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Also admitted in Massachusetts

February 24, 2014

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

Re: **Notice of Exempt Modification – Antenna Swap**
627 Honeyspot Road, Stratford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 82-foot level of the existing 103-foot tower at 627 Honeyspot Road in Stratford, Connecticut (the "Property"). The tower is owned by Becker LLC. The Council approved Cellco's use of the tower in 1999. Cellco now intends to replace nine (9) of its existing antennas with three (3) model BXA-70063-6CF, 850 MHz antennas; three (3) model BXA-70063-6CF, 700 MHz antennas; and three (3) model BXA-171063-8BF, 2100 MHz antennas, all at the same 82-foot level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs"), three (3) behind its 700 MHz antennas and three (3) behind its 2100 MHz antennas, and one (1) HYBRIFLEX™ antenna cable inside the monopole. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

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 John Harkins, Mayor for the Town of Stratford. A copy of this letter is also being sent to Becker LLC, the owners 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).

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1. The proposed modifications will not result in an increase in the height of the existing tower. The replaced antennas and RRHs will be located on Cellco's existing platform at the 82-foot level on the 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 modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. Far Field Approximation tables for each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions limits established by the FCC.

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, with certain structural modifications, can support Cellco's proposed facility modifications. (*See* Rigorous 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:
John Harkins, Stratford Mayor
Becker LLC
Sandy M. Carter

ATTACHMENT 1

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

Replace "X" with desired electrical downtilt.

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

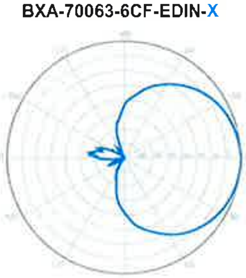
X-Pol | FET Panel | 63° | 14.5 dBd

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
IM3 (2x20W carriers)	< -153 dBc	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	

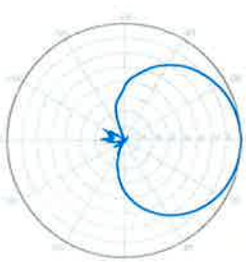
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

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

BXA-70063-6CF-EDIN-X

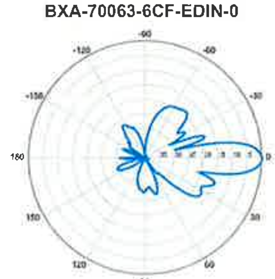


Horizontal | 750 MHz

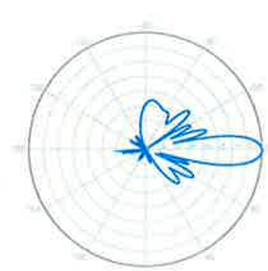


Horizontal | 850 MHz

BXA-70063-6CF-EDIN-0

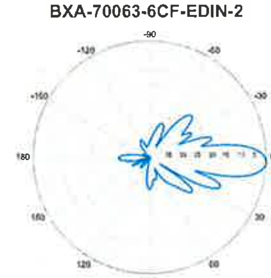


0° | Vertical | 750 MHz

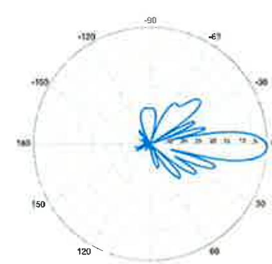


0° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-2



2° | Vertical | 750 MHz



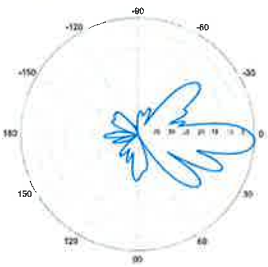
2° | Vertical | 850 MHz

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

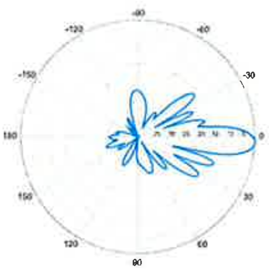
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

