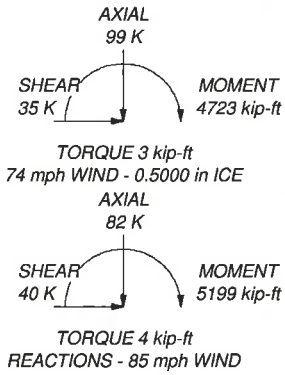
	Top Elevation Failure	Bottom Elevation Failure	Section Failure %
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

APPENDIX C

Tower Elevation Drawing

Section	Size	Length (ft)	Grade	Weight (K)
1	P18x3/8	1.00	A53-B-42	0.1
2	P24x3/8	15.00		1.4
3	P30x3/8	20.00		2.4
4	P36x3/8	20.00		2.9
5	P42x3/8	4.00		0.7
6	P42x3/8 [0.632241]	16.00	34.410173ksi	4.3
7	P48x3/8 [0.595266]	20.00	36.898421ksi	5.8
8	P54x3/8 [0.567552]	20.00	37.826923ksi	6.3
9	P60x3/8 [0.546065]	20.00	38.526976ksi	6.8
10	P60x1/2 [0.673218]	20.00	38.686907ksi	8.4
11	P60x5/8 [0.800428]	20.00	35.902778ksi	9.9
12	P60x5/8 [0.800428]	20.00		9.9
				58.7





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Pirod 16.5' LP Platform	195	(2) RRUS-11	185
(3) AIR 21 w/ Mount Pipe	195	DC6-48-60-18-8F Surge Suppression Unit	185
(3) AIR 21 w/ Mount Pipe	195		
(3) AIR 21 w/ Mount Pipe	195	Valmont Light Duty Tri-Bracket (1)	175
AIR 33 w/ Mount Pipe	195	APXV18-206517S-C w/ Mount Pipe	175
AIR 33 w/ Mount Pipe	195	APXV18-206517S-C w/ Mount Pipe	175
AIR 33 w/ Mount Pipe	195	APXV18-206517S-C w/ Mount Pipe	175
ATMAA1412D	195	MTS 12.5' LP Platform	165
ATMAA1412D	195	(3) DB980E (90E-M) w/ Mount Pipe	165
ATMAA1412D	195	(3) DB980E (90E-M) w/ Mount Pipe	165
DC4-48-60-B-20F	195	(3) DB980E (90E-M) w/ Mount Pipe	165
PiROD 13' Low Profile Platform (Monopole)	185	PiROD 15' Low Profile Platform (Monopole)	155
7770.00 w/ 6' Mount Pipe	185	(2) HBXX-6516DS w/Mount Pipe	155
7770.00 w/ 6' Mount Pipe	185	(2) HBXX-6516DS w/Mount Pipe	155
7770.00 w/ 6' Mount Pipe	185	(2) HBXX-6516DS w/Mount Pipe	155
AM-X-CD-16-65-00T-RET w/ 2" x 54" mount pipe	185	(2) BXA-70063-4CF-EDIN-6 w/ Mount Pipe	155
AM-X-CD-16-65-00T-RET w/ 2" x 54" mount pipe	185	(2) BXA-70063-4CF-EDIN-6 w/ Mount Pipe	155
AM-X-CD-17-65-00T-RET w/ Mount Pipe	185	(2) SLCP2x6014 w/ Mount Pipe	155
		(2) FD9R6004/2C-3L	155
(2) TT19-08BP111-001	185	(2) FD9R6004/2C-3L	155
(2) TT19-08BP111-001	185	(2) FD9R6004/2C-3L	155
(2) TT19-08BP111-001	185	(2) DPX 021 Diplexer	155
(2) LGP21901	185	(2) DPX 021 Diplexer	155
(2) LGP21901	185	(2) DPX 021 Diplexer	155
(2) LGP21901	185	Pipe Mount 3'x4.5"	91
(2) RRUS-11	185	2' MW	91
(2) RRUS-11	185	GPS-TMG-HR-26N	75

MATERIAL STRENGTH

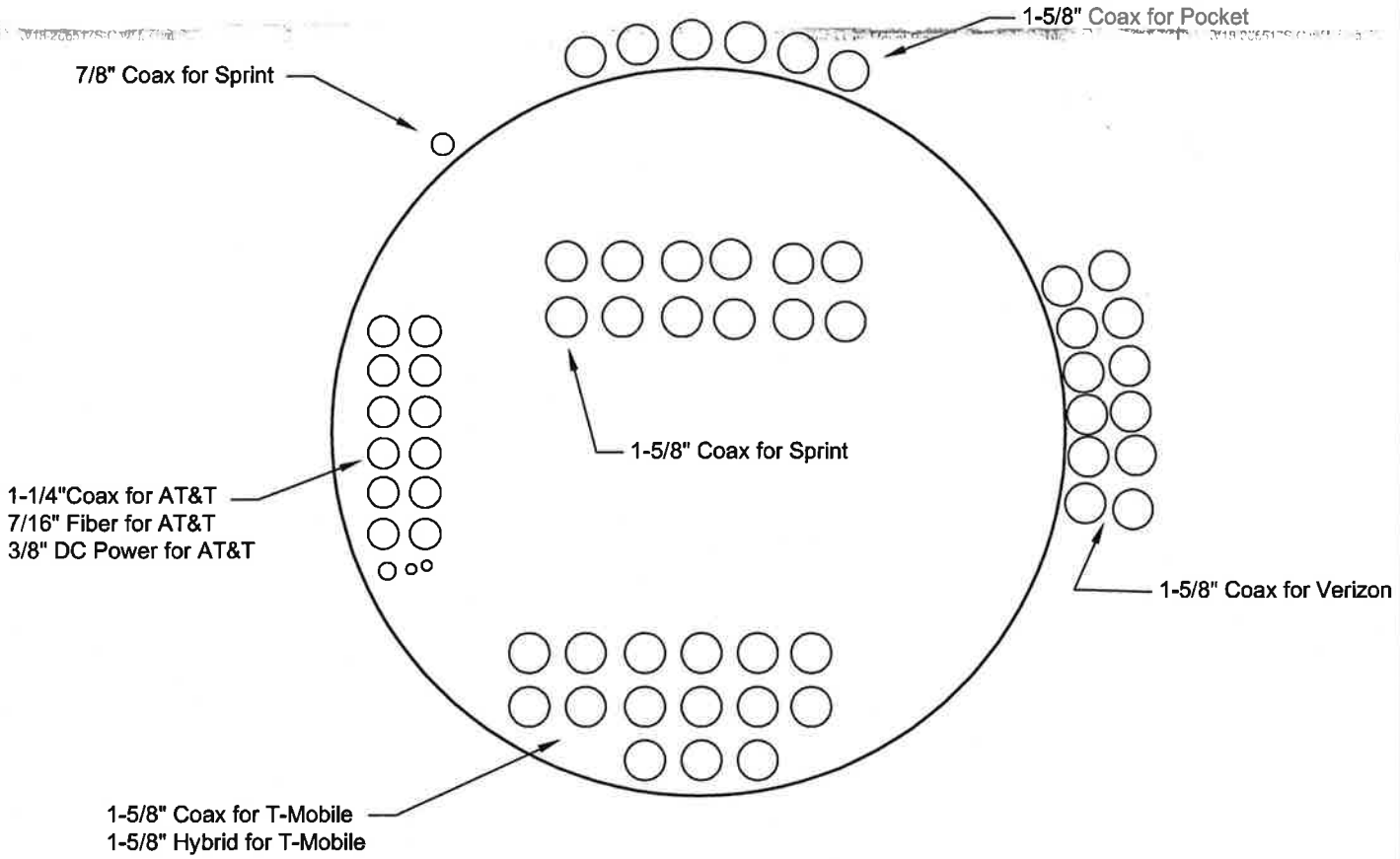
GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-42	42 ksi	63 ksi	38.526976ksi	39 ksi	54 ksi
34.410173ksi	34 ksi	49 ksi	38.686907ksi	39 ksi	54 ksi
36.898421ksi	37 ksi	52 ksi	35.902778ksi	36 ksi	51 ksi
37.826923ksi	38 ksi	53 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.