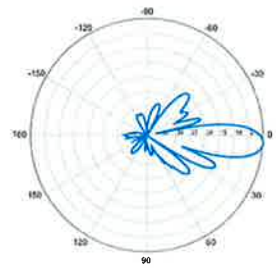


3° | Vertical | 750 MHz

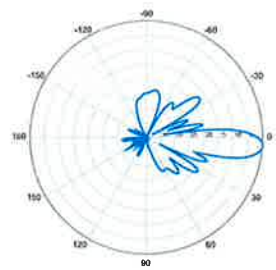


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

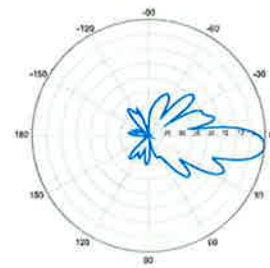


4° | Vertical | 750 MHz

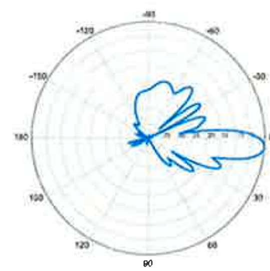


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

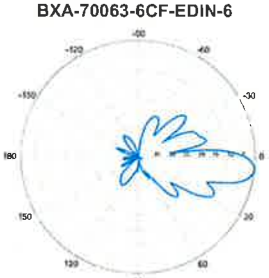


5° | Vertical | 750 MHz

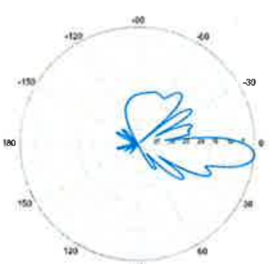


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

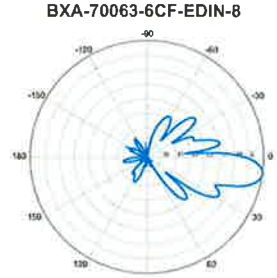


6° | Vertical | 750 MHz

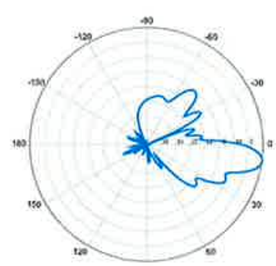


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

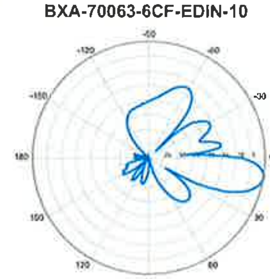


8° | Vertical | 750 MHz

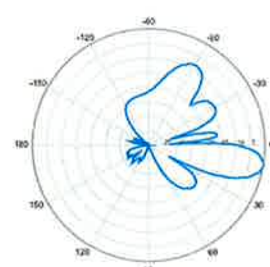


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

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Amphenol ANTENNA SOLUTIONS

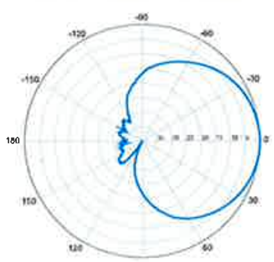
BXA-171063-8BF-EDIN-X

Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 17.4 dBi

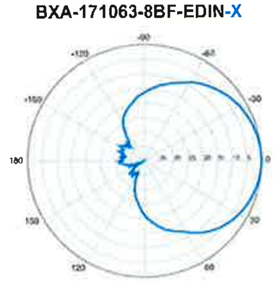
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 6, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	< -25 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1225 x 154 x 105 mm	48.2 x 6.1 x 4.1 in	
Depth with t-brackets	133 mm	5.2 in	
Weight without mounting brackets	4.2 kg	9.2 lbs	
Survival wind speed	296 km/hr	184 mph	
Wind area	Front: 0.19 m² Side: 0.14 m²	Front: 2.0 ft² Side: 1.5 ft²	
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 lbf	
Mounting Options	**Part Number**	**Fits Pipe Diameter**	**Weight**
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-8BF-EDIN-X-FP		

BXA-171063-8BF-EDIN-X



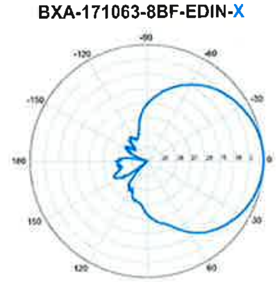
Horizontal | 1710-1880 MHz

BXA-171063-8BF-EDIN-X



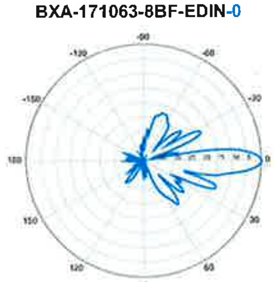
Horizontal | 1850-1990 MHz

BXA-171063-8BF-EDIN-X



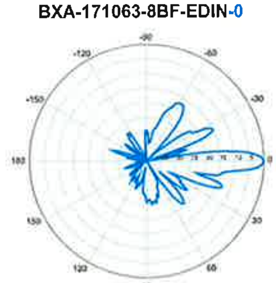
Horizontal | 1920-2170 MHz

BXA-171063-8BF-EDIN-0



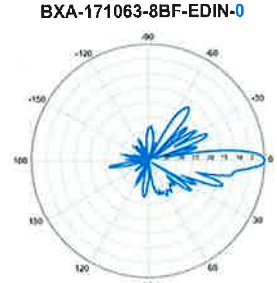
0° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-0



0° | Vertical | 1920-2170 MHz

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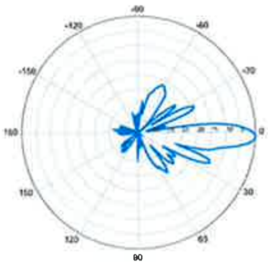
BXA-171063-8BF-EDIN-X

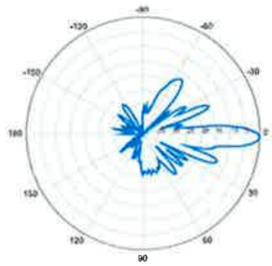
X-Pol | FET Panel | 63° | 17.4 dBi

BXA-171063-8BF-EDIN-2



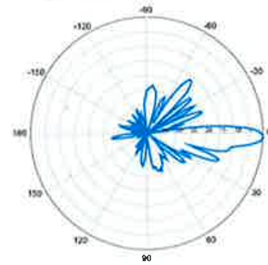
2° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-2



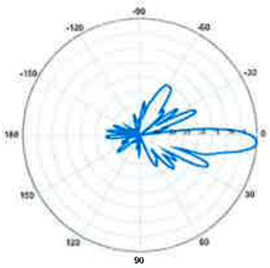
2° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-2



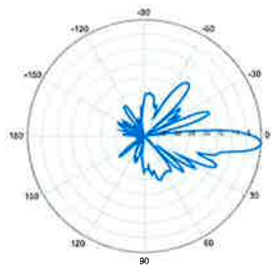
2° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-4



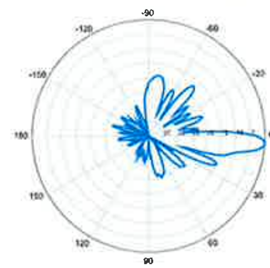
4° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-4



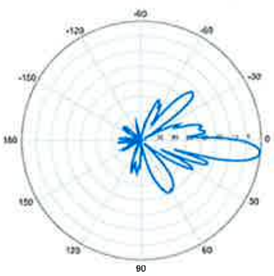
4° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-4



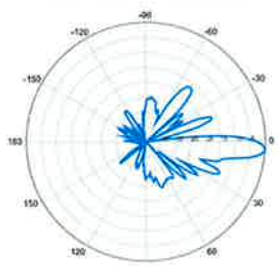
4° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-6



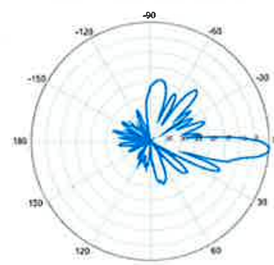
6° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-6



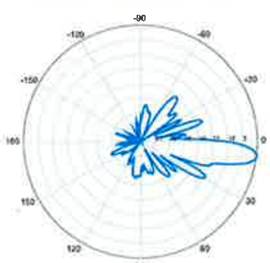
6° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-6



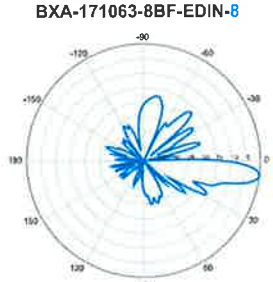
6° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-8



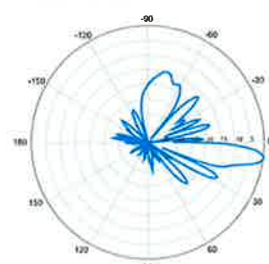
8° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-8



8° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-8



8° | Vertical | 1920-2170 MHz

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

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

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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

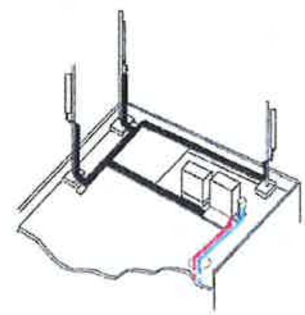
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and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

Features

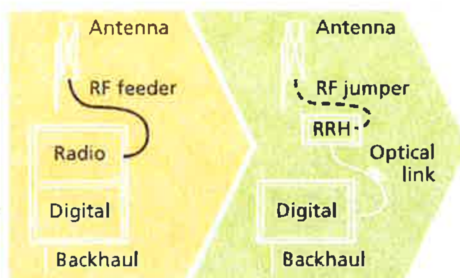
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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

Benefits

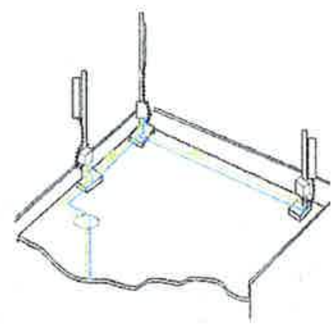
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48V

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Alarms and ports

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

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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

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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

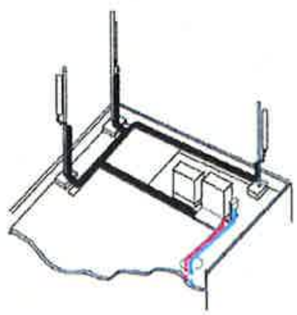
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

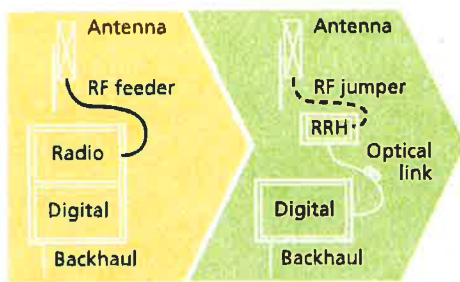
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

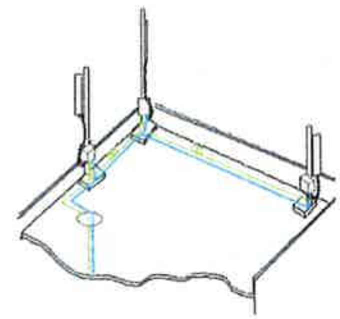
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

CPG2809100912 (09)

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Features/Benefits

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

Figure 1: HYBRIFLEX Series

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	.068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

* This data is provisional and subject to change

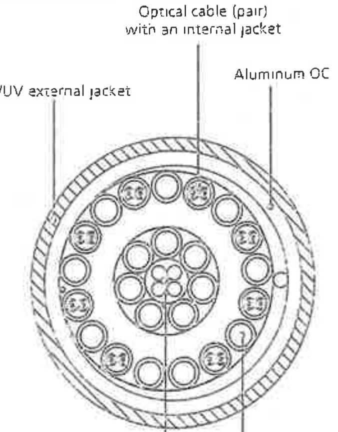


Figure 2: Construction Detail

ATTACHMENT 2

Far Field Approximation
with downtilt variation

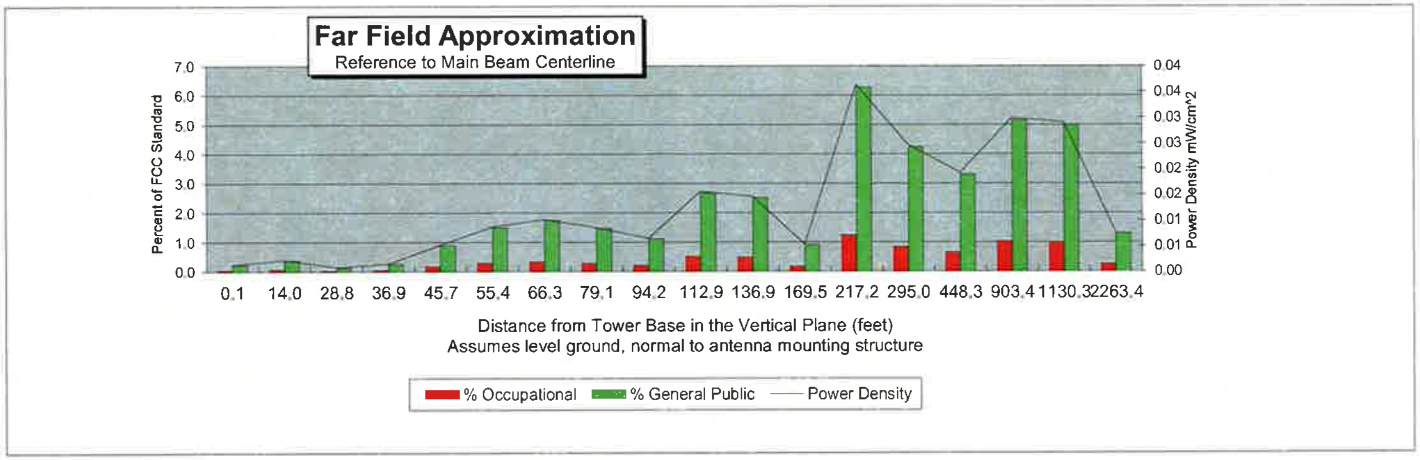
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STRATFORD, CT
Site #:	5-0021
Date:	02/18/14
Name:	Ryan Ulanday
File Name:	Stratford, CT - FF Power

Operating Freq. (MHz)	869.0
Antenna Height (ft):	82.0
Antenna Gain (dBi):	16.7
Antenna Size (in.):	71.1
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	3843.0



This approximation is only valid in the far field, which begins at: 62.7 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	79.0	80.2	84.1	87.2	91.2	96.5	103.2	111.8	123.0	137.8	158.1	187.0	231.1	305.4	455.2	906.9	1133.1	2264.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	14.0	28.8	36.9	45.7	55.4	66.3	79.1	94.2	112.9	136.9	169.5	217.2	295.0	448.3	903.4	1130.3	2263.4	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.04	0.02	0.02	0.03	0.03	0.01	#NUM!
Percent of Occupational Standard	0.0	0.1	0.0	0.1	0.2	0.3	0.3	0.3	0.2	0.5	0.5	0.2	1.3	0.8	0.7	1.0	1.0	0.3	#NUM!
Percent of General Population Standard	0.2	0.4	0.1	0.3	0.9	1.5	1.7	1.5	1.1	2.7	2.5	0.9	6.3	4.2	3.3	5.2	5.0	1.3	#NUM!