GPD Group
520 South Main Street, Suite 2531
Akron, OH 44311
Phone: (330) 572-2100
FAX: (330) 572-3709
Consulting Engineers

Job: CT11126F SOUTHBURY/ I-84 X15/ BAGL		
Project: 2014790.50		
Client: T-Mobile Towers	Drawn by: tbeltz	App'd:
Code: TIA/EIA-222-F	Date: 04/25/14	Scale: NTS
Path:		Dwg No. E-1



FEEDLINE PLAN

NOT TO SCALE

GPD GROUP.
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.
520 South Main Street, Suite 2531
Akron, Ohio 44311
330-572-2100 Fax 330-572-2101

CT11126F SOUTHBURY/ I-84 X15/ BAGL

JOB NO. 2014790.50
DATE 4/25/2014
DRAWN BY TTB

APPENDIX D

Flange Plate Analysis

Existing Flange Connection @ 180'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50

O.T. Moment =	111.00	k*ft
Axial =	6.69	kips
Shear =	10.53	kips

Acceptable Stress Ratio =	100.0%

Flange Bolts		
# Bolts =	20	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	27	in
Bolt Diameter =	1	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	0.79	in^2
f_v =	0.67	ksi
Applied Shear =	0.53	kips
Allowable Shear =	21.99	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.98	ksi
Allowable Bolt Stress =	58.63677	ksi
B =	46.05	kips
Prying Action Check		
Tall =	42.69	kips
$t_{req'd}$ =	0.50	in
Max Comp. on Bolt =	10.19	kips
Max Tension on Bolt =	9.53	kips
Shear Capacity =	2.4%	
Tensile Capacity =	22.3%	
Bolt Capacity =	**22.3% OK**	

Pole Information		
Shaft Diam. (Upper) =	24	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	30	in
Thickness (Lower)=	0.375	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Outer Diameter =	30.375	in
wcalc =	12.37	in
wmax =	20.84	in
w =	12.37	in
S =	3.22	in^3
f_b =	9.81	ksi
F_b =	36	ksi
UP Capacity =	**27.2% OK**	

UpperStiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	3	in
Notch =	0.5	in
Height =	5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners Ineffective - check plate unstiffened

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	24.25	in
Pole Inner Diameter =	29.25	in
e =	1.13	in
w =	4.59	in
S =	1.20	in^3
f_b =	9.59	ksi
F_b =	36	ksi
LP Capacity =	**26.6% OK**	

Lower Stiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	2	in
Notch =	0.5	in
Height =	3.5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners Ineffective - check plate unstiffened

Existing Flange Connection @ 160'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50

O.T. Moment =	384.88	k*ft
Axial =	11.19	kips
Shear =	15.69	kips

Acceptable Stress Ratio =	100.0%

Flange Bolts		
# Bolts =	24	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	33	in
Bolt Diameter =	1	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	0.79	in^2
f_v =	0.83	ksi
Applied Shear =	0.65	kips
Allowable Shear =	21.99	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.97	ksi
Allowable Bolt Stress =	58.62056	ksi
B =	46.04	kips
Prying Action Check		
Tall =	43.15	kips
$t_{req'd}$ =	0.73	in
Max Comp. on Bolt =	22.57	kips
Max Tension on Bolt =	21.64	kips
Shear Capacity =	3.0%	
Tensile Capacity =	50.1%	
Bolt Capacity =	**50.1% OK**	

Pole Information		
Shaft Diam. (Upper) =	30	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	36	in
Thickness (Lower)=	0.375	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Outer Diameter =	36.375	in
wcalc =	13.75	in
wmax =	21.04	in
w =	13.75	in
S =	3.58	in^3
f_b =	20.89	ksi
F_b =	36	ksi
UP Capacity =	**58.0% OK**	

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	27.375	in
Pole Inner Diameter =	35.25	in
e =	1.13	in
w =	4.61	in
S =	1.20	in^3
f_b =	21.13	ksi
F_b =	36	ksi
LP Capacity =	**58.7% OK**	

UpperStiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	3	in
Notch =	0.5	in
Height =	5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners ineffective - check plate unstiffened

Lower Stiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	2	in
Notch =	0.5	in
Height =	3.5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners ineffective - check plate unstiffened

Existing Flange Connection @ 140'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50

O.T.Moment =	766.82	k*ft
Axial =	16.88	kips
Shear =	22.31	kips

Acceptable Stress Ratio =	100.0%

Flange Bolts		
# Bolts =	28	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	39	in
Bolt Diameter =	1	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	0.79	in^2
f_v =	1.01	ksi
Applied Shear =	0.80	kips
Allowable Shear =	21.99	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.95	ksi
Allowable Bolt Stress =	58.59817	ksi
B =	46.02	kips
Prying Action Check		
Tall =	43.46	kips
$t_{req'd}$ =	0.89	in
Max Comp. on Bolt =	34.30	kips
Max Tension on Bolt =	33.09	kips
Shear Capacity =	3.6%	
Tensile Capacity =	76.1%	
Bolt Capacity =	**76.1% OK**	