Antenna Type BXA-70063-6CF4
Max% 6.27%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

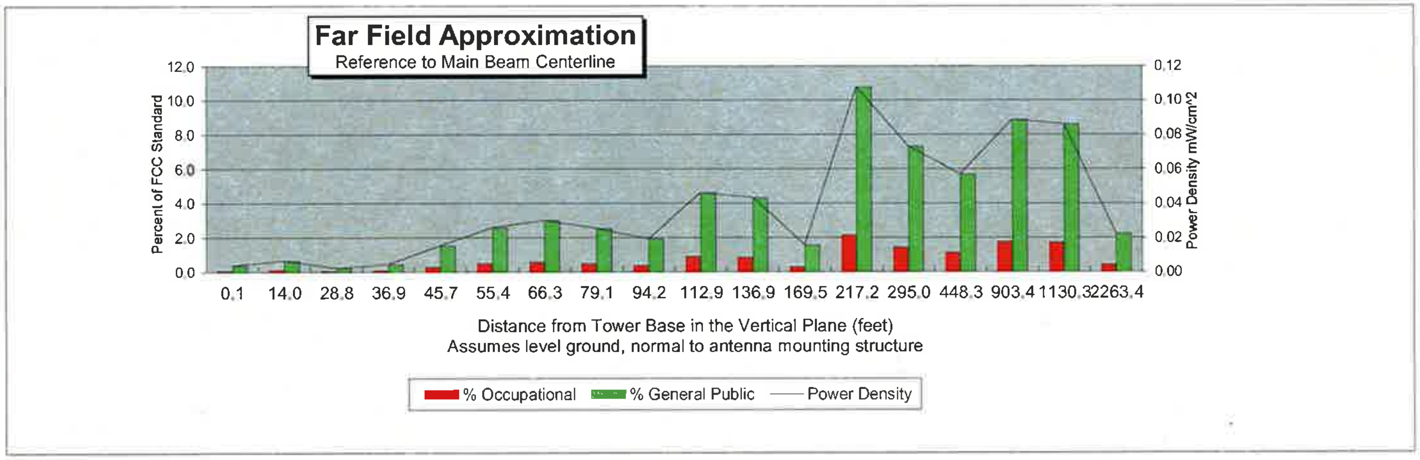
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STRATFORD, CT
Site #:	5-0021
Date:	02/18/14
Name:	Ryan Ulanday
File Name:	Stratford, CT - FF Power

Operating Freq. (MHz)	1971.0
Antenna Height (ft):	82.0
Antenna Gain (dBi):	18.7
Antenna Size (in.):	54.3
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	7185.0



This approximation is only valid in the far field, which begins at: 36.7 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	79.0	80.2	84.1	87.2	91.2	96.5	103.2	111.8	123.0	137.8	158.1	187.0	231.1	305.4	455.2	906.9	1133.1	2264.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	14.0	28.8	36.9	45.7	55.4	66.3	79.1	94.2	112.9	136.9	169.5	217.2	295.0	448.3	903.4	1130.3	2263.4	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.01	0.00	0.00	0.02	0.03	0.03	0.03	0.02	0.05	0.04	0.02	0.11	0.07	0.06	0.09	0.09	0.02	#NUM!
Percent of Occupational Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	0.9	0.9	0.3	2.2	1.5	1.1	1.8	1.7	0.5	#NUM!
Percent of General Population Standard	0.4	0.7	0.2	0.4	1.5	2.6	3.0	2.5	1.9	4.6	4.3	1.6	10.8	7.3	5.7	8.9	8.6	2.3	#NUM!

Antenna Type MG D3-800T0
Max% 10.77%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

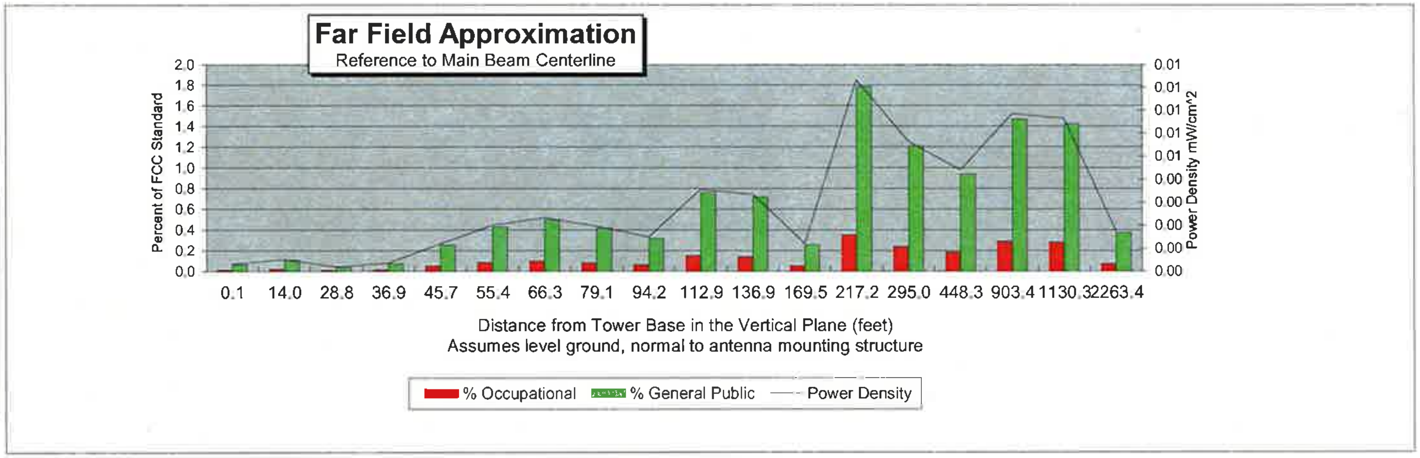
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	STRATFORD, CT
Site #:	5-0021
Date:	02/18/14
Name:	Ryan Ulanday
File Name:	Stratford, CT - FF Power

Operating Freq. (MHz)	**698.0**
Antenna Height (ft):	**82.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**71.1**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**879.0**



This approximation is only valid in the far field, which begins at: 62.7 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	79.0	80.2	84.1	87.2	91.2	96.5	103.2	111.8	123.0	137.8	158.1	187.0	231.1	305.4	455.2	906.9	1133.1	2264.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	14.0	28.8	36.9	45.7	55.4	66.3	79.1	94.2	112.9	136.9	169.5	217.2	295.0	448.3	903.4	1130.3	2263.4	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.4	0.2	0.2	0.3	0.3	0.1	#NUM!
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.4	0.5	0.4	0.3	0.8	0.7	0.3	1.8	1.2	0.9	1.5	1.4	0.4	#NUM!

Antenna Type BXA-70063-6CF4
Max% 1.79%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Po
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

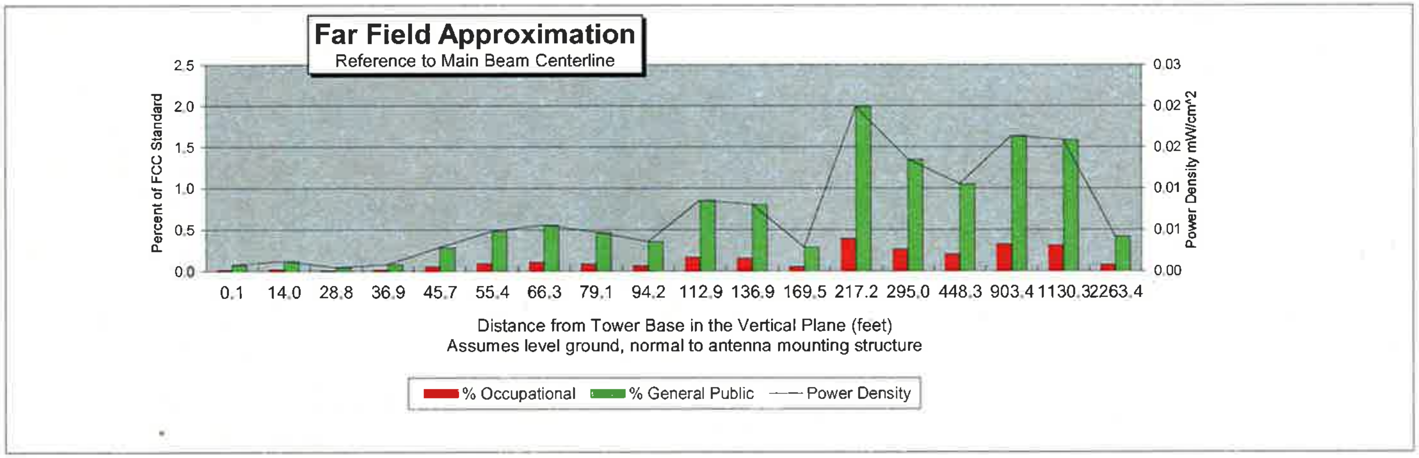
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Stratford, CT
Site #:	5-0021
Date:	02/18/14
Name:	Ryan Ulanday
File Name:	Stratford, CT - FF Power

Operating Freq. (MHz)	2110.0
Antenna Height (ft):	82.0
Antenna Gain (dBi):	17.5
Antenna Size (in.):	48.5
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	1750.0



This approximation is only valid in the far field, which begins at: 29.2 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	79.0	80.2	84.1	87.2	91.2	96.5	103.2	111.8	123.0	137.8	158.1	187.0	231.1	305.4	455.2	906.9	1133.1	2264.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	14.0	28.8	36.9	45.7	55.4	66.3	79.1	94.2	112.9	136.9	169.5	217.2	295.0	448.3	903.4	1130.3	2263.4	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.02	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.3	0.3	0.1	#NUM!
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	0.9	0.8	0.3	2.0	1.3	1.0	1.6	1.6	0.4	#NUM!

Antenna Type BXA-171063-8BF
Max% 1.99%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 3

URS

PASS
(Shaft, 100% capacity)

vertical solutions "execute & deliver"

January 27, 2014

Mr. Michael J. Egan III, AIA
URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067-3913
(860) 990-6737

Vertical Solutions, Inc.
PO Box 579
Holly Springs, NC 27540
(888) 321-6167
operations@verticalsolutions-inc.com

Subject	**Rigorous Structural Analysis**
Carrier Designation	**Verizon, Reconfiguration** **Site Number: Stratford** **Site Name: VZ5-156**
URS Designation	**Site Number: 36917405.00000** **Site Name: Stratford, CT**
Engineering Firm Designation	**Vertical Solutions Project: 140008.01, Revision 0**
Site Data	**627 Honeyspot Road, Stratford, Fairfield County, CT 06615** **Latitude: N41° 10' 36.91"±, Longitude: W073° 08' 45.71"±** **Elevation: 25-ft±; Topography Category 1;** **Exposure Category: "C"; Structure Class II; Site Class: "D"** **103-ft Self-Supporting Pole Structure**

Dear Mr. Egan,

To your request, we present our rigorous structural analysis. Our work indicates that with the proposed appurtenance configuration, the tower and foundation **will** satisfy the structural strength requirements of TIA/EIA-222-F, *Structural Standards for Steel Towers and Antenna Supporting Structures* (industry standard) and the *2005 Connecticut State Building Code* (local building code) for:

- 90-mph fastest mile basic wind speed
- 78-mph fastest mile basic wind speed with 1/2-in radial ice

All equipment and modifications proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We trust you find our work satisfactory. Please do not hesitate to call should you have any questions.