Pole Information		
Shaft Diam. (Upper) =	36	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	42	in
Thickness (Lower)=	0.375	In
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Outer Diameter =	42.375	in
wcalc =	15.00	in
wmax =	25.38	in
w =	15.00	in
S =	3.91	in^3
f_b =	30.77	ksi
F_b =	36	ksi
UP Capacity =	**85.5% OK**	

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	33.375	In
Pole Inner Diameter =	41.25	in
e =	1.13	in
w =	4.63	in
S =	1.21	in^3
f_b =	32.01	ksi
F_b =	36	ksi
LP Capacity =	**88.9% OK**	

UpperStiffeners		
Configuration =	Every Other	
Thickness =	0.5	in
Width =	3	in
Notch =	0.5	in
Height =	5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners ineffective - check plate unstiffened

Lower Stiffeners		
Configuration =	Every Other	
Thickness =	0.5	in
Width =	2	in
Notch =	0.5	in
Height =	3.5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners ineffective - check plate unstiffened

Existing Flange Connection @ 120'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50

*O.T. Moment =	529.27	k*ft
Axial =	22.82	kips
Shear =	24.96	kips

Acceptable Stress Ratio =	100.0%

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of flange bolt forces used in the analysis.

Flange Bolts		
# Bolts =	32	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	45	in
Bolt Diameter =	1	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	0.79	in^2
f_v =	0.99	ksi
Applied Shear =	0.78	kips
Allowable Shear =	21.99	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.95	ksi
Allowable Bolt Stress =	58.60103	ksi
B =	46.03	kips
Prying Action Check		
Tall =	43.71	kips
$t_{req'd}$ =	0.63	in
Max Comp. on Bolt =	18.35	kips
Max Tension on Bolt =	16.93	kips
Shear Capacity =	3.5%	
Tensile Capacity =	38.7%	
Bolt Capacity =	**38.7% OK**	

Pole Information		
Shaft Diam. (Upper) =	42	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	48	in
Thickness (Lower)=	0.375	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Outer Diameter =	48.375	in
wcalc =	16.16	in
wmax =	25.56	in
w =	16.16	in
S =	4.21	in^3
f_b =	16.53	ksi
F_b =	36	ksi
UP Capacity =	**45.9% OK**	

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	39.375	in
Pole Inner Diameter =	47.25	in
e =	1.13	in
w =	4.64	in
S =	1.21	in^3
f_b =	17.09	ksi
F_b =	36	ksi
LP Capacity =	**47.5% OK**	

UpperStiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	3	in
Notch =	0.5	in
Height =	5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners Ineffective - check plate unstiffened

Lower Stiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	2	in
Notch =	0.5	in
Height =	3.5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =		in
Weld Strength =		ksi

Stiffeners Ineffective - check plate unstiffened

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Project #: 2014790.50
Sheet No 1 Of 1

Calculated By: TTB Date: 4/25/2014
Checked By: RE Date: 4/25/2014

BOLT AND BRIDGE STIFFENER CALCULATIONS @ 120'

Moment from TNX (M) =	1239.64	kip-ft	ASIF =	1.33			
Axial from TNX (P) =	22.82	kip					
Inner Bolt Diameter =	1	in					
Inner Bolt Area (A_{inner}) =	0.79	in^2	Inner Bolt Circle (BC_{inner}) =	45	in		
Inner Bolt MOI ($I_{o.inner}$) =	0.05	in^4	Total Area ($A_{tot.in}$) =	25.13	in^2		
Number Inner Bolts (N_{inner}) =	32		Percent Total Area (η_{in}) =	48.2%		Axial, Inner Bolts ($P*\eta_{in}$) =	11.00 kips
Bridge Stiffener Width =	6.00	in					
Bridge Stiffener Thickness =	1.50	in	Connection Bolt Hole Size =	0	in		
Bridge Stiffener Unbraced Length =	12.00	in	Net Bridge Stiffener Area ($A_{e.pl}$)	9	in		
Bridge Stiffener Area (A_{pl}) =	9.00	in^2	Bridge Stiffener Circle (BC_{pl}) =	51	in		
Bridge Stiffener MOI (I_o) =	27.00	in^4	Total Area ($A_{tot.pl}$) =	27.00	in^2		
Number Bridge Stiffeners (N_{pl})	3		Percent Total Area (η_{pl}) =	51.8%		Axial, Bridge Stiffener ($P*\eta_{pl}$) =	11.82 kips

I_{inner} =	6363.30	$in.^4$	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o.inner})$
I_{pl} =	8859.38	$in.^4$	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o.pl})$
I_{tot} =	15222.67	$in.^4$	$(I_{inner} + I_{outer} + I_{pl})$
$P_{u.t.inner}$ =	16.9	kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} - P*\eta_{in}/N_{inner})$
$P_{u.t.pl}$ =	220.3	kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$
$P_{u.c.pl}$ =	228.2	kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$
$P_{nt.bolt} / (\Omega \times ASIF)$ =	43.71	kips	
Bolt Rating =	38.7%	OK	

Bridge Stiffener Check

f_y =	50	ksi
f_u =	65	ksi
E =	29000	ksi
K =	0.85	
KL/r =	23.556	
F_e =	515.82	ksi
F_{cr} =	48.01	ksi
P_{nc} / Ω =	258.75	kips
P_{nt} / Ω =	269.46	kips
Bridge Stiffener Rating =	66.1%	OK

Existing Flange Connection @ 100'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50

*O.T. Moment =	848.70	k*ft
Axial =	29.66	kips
Shear =	27.72	kips

Acceptable Stress Ratio =	100.0%

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of flange bolt forces used in the analysis.