Sincerely,

Matthew Reeves, P.E.
Structural Engineer

Reviewed by: AVF

STATE OF CONNECTICUT
MICHAEL L. LASSITER
No. 25064
LICENSED
PROFESSIONAL ENGINEER
01/28/2014

Michael L. Lassiter, S.E., P.E.
Structural Engineer, Civil Engineer, & President

CT PE License No.: 25064

Table 1: Existing, Proposed and Reserved Appurtenance Configuration[2]

Elevation (AGL, ft)	Carrier	Mount	Equipment	Coax	Location[1]
101	Metro PCS	(3) 5-ft T-Arms	(6) Kathrein 800-10504	(12) 7/8 (1) 3/8 RET	Inside
92	AT&T	Platform w/ Handrails	(6) Powerwave 7770.00 (12) LGP21401 (3) KMW AM-X-CD-16-65-00T (1) Raycap DC6-48-60-18-8F (6) Ericsson RRUS-11	(12) 7/8 (1) 1/2 (2) 7/8 DC Cables (1) 3/8[3]	Inside[3]
	--	--	Climbing Ladder	--	--
82	***Verizon***	Platform w/ Handrails	(3) Rymsa MGD3-800TO ***(3) BXA-171063-8BFEDIN-0*** ***(3) RH_2x40-AWS*** ***(1) DB-T1-6Z-8AB-0Z*** ***(6) BXA-7063-6CF*** ***(3) RH_2x40-700 MHz***	(12) 7/8 (1) 1/2 ***(1) HB158-1-08U8-S8J18*** ***(12) HB114-1-08U4-S4J18***	***Inside***
	--	--	Climbing Ladder	--	--
71	Sprint	(3) 12-ft T-Arms	(2) Andrew 2' Dishes w/ Radome (1) Andrew PX2F-52-NXA (3) Samsung U-RAS (3) Argus LLPX310R (1) Junction Box (6) Decibel 950F85T2E-M	(6) 1 1/4" (3) 2" Flex (2) 1/2	Outside[4]
58	Nextel	Flush	(3) EMS DR65-12-05DBL	(12) 1 1/4	Inside
28	Unknown	(1) 12-ft T-Arm w/ (2) 4-ft Stand-offs	(2) 2.5" x 12' Omni (1) 3" x 20' Omni (3) 2" x 10' Omni (1) GPS Antenna	(8) 1/2 (1) 1 1/4	Inside

1. See coax configuration plan, QP-P for coax locations.
2. Tower loading per URS analysis dated April 10, 2013.
3. (1) 3/8 RET coax located on outside of monopole.
4. Coax location were assumed based on previous analysis.

Table 2: Tower Structure Results, Percent Capacity Utilized

Elevation (ft)	Shaft	Result	Connections	Result
103.0 to 90.1[1]	35	O. K.	12[3]	O. K.
90.1 to 64.1	95	O. K.	--	--
64.1 to 45.1[2]	88	O. K.	--	--
45.1 to 32.1[2]	99	O. K.	--	--
32.1 to 0.1[2]	**100**	**O. K.**	91	O. K.

1. Extension geometry per URS analysis dated April 10, 2013.
2. Section reinforced with bar modifications; see additional calculations for results.
3. Extension size and connection based on previous analysis and tower top flange dimensions.

Table 3: Foundation Results, Percent Capacity Utilized

Component	Design Capacity	Analysis Requirement	Percent Utilized	Result
Soil	16.0' caisson	13.0' caisson	81	O. K.
Structure – Flexure (kip-ft)	3041	2436	80	O. K.

ASSUMPTIONS

This rigorous 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. Vertical Solutions, Inc. ("VSI") 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 based on industry standards.
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 ±5' AGL, antenna size accurate to ±3.3 sf, and coax equal to the number of existing antennas without reserve.
11. Documents reviewed and used in this structural analysis were provided by CLIENT.
12. The proposed coax shall be installed per the attached coax layout plan, Sheet QP-P.
13. Leg A is determined per best industry practice.

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

DISCLAIMER OF WARRANTIES

Vertical Solutions, Inc. ("VSI") has not performed a detailed 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 VSI in connection with this Rigorous 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.

VSI 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. VSI 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 VSI, but are beyond the scope of this report.

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.

VSI makes no warranties, expressed and/or implied, in connection with this report and disclaim any liability arising from material, fabrication, and erection of this tower. VSI 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 VSI pursuant to this report will be limited to the total fee received for preparation of this report.

Attachments:

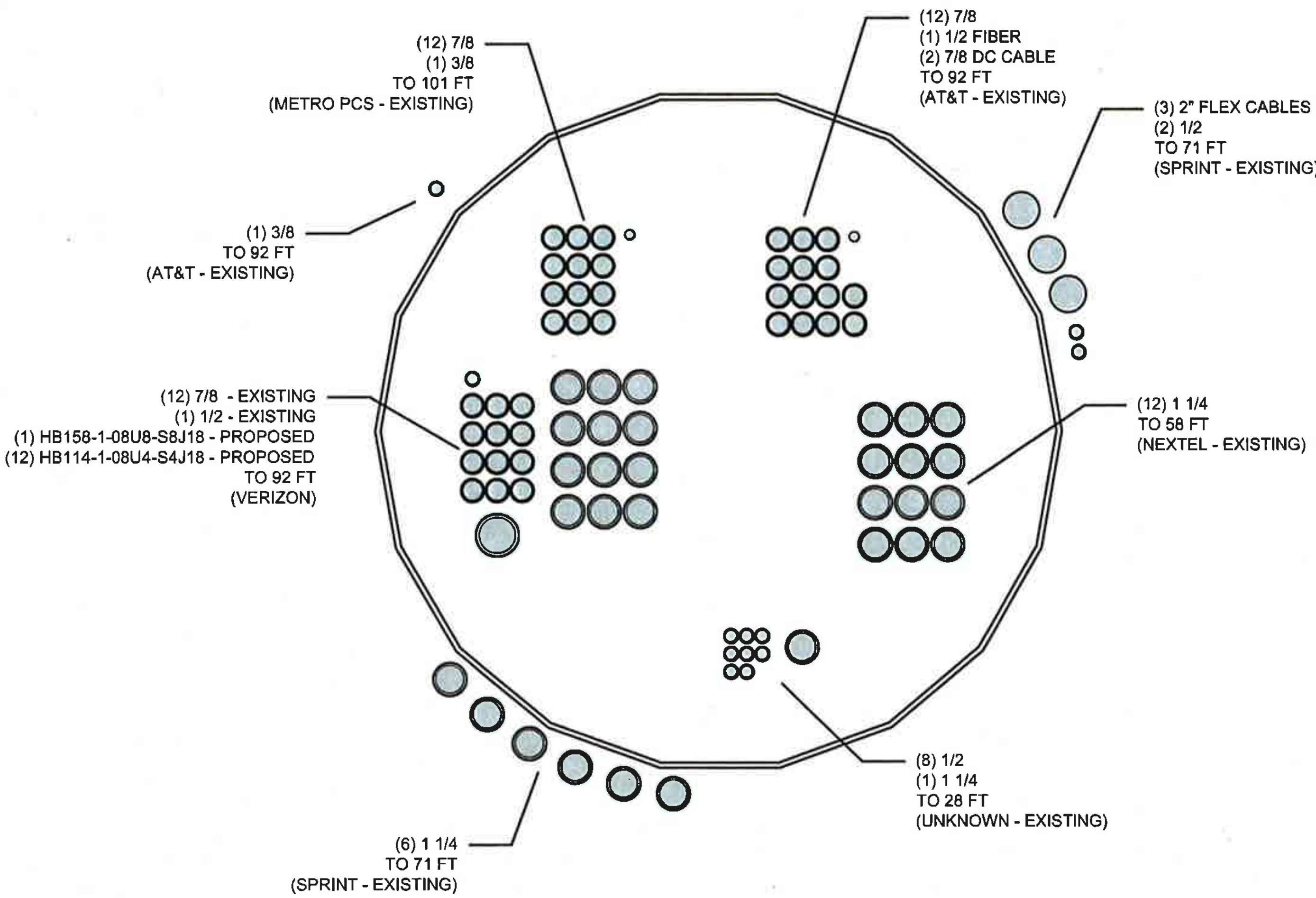
- Project History
- Sheet QP-P, Coax configuration plan
- Program input and output – wind
- Tower improvement calculations
- Sheet FPL, Flange plate layout
- Flange plate and flange bolt calculations
- Sheet BPL, Base plate layout
- Base plate and anchor rod calculations
- Foundation analysis
- Tower Improvement Drawings [For Construction]

Project History

VSi Project #: 140008, Revision 0
URS Site ID: VZ5-156
URS Site Name: Stratford, CT

Issued Date	Document ID	Issued By	Issued To	Description
09/08/1999	19990908_GEO_Stratford.pdf	Dr. Clarence Welti, P.E., P.C.	URS Greiner	Geotechnical Report
09/10/1999	19990910_TDD_Stratford.pdf	EEI	URS Greiner	Tower Design Drawings
10/19/1999	19990910_FDD_Stratford.pdf	EEI	URS Greiner	Foundation Design Drawings
				Extension Design Drawings
04/10/2013	20130410_SAR_Stratford.pdf	URS	Verizon	Structural Analysis Report

Table Note:
Files name format YYYYMMDD-XXX-ZZZZZZ.pdf
Where:
YYYYMMDD = Year, Month, Day published/issued
XXX=file describer
ZZZZZZ=City of Asheville Site Name



COAX CONFIGURATION PLAN

SCALE: 1" = 1'–0"

PROJECT INFORMATION:

STRATFORD, CT
VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

REV	DATE:	Issued For:
0	01-23-14	PSAR

DRAWN BY: MER | CHECKED BY: AVF

SHEET NUMBER: **QP-P**

REVISION: 0

VSI #: 140008

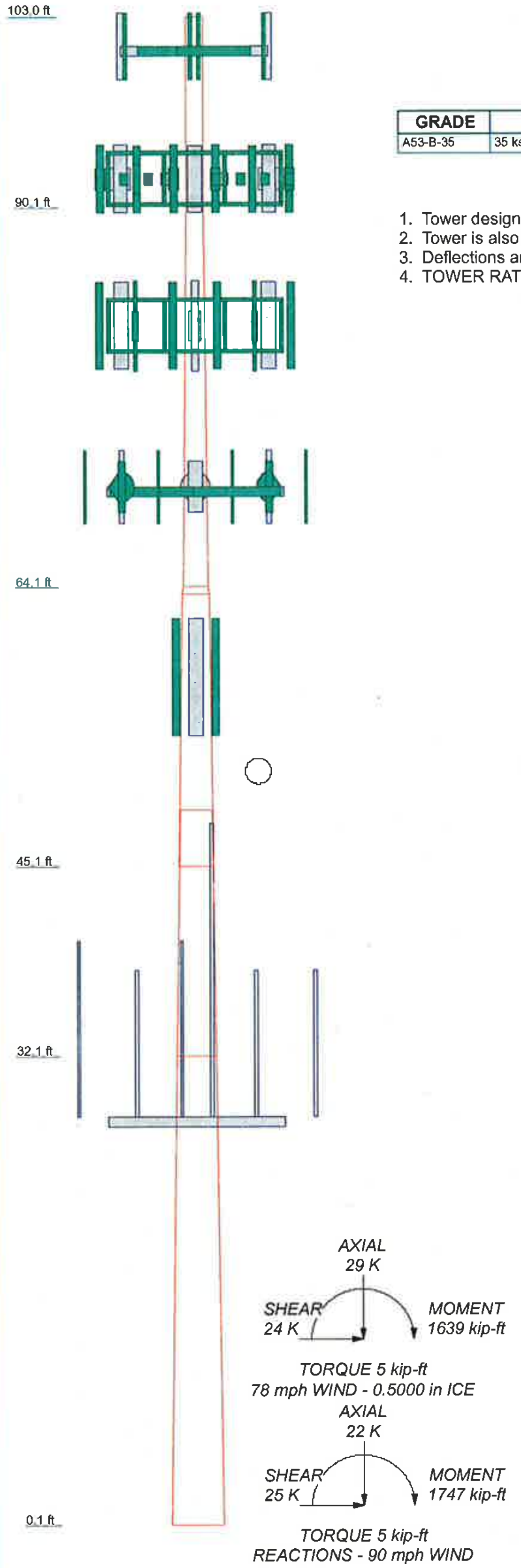
PLANS PREPARED FOR:

URS
500 Enterprise Drive
Suite 3B
Rocky Hill, CT 06067
Office: (860) 990-6737

PLANS PREPARED BY:

vertical solutions "execute & deliver"
2002 Production Drive
Apex, NC 27539
Office: (888) 321-6167
Fax: (919) 321-1768