Flange Bolts		
# Bolts =	36	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	51	in
Bolt Diameter =	1	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	0.79	in^2
f_v =	0.98	ksi
Applied Shear =	0.77	kips
Allowable Shear =	21.99	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.95	ksi
Allowable Bolt Stress =	58.6027	ksi
B =	46.03	kips
Prying Action Check		
Tall =	43.91	kips
$t_{req'd}$ =	0.70	In
Max Comp. on Bolt =	23.01	kips
Max Tension on Bolt =	21.36	kips
Shear Capacity =	3.5%	
Tensile Capacity =	48.6%	
Bolt Capacity =	**48.6% OK**	

Pole Information		
Shaft Diam. (Upper) =	48	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	54	in
Thickness (Lower)=	0.375	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Outer Diameter =	54.375	in
wcalc =	17.23	in
wmax =	25.70	in
w =	17.23	in
S =	4.49	in^3
f_b =	20.59	ksi
F_b =	36	ksi
UP Capacity =	**57.2% OK**	

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	45.375	in
Pole Inner Diameter =	53.25	in
e =	1.13	in
w =	4.65	in
S =	1.21	in^3
f_b =	21.39	ksi
F_b =	36	ksi
LP Capacity =	**59.4% OK**	

UpperStiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	3	in
Notch =	0.5	in
Height =	5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =	0.3125	in
Weld Strength =	70	ksi

Stiffeners ineffective - check plate unstiffened

Lower Stiffeners		
Configuration =	Every Other	
Thickness =	0.625	in
Width =	2	in
Notch =	0.5	in
Height =	3.5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =	0.3125	in
Weld Strength =	70	ksi

Stiffeners ineffective - check plate unstiffened

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Calculated By: TTB Date: 4/25/2014
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BOLT AND BRIDGE STIFFENER CALCULATIONS @ 100'

Moment from TNX (M) =	1766.69 kip-ft	ASIF =	1.33		
Axial from TNX (P) =	29.66 kip				
Inner Bolt Diameter =	1 in				
Inner Bolt Area (A_{inner}) =	0.79 in^2	Inner Bolt Circle (BC_{inner}) =	51 in		
Inner Bolt MOI ($I_{o.inner}$) =	0.05 in^4	Total Area ($A_{tot.in}$) =	25.92 in^2		
Number Inner Bolts (N_{inner}) =	33	Percent Total Area (η_{in}) =	49.0%	Axial, Inner Bolts ($P*\eta_{in}$) =	14.53 kips
Bridge Stiffener Width =	6.00 in				
Bridge Stiffener Thickness =	1.50 in	Connection Bolt Hole Size =	0 in		
Bridge Stiffener Unbraced Length =	12.00 in	Net Bridge Stiffener Area ($A_{e.pl}$)	9 in		
Bridge Stiffener Area (A_{pl}) =	9.00 in^2	Bridge Stiffener Circle (BC_{pl}) =	57 in		
Bridge Stiffener MOI (I_o) =	27.00 in^4	Total Area ($A_{tot.pl}$) =	27.00 in^2		
Number Bridge Stiffeners (N_{pl})	3	Percent Total Area (η_{pl}) =	51.0%	Axial, Bridge Stiffener ($P*\eta_{pl}$) =	15.13 kips

I_{inner} =	8428.25 $in.^4$	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o.inner})$	
I_{pl} =	11046.38 $in.^4$	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o.pl})$	
I_{tot} =	19474.63 $in.^4$	$(I_{inner} + I_{outer} + I_{pl})$	
$P_{u.t.inner}$ =	21.4 kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} - P*\eta_{in}/N_{inner})$	
$P_{u.t.pl}$ =	274.2 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$	
$P_{u.c.pl}$ =	284.3 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$	
$P_{nt.bolt} / (\Omega \times ASIF)$ =	43.91 kips		
Bolt Rating =	48.7% OK		

Bridge Stiffener Check

f_y =	50	ksi
f_u =	65	ksi
E =	29000	ksi
K =	0.85	
KL/r =	23.556	
F_e =	515.82	ksi
F_{cr} =	48.01	ksi
P_{nc} / Ω =	258.75	kips
P_{nt} / Ω =	269.46	kips
Bridge Stiffener Rating =	82.4%	OK

Existing Flange Connection @ 80'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50

*O.T. Moment =	1268.60	k*ft
Axial =	37.09	kips
Shear =	30.63	kips

Acceptable Stress Ratio	
=	100.0%

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of flange bolt forces used in the analysis.

Flange Bolts		
# Bolts =	48	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	57	in
Bolt Diameter =	1	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	0.79	in^2
f_v =	0.81	ksi
Applied Shear =	0.64	kips
Allowable Shear =	21.99	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.97	ksi
Allowable Bolt Stress =	58.62274	ksi
B =	46.04	kips
Prying Action Check		
N/A for stiffened flange		
Max Comp. on Bolt =	23.03	kips
Max Tension on Bolt =	21.48	kips
Shear Capacity =	2.9%	
Tensile Capacity =	46.7%	
Bolt Capacity =	**46.7% OK**	

Pole Information		
Shaft Diam. (Upper) =	54	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	60	in
Thickness (Lower)=	0.375	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Outer Diameter =	60.375	in
b =	3.11	in
Le =	3.00	in
f_b =	18.72	ksi
F_b =	36	ksi
UP Capacity =	**52.0% OK**	

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	51.375	in
b =	3.11	in
Le =	2.00	in
f_b =	22.36	ksi
F_b =	36	ksi
LP Capacity =	**62.1% OK**	

UpperStiffeners		
Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	3	in
Notch =	0.5	in
Height =	5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =	0.3125	in
Weld Strength =	70	ksi
Stiffener Vertical Force =	13.15	kips
Vert. Weld Capacity =	32.5%	kips
Horiz. Weld Capacity =	47.9%	kips
Stiffener Capacity =	51.5%	kips
Controlling Capacity =	**51.5%**	**OK**

Lower Stiffeners		
Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	2	in
Notch =	0.5	in
Height =	3.5	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.3125	in
Horiz. Weld Type =	Fillet	
Fillet Size =	0.3125	in
Weld Strength =	70	ksi
Stiffener Vertical Force =	8.51	kips
Vert. Weld Capacity =	31.2%	kips
Horiz. Weld Capacity =	51.8%	kips
Stiffener Capacity =	47.2%	kips
Controlling Capacity =	**51.8%**	**OK**

- Welds Control

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Project #: 2014790.50
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Calculated By: TTB Date: 4/25/2014
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BOLT AND BRIDGE STIFFENER CALCULATIONS @ 80'

Moment from TNX (M) =	2350.58 kip-ft	ASIF =	1.33		
Axial from TNX (P) =	37.09 kip				
Inner Bolt Diameter =	1 in				
Inner Bolt Area (A_{inner}) =	0.79 in^2	Inner Bolt Circle (BC_{inner}) =	57 in		
Inner Bolt MOI ($I_{o.inner}$) =	0.05 in^4	Total Area ($A_{tot.in}$) =	37.70 in^2		
Number Inner Bolts (N_{inner}) =	48	Percent Total Area (η_{in}) =	58.3%	Axial, Inner Bolts ($P*\eta_{in}$) =	21.61 kips
Bridge Stiffener Width =	6.00 in				
Bridge Stiffener Thickness =	1.50 in	Connection Bolt Hole Size =	0 in		
Bridge Stiffener Unbraced Length =	12.00 in	Net Bridge Stiffener Area ($A_{e.pl}$)	9 in		
Bridge Stiffener Area (A_{pl}) =	9.00 in^2	Bridge Stiffener Circle (BC_{pl}) =	63 in		
Bridge Stiffener MOI (I_o) =	27.00 in^4	Total Area ($A_{tot.pl}$) =	27.00 in^2		
Number Bridge Stiffeners (N_{pl})	3	Percent Total Area (η_{pl}) =	41.7%	Axial, Bridge Stiffener ($P*\eta_{pl}$) =	15.48 kips

I_{inner} =	15312.91 $in.^4$	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o.inner})$	
I_{pl} =	13476.38 $in.^4$	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o.pl})$	
I_{tot} =	28789.28 $in.^4$	$(I_{inner} + I_{outer} + I_{pl})$	
$P_{u.t.inner}$ =	21.5 kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} - P*\eta_{in}/N_{inner})$	
$P_{u.t.pl}$ =	272.6 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$	
$P_{u.c.pl}$ =	282.9 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$	
$P_{nt.bolt} / (\Omega \times ASIF)$ =	46.04 kips		
Bolt Rating =	46.7% OK		

Bridge Stiffener Check

f_y =	50	ksi
f_u =	65	ksi
E =	29000	ksi
K =	0.85	
KL/r =	23.556	
F_e =	515.82	ksi
F_{cr} =	48.01	ksi
P_{nc} / Ω =	258.75	kips
P_{nt} / Ω =	269.46	kips
Bridge Stiffener Rating =	82.0%	OK

Existing Flange Connection @ 60'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50 (FLANGE PLATES ANALYSIS ONLY)

*O.T. Moment =	1443.498	k*ft
Axial =	45.71	kips
Shear =	33.48	kips

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of flange bolt forces used in the analysis.

Acceptable Stress Ratio	
=	100.0%

Flange Bolts		
# Bolts =	32	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	50	in
Bolt Diameter =	1.75	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	2.41	in²
f_v =	0.43	ksi
Applied Shear =	1.05	kips
Allowable Shear =	67.35	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.99	ksi
Allowable Bolt Stress =	58.65408	ksi
B =	141.08	kips
Prying Action Check		
N/A for stiffened flange		
Max Comp. on Bolt =	44.71	kips
Max Tension on Bolt =	41.85	kips
Shear Capacity =	1.6%	
Tensile Capacity =	29.7%	
Bolt Capacity =	**29.7% OK**	

Pole Information		
Shaft Diam. (Upper) =	60	in
Thickness (Upper)=	0.375	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	60	in
Thickness (Lower)=	0.5	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	43	in
b =	4.28	in
Le =	7.00	in
f_b =	18.21	ksi
F_b =	36	ksi
UP Capacity =	**50.6% OK**	

Lower Flange Plate		
Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	43	in
b =	4.28	in
Le =	7.00	in
f_b =	18.21	ksi
F_b =	36	ksi
LP Capacity =	**50.6% OK**	

UpperStiffeners		
Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	7	in
Notch =	0.5	in
Height =	10	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	No	
Stiffener Vertical Force =	25.22	kips
Vert. Weld Capacity =	*Not Verified*	kips
Horiz. Weld Capacity =	*Not Verified*	kips
Stiffener Capacity =	51.8%	kips
Controlling Capacity =	**51.8%**	**OK**

Lower Stiffeners		
Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	7	in
Notch =	0.5	in
Height =	10	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	No	
Stiffener Vertical Force =	22.23	kips
Vert. Weld Capacity =	*Not Verified*	kips
Horiz. Weld Capacity =	*Not Verified*	kips
Stiffener Capacity =	45.6%	kips
Controlling Capacity =	**45.6%**	**OK**

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Calculated By: TTB Date: 4/25/2014
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BOLT AND BRIDGE STIFFENER CALCULATIONS @ 60'

Moment from TNX (M) =	2991.41	kip-ft	ASIF =	1.33			
Axial from TNX (P) =	45.71	kip					
Inner Bolt Diameter =	1.25	in					
Inner Bolt Area (A_{inner}) =	1.23	in^2	Inner Bolt Circle (BC_{inner}) =	47	in		
Inner Bolt MOI ($I_{o.inner}$) =	0.12	in^4	Total Area ($A_{tot.in}$) =	39.27	in^2		
Number Inner Bolts (N_{inner}) =	32		Percent Total Area (η_{in}) =	29.6%		Axial, Inner Bolts ($P*\eta_{in}$) =	13.54 kips
Outer Bolt Diameter =	1.25	in					
Outer Bolt Area (A_{outer}) =	1.23	in^2	Outer Bolt Circle (BC_{outer}) =	53	in		
Outer Bolt MOI ($I_{o.outer}$) =	0.12	in^4	Total Area ($A_{tot.out}$) =	39.27	in^2		
Number Outer Bolts (N_{outer}) =	32		Percent Total Area (η_{out}) =	29.6%		Axial, Outer Bolts ($P*\eta_{out}$) =	13.54 kips
Bridge Stiffener Width =	6.00	in					
Bridge Stiffener Thickness =	1.50	in	Connection Bolt Hole Size =	1.21875	in		
Bridge Stiffener Unbraced Length =	30.00	in	Net Bridge Stiffener Area ($A_{e.pl}$)	7.17188	in		
Bridge Stiffener Area (A_{pl}) =	9.00	in^2	Bridge Stiffener Circle (BC_{pl}) =	63	in		
Bridge Stiffener MOI (I_o) =	27.00	in^4	Total Area ($A_{tot.pl}$) =	54.00	in^2		
Number Bridge Stiffeners (N_{pl})	6		Percent Total Area (η_{pl}) =	40.7%		Axial, Bridge Stiffener ($P*\eta_{pl}$) =	18.62 kips

I_{inner} =	10847.24	in^4	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o.inner})$
I_{outer} =	13792.48	in^4	$(N_{outer}*A_{outer}*BC_{outer}^2/8 + N_{outer}*I_{o.outer})$
I_{pl} =	26952.75	in^4	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o.pl})$
I_{tot} =	51592.47	in^4	$(I_{inner} + I_{outer} + I_{pl})$
$P_{u.t.inner}$ =	19.6	kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} - P*\eta_{in}/N_{inner})$
$P_{u.t.outer}$ =	22.2	kips	$(M*(BC_{outer}/2)*A_{outer})/I_{total} - P*\eta_{out}/N_{outer})$
$P_{u.t.pl}$ =	194.1	kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$
$P_{u.c.pl}$ =	200.4	kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$
$P_{nt.bolt} / (\Omega \times ASIF)$ =	141.08	kips	
Bolt Rating =	15.7%	OK	

Bridge Stiffener Check

f_y =	50	ksi
f_u =	65	ksi
E =	29000	ksi
K =	0.85	
KL/r =	58.890	
F_e =	82.53	ksi
F_{cr} =	38.80	ksi
P_{nc} / Ω =	209.11	kips
P_{nt} / Ω =	233.09	kips
Bridge Stiffener Rating =	71.9%	OK

Existing Flange Connection @ 40'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50 (FLANGE PLATES ANALYSIS ONLY)

*O.T. Moment =	1778.683	k*ft
Axial =	56.89	kips
Shear =	35.91	kips

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of flange bolt forces used in the analysis.

Acceptable Stress Ratio	
=	100.0%

Flange Bolts

# Bolts =	32	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	50	in
Bolt Diameter =	1.75	in

Tension & Shear (ASD, Section J3.5)

F_v =	21	ksi
Nominal Area =	2.41	in²
f_v =	0.47	ksi
Applied Shear =	1.12	kips
Allowable Shear =	67.35	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.99	ksi
Allowable Bolt Stress =	58.65219	ksi
B =	141.08	kips

Prying Action Check
N/A for stiffened flange

Max Comp. on Bolt =	55.11	kips
Max Tension on Bolt =	51.55	kips
Shear Capacity =	1.7%	
Tensile Capacity =	36.5%	
Bolt Capacity =	**36.5%**	**OK**

Pole Information

Shaft Diam. (Upper) =	60	in
Thickness (Upper)=	0.5	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	60	in
Thickness (Lower)=	0.625	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate

Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	43	in
b =	4.28	in
Le =	7.00	in
f_b =	22.44	ksi
F_b =	36	ksi
UP Capacity =	**62.3%**	**OK**

Lower Flange Plate

Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	43	in
b =	4.28	in
Le =	7.00	in
f_b =	22.44	ksi
F_b =	36	ksi
LP Capacity =	**62.3%**	**OK**

UpperStiffeners

Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	7	in
Notch =	0.5	in
Height =	10	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =		
Stiffener Vertical Force =	27.40	kips
Vert. Weld Capacity =	*Not Verified*	kips
Horiz. Weld Capacity =	*Not Verified*	kips
Stiffener Capacity =	56.3%	kips
Controlling Capacity =	**56.3%**	**OK**

Lower Stiffeners

Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	7	in
Notch =	0.5	in
Height =	10	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =		
Stiffener Vertical Force =	24.51	kips
Vert. Weld Capacity =	*Not Verified*	kips
Horiz. Weld Capacity =	*Not Verified*	kips
Stiffener Capacity =	50.3%	kips
Controlling Capacity =	**50.3%**	**OK**

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Project #: 2014790.50
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Calculated By: TTB Date: 4/25/2014
Checked By: RE Date: 4/25/2014

BOLT AND BRIDGE STIFFENER CALCULATIONS @ 40'

Moment from TNX (M) =	3685.56	kip-ft	ASIF =	1.33			
Axial from TNX (P) =	56.89	kip					
Inner Bolt Diameter =	1.25	in					
Inner Bolt Area (A_{inner}) =	1.23	in^2	Inner Bolt Circle (BC_{inner}) =	47	in		
Inner Bolt MOI ($I_{o.inner}$) =	0.12	in^4	Total Area ($A_{tot.in}$) =	39.27	in^2		
Number Inner Bolts (N_{inner}) =	32		Percent Total Area (η_{in}) =	29.6%		Axial, Inner Bolts ($P*\eta_{in}$) =	16.86 kips
Outer Bolt Diameter =	1.25	in					
Outer Bolt Area (A_{outer}) =	1.23	in^2	Outer Bolt Circle (BC_{outer}) =	53	in		
Outer Bolt MOI ($I_{o.outer}$) =	0.12	in^4	Total Area ($A_{tot.out}$) =	39.27	in^2		
Number Outer Bolts (N_{outer}) =	32		Percent Total Area (η_{out}) =	29.6%		Axial, Outer Bolts ($P*\eta_{out}$) =	16.86 kips
Bridge Stiffener Width =	6.00	in					
Bridge Stiffener Thickness =	1.50	in	Connection Bolt Hole Size =	1.18	in		
Bridge Stiffener Unbraced Length =	30.00	in	Net Bridge Stiffener Area ($A_{e.pl}$)	7.23	in		
Bridge Stiffener Area (A_{pl}) =	9.00	in^2	Bridge Stiffener Circle (BC_{pl}) =	63	in		
Bridge Stiffener MOI (I_o) =	27.00	in^4	Total Area ($A_{tot.pl}$) =	54.00	in^2		
Number Bridge Stiffeners (N_{pl})	6		Percent Total Area (η_{pl}) =	40.7%		Axial, Bridge Stiffener ($P*\eta_{pl}$) =	23.18 kips

I_{inner} =	10847.24	$in.^4$	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o.inner})$
I_{outer} =	13792.48	$in.^4$	$(N_{outer}*A_{outer}*BC_{outer}^2/8 + N_{outer}*I_{o.outer})$
I_{pl} =	26952.75	$in.^4$	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o.pl})$
I_{tot} =	51592.47	$in.^4$	$(I_{inner} + I_{outer} + I_{pl})$
$P_{u.t.inner}$ =	24.2	kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} - P*\eta_{in}/N_{inner})$
$P_{u.t.outer}$ =	27.4	kips	$(M*(BC_{outer}/2)*A_{outer})/I_{total} - P*\eta_{out}/N_{outer})$
$P_{u.t.pl}$ =	239.2	kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$
$P_{u.c.pl}$ =	246.9	kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$
$P_{nt.bolt} / (\Omega \times ASIF)$ =	72.15	kips	
Bolt Rating =	37.9%	OK	

Bridge Stiffener Check

f_y =	50	ksi
f_u =	65	ksi
E =	29000	ksi
K =	0.85	
KL/r =	58.890	
F_e =	82.53	ksi
F_{cr} =	38.80	ksi
P_{nc} / Ω =	209.11	kips
P_{nt} / Ω =	234.98	kips
Bridge Stiffener Rating =	88.6%	OK

Existing Flange Connection @ 20'
CT11126F SOUTHBURY/I-84 X15/ BAGL
2014790.50 (FLANGE PLATES ANALYSIS ONLY)

*O.T. Moment =	1747.672	k*ft
Axial =	69.89	kips
Shear =	37.93	kips

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of flange bolt forces used in the analysis.

Acceptable Stress Ratio =	100.0%

Flange Bolts

# Bolts =	32	
Bolt Type =	A325	
F_t =	44	ksi
ASIF =	1.333	
Bolt Circle =	50	in
Bolt Diameter =	1.75	in
Tension & Shear (ASD, Section J3.5)		
F_v =	21	ksi
Nominal Area =	2.41	in^2
f_v =	0.49	ksi
Applied Shear =	1.19	kips
Allowable Shear =	67.35	kips
Ft^2 - 4.39(fv^2))^1/2 =	43.99	ksi
Allowable Bolt Stress =	58.65051	ksi
B =	141.07	kips
Prying Action Check		
N/A for stiffened flange		
Max Comp. on Bolt =	54.59	kips
Max Tenslon on Bolt =	50.22	kips
Shear Capacity =	1.8%	
Tensile Capacity =	35.6%	
Bolt Capacity =	**35.6%**	**OK**

Pole Information

Shaft Diam. (Upper) =	60	in
Thickness (Upper)=	0.625	in
# of Sides (Upper) =	Round	
F_y (Upper) =	42	ksi
Shaft Diam. (Lower) =	60	in
Thickness (Lower)=	0.625	in
# of Sides (Lower) =	Round	
F_y (Lower) =	42	ksi

Upper Flange Plate

Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	43	in
b =	4.28	in
Le =	7.00	in
f_b =	22.23	ksi
F_b =	36	ksi
UP Capacity =	**61.8%**	**OK**

Lower Flange Plate

Location =	Internal	
Plate Strength (F_y) =	36	ksi
Plate Thickness =	1.25	in
Hole Diameter =	43	in
b =	4.28	in
Le =	7.00	in
f_b =	22.23	ksi
F_b =	36	ksi
LP Capacity =	**61.8%**	**OK**

UpperStiffeners

Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	7	in
Notch =	0.5	in
Height =	10	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	No	
Stiffener Vertical Force =	24.31	kips
Vert. Weld Capacity =	*Not Verified*	kips
Horiz. Weld Capacity =	*Not Verified*	kips
Stiffener Capacity =	49.9%	kips
Controlling Capacity =	**49.9%**	**OK**

Lower Stiffeners

Configuration =	Every Bolt	
Thickness =	0.625	in
Width =	7	in
Notch =	0.5	in
Height =	10	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	No	
Stiffener Vertical Force =	24.31	kips
Vert. Weld Capacity =	*Not Verified*	kips
Horiz. Weld Capacity =	*Not Verified*	kips
Stiffener Capacity =	49.9%	kips
Controlling Capacity =	**49.9%**	**OK**

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Calculated By: TTB Date: 4/25/2014
Checked By: RE Date: 4/25/2014

BOLT AND BRIDGE STIFFENER CALCULATIONS @ 20'

Moment from TNX (M) =	4424.17 kip-ft	ASIF =	1.33				
Axial from TNX (P) =	69.89 kip						
Inner Bolt Diameter =	1.25 in						
Inner Bolt Area (A_{inner}) =	1.23 in^2	Inner Bolt Circle (BC_{inner}) =	47 in				
Inner Bolt MOI ($I_{o,inner}$) =	0.12 in^4	Total Area ($A_{tot,in}$) =	39.27 in^2				
Number Inner Bolts (N_{inner}) =	32	Percent Total Area (η_{in}) =	24.2%	Axial, Inner Bolts ($P*\eta_{in}$) =	16.89 kips		
Outer Bolt Diameter =	1.25 in						
Outer Bolt Area (A_{outer}) =	1.23 in^2	Outer Bolt Circle (BC_{outer}) =	53 in				
Outer Bolt MOI ($I_{o,outer}$) =	0.12 in^4	Total Area ($A_{tot,out}$) =	39.27 in^2				
Number Outer Bolts (N_{outer}) =	32	Percent Total Area (η_{out}) =	24.2%	Axial, Outer Bolts ($P*\eta_{out}$) =	16.89 kips		
Bridge Stiffener Width =	6.00 in						
Bridge Stiffener Thickness =	1.50 in	Connection Bolt Hole Size =	1.21875 in				
Bridge Stiffener Unbraced Length =	30.00 in	Net Bridge Stiffener Area ($A_{e,pl}$) =	7.17188 in				
Bridge Stiffener Area (A_{pl}) =	9.00 in^2	Bridge Stiffener Circle (BC_{pl}) =	60.75 in				
Bridge Stiffener MOI (I_o) =	27.00 in^4	Total Area ($A_{tot,pl}$) =	54.00 in^2				
Number Bridge Stiffeners (N_{pl})	6	Percent Total Area (η_{pl}) =	33.2%	Axial, Bridge Stiffener ($P*\eta_{pl}$) =	23.22 kips		
Bridge Stiffener Width =	4.00 in						
Bridge Stiffener Thickness =	1.25 in	Connection Bolt Hole Size =	1.21875 in				
Bridge Stiffener Unbraced Length =	12.00 in	Net Bridge Stiffener Area ($A_{e,pl}$) =	3.47656 in				
Bridge Stiffener Area (A_{pl}) =	5.00 in^2	Bridge Stiffener Circle (BC_{pl}) =	60.625 in				
Bridge Stiffener MOI (I_o) =	6.67 in^4	Total Area ($A_{tot,pl}$) =	30.00 in^2				
Number Bridge Stiffeners (N_{pl})	6	Percent Total Area (η_{pl}) =	18.5%	Axial, Bridge Stiffener ($P*\eta_{pl}$) =	12.90 kips		

I_{inner} =	10847.24 $in.^4$	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o,inner})$
I_{outer} =	13792.48 $in.^4$	$(N_{outer}*A_{outer}*BC_{outer}^2/8 + N_{outer}*I_{o,outer})$
I_{pl} =	25073.30 $in.^4$	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o,pl})$
I_{pl} =	13822.71 $in.^4$	$(N_{pl}*A_{pl}*BC_{pl}^2/8 + N_{pl}*I_{o,pl})$
I_{tot} =	63535.73 $in.^4$	$(I_{inner} + I_{outer} + I_{pl})$

$P_{u,t,inner}$ =	23.6 kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} - P*\eta_{in}/N_{inner})$
$P_{u,t,outer}$ =	26.6 kips	$(M*(BC_{outer}/2)*A_{outer})/I_{total} - P*\eta_{out}/N_{outer})$
$P_{u,t,pl}$ =	224.6 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$
$P_{u,c,pl}$ =	232.3 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$
$P_{u,t,pl}$ =	124.5 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} - P*\eta_{pl}/N_{pl})$
$P_{u,c,pl}$ =	128.8 kips	$(M*(BC_{pl}/2)*A_{pl})/I_{total} + P*\eta_{pl}/N_{pl})$
$P_{nt,bolt} / (\Omega \times ASIF)$ =	72.15 kips	
Bolt Rating =	36.9% OK	

Bridge Stiffener Check

f_y =	50	ksi
f_u =	65	ksi
E =	29000	ksi
K =	0.85	
KL/r =	58.890	
F_e =	82.53	ksi
F_{cr} =	38.80	ksi
P_{nc} / Ω =	209.11	kips
P_{nt} / Ω =	233.09	kips
Bridge Stiffener Rating =	83.3%	OK

APPENDIX E

Anchor Rod & Base Plate Analysis

Anchor Rod and Base Plate Stresses
CT11126F SOUTHBURY/ I-84 X15/ BAGL
2014790.50

*Overturning Moment =	4056.97	k*ft
Axial Force =	66.63	k
Shear Force =	40.00	k

Acceptable Stress Ratio =	100.0%

*Above reactions have been adjusted due to consideration of modifications. See attached hand calculations for determination of anchor rod forces used in the analysis below.

Anchor Rods		
Number of Rods =	52	
Type =	Bolt	
Rod Ultimate Strength (Fu) =	150	ksi
ASIF =	1.333	
Rod Circle =	67	in
Rod Diameter =	1.25	in
Area =	1.23	in^2
Max Tension on Rod =	54.60	kips
Max Compression on Rod =	57.17	kips
Allow. Rod Force =	80.99	kips
Anchor Rod Capacity =	**67.4%**	**OK**

Base Plate		
Location =	External	
Plate Strength (F_y) =	36	ksi
Outside Diameter =	69.75	in
Plate Thickness =	1.25	in
b =	3.42	in
Le =	4.50	in
fb =	32.25	ksi
Fb =	36	ksi
BP Capacity =	**89.6%**	**OK**

Stiffeners		
Configuration =	Every Rod	
Thickness =	0.625	in
Width =	4.5	in
Notch =	0.5	in
Height =	8	in
Stiffener Strength (F_y) =	36	ksi
Weld Info. Known? =	Yes	
Vertical Weld Size =	0.375	in
Horiz. Weld Type =	Fillet	
Fillet Size =	0.375	in
Weld Strength =	70	ksi
Stiffener Vertical Force =	33.62	kips
Vert. Weld Capacity =	40.2%	kips
Horiz. Weld Capacity =	62.5%	kips
Stiffener Capacity =	81.4%	kips
Controlling Capacity =	**81.4%**	**OK**

Pole		
Pole Diameter =	60	in
Number of Sides =	Round	
Thickness =	0.625	in
Pole Yield Strength =	42	ksi

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MODIFIED ANCHOR ROD CALCULATIONS

Moment from RISA (M) =	5199.00 kip-ft	Code	TIA/EIA-222-F				
Axial from RISA (P) =	82.00 kip	ASIF =	1.33				
Shear from RISA (V) =	40.00 kip	Allowable Stress Ratio =	100%				
Inner Bolt Diameter =	1.25 in						
Number Inner Bolts (N_{inner}) =	52	Inner Bolt Circle (BC_{inner}) =	67 in				
Inner Bolt Area (A_{inner}) =	0.97 in^2	Total Area ($A_{tot.in}$) =	50.39 in^2	Axial, Inner Bolts ($P*\eta_{in}$) =	66.63 kips		
Inner Bolt MOI ($I_{o.inner}$) =	0.12 in^4	Percent Total Area (η_{in}) =	81.3%				
Outer Bolt Diameter =	1.25 in						
Number Outer Bolts (N_{outer}) =	12	Outer Bolt Circle (BC_{outer}) =	74 in				
Outer Bolt Area (A_{outer}) =	0.97 in^2	Total Area ($A_{tot.out}$) =	11.63 in^2	Axial, Outer Bolts ($P*\eta_{out}$) =	15.38 kips		
Outer Bolt MOI ($I_{o.outer}$) =	0.12 in^4	Percent Total Area (η_{out}) =	18.8%				

I_{inner} =	28280.20 $in.^4$	$(N_{inner}*A_{inner}*BC_{inner}^2/8 + N_{inner}*I_{o.inner})$
I_{outer} =	7960.80 $in.^4$	$(N_{outer}*A_{outer}*BC_{outer}^2/8 + N_{outer}*I_{o.outer})$
I_{tot} =	36241.00 $in.^4$	$(I_{inner} + I_{outer})$
F_{inner} =	57.16 kips	$(M*(BC_{inner}/2)*A_{inner})/I_{total} + P*\eta_{in}/N_{inner})$
F_{outer} =	63.00 kips	$(M*(BC_{outer}/2)*A_{outer})/I_{total} + P*\eta_{out}/N_{outer})$
Rnt.outer / Ω=	68.2 kips	(1/3 * ASIF * Fu * Agross)

Modified Anchor Rod Rating
% = 92.4% OK

APPENDIX F

Foundation Analysis

Pile Analysis

CT11126F SOUTHBURY/I-84 X15/BAGL

2014790.50

M	5199.00	k-ft
P	157.00	k
V	40.00	k
M tot	5419	k-ft
M tot 45	3831.812	k-ft
d	5.5	ft
h	46	ft
Vconc	11638	ft^3
wconc	1745.7	k

Pile Ultimate Capacities

Existing

Compression	150	k
Tension	100	k

Modification

Compression	100	k
Tension	100	k

Wequip	75	k

(weight of the equipment above the pad)

n existing	24
n mod	48

Total force on piles

				X			45	
	n	x (ft)	y (ft)	Pc (k)	Pt (k)	Mu (k-ft)	Pc (k)	Pt (k)
Existing	4	0	0	26.43	26.43	0.00	26.43	26.43
	10	6	6	28.46	24.39	853.90	29.31	23.55
	10	12	12	30.50	22.35	1830.03	32.19	20.66
	24							
Mod	2	0	0	26.43	26.43	0.00	26.43	26.43
	4	3.5	3.5	27.61	25.24	193.30	28.11	24.75
	4	7	7	28.80	24.05	403.24	29.79	23.07
	4	10.5	10.5	29.99	22.86	629.82	31.47	21.38
	4	14	14	31.18	21.67	873.03	33.15	19.70
	4	17.5	17.5	32.37	20.48	1132.88	34.83	18.02
	26	21	21	33.56	19.30	9160.84	36.51	16.34
	48							

Pile Capacities

Existing

Compression	40.7%
Tension	52.9%

Modification

Compression	67.1%
Tension	52.9%

Reinforcement Capacity

Mu	19600.17	k-ft
a	4.262575	in
d	60.885	in
Phi Mn	26439.17	k-ft

Capacity 74.1%