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	12.9167	1	0.2500		13.0000	13.0000	A53-B-35	0.4
2	25.9375	18	0.2500		13.0000	20.9200		1.2
3	0.5000	18	0.2709		20.9200	22.4500	A572-65	0.0
4	18.5703	18	0.3384	3.8490	22.4500	27.7800		1.7
5	16.7786	18	0.2964		25.9986	31.7300		1.5
6	32.0000	18	0.3074		31.7300	41.5000		3.9
								8.7



MATERIAL STRENGTH

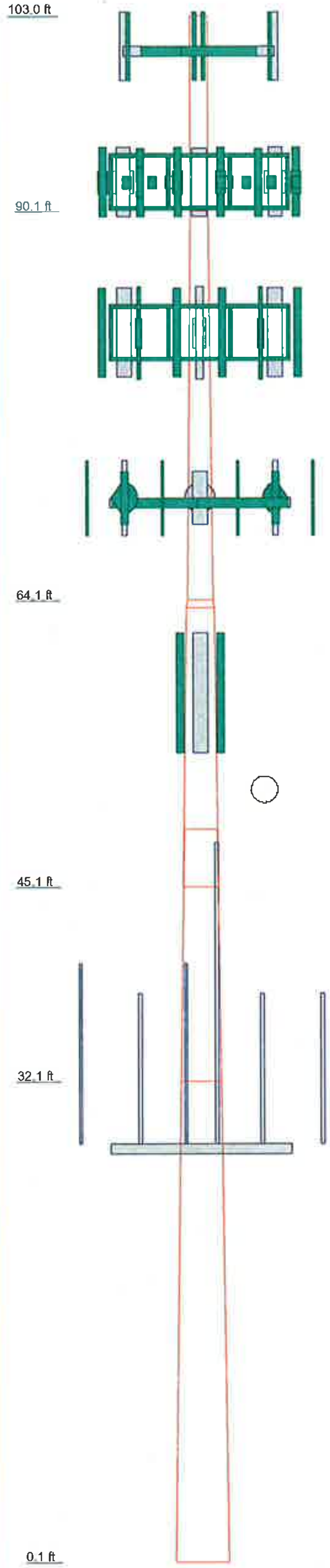
GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 78 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. TOWER RATING: 99.9%

Vertical Solutions, Inc 2002 Production Dr. Apex, NC 27539 Phone: (888) 321-3167 FAX: (888) 321-1768	Job: Stratford, CT (VZ5-156)		
	Project: VSI # 140008.01, Rev. 0 (100%)		
	Client: URS Corporation	Drawn by: MER	App'd:
	Code: TIA/EIA-222-F	Date: 01/22/14	Scale: NTS
	Path: [illegible]		Dwg No. E-1

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	12.9167	1	0.2500		13.0000	13.0000	A53-B-35	0.4
2	25.9375	18	0.2500		13.0000	20.9200		1.2
3	0.5000	18	0.2709		20.9200	22.4500	A572-65	0.0
4	18.5703	18	0.3384	3.8490	22.4500	27.7800		1.7
5	16.7786	18	0.2964		25.9986	31.7300		1.5
6	32.0000	18	0.3074		31.7300	41.5000		3.9
								8.7



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION
(2) Kathrein 800-10504 w/ 60" MP (Metro PCS)	101
(2) Kathrein 800-10504 w/ 60" MP (Metro PCS)	101
(2) Kathrein 800-10504 w/ 60" MP (Metro PCS)	101
Valmont 5-ft T-Arm (TA702-1) (Metro PCS)	101
Valmont 5-ft T-Arm (TA702-1) (Metro PCS)	101
Valmont 5-ft T-Arm (TA702-1) (Metro PCS)	101
(2) Powerwave 7770.00 with Mount Pipe (ATI)	92
(2) Powerwave 7770.00 with Mount Pipe (ATI)	92
(2) Powerwave 7770.00 with Mount Pipe (ATI)	92
(4) Powerwave LGP21401 (ATI)	92
(4) Powerwave LGP21401 (ATI)	92
(4) Powerwave LGP21401 (ATI)	92
KMW AM-X-CD-16-65-00T-RET (54") w/ 60" MP (ATI)	92
KMW AM-X-CD-16-65-00T-RET (54") w/ 60" MP (ATI)	92
KMW AM-X-CD-16-65-00T-RET (54") w/ 60" MP (ATI)	92
Raycap DC6-48-60-18-8F (ATI)	92
(2) Ericsson RRUS-11 (ATI)	92
(2) Ericsson RRUS-11 (ATI)	92
(2) Ericsson RRUS-11 (ATI)	92
PiROD 12' Platform w / handrails (ATI)	92
Climbing Ladder (ATI)	92
RYMSA MGV3-900T2 (Verizon)	82
RYMSA MGV3-900T2 (Verizon)	82
RYMSA MGV3-900T2 (Verizon)	82
PiROD 12' Platform w / handrails (Verizon)	82
Climbing Ladder (Verizon)	82
Amphenol BXA-171063-8BF-EDIN-X w/ 60" MP (Verizon)	82
Amphenol BXA-171063-8BF-EDIN-X w/ 60" MP (Verizon)	82
Amphenol BXA-171063-8BF-EDIN-X w/ 60" MP (Verizon)	82
Alcatel-Lucent RRH2x40-AWS (Verizon)	82
Alcatel-Lucent RRH2x40-AWS (Verizon)	82
Alcatel-Lucent RRH2x40-AWS (Verizon)	82
DB-T1-6Z-8AB-0Z (Verizon)	82
(2) Amphenol BXA-70063-6CF-EDIN-X w/ 96" MP (Verizon)	82
(2) Amphenol BXA-70063-6CF-EDIN-X w/ 96" MP (Verizon)	82
(2) Amphenol BXA-70063-6CF-EDIN-X w/ 96" MP (Verizon)	82
Alcatel-Lucent RRH2x40-700 (Verizon)	82
Alcatel-Lucent RRH2x40-700 (Verizon)	82
Alcatel-Lucent RRH2x40-700 (Verizon)	82
2SCH40x84" (Sprint)	71
2SCH40x84" (Sprint)	71
2SCH40x84" (Sprint)	71
U-RAS (Sprint)	71
U-RAS (Sprint)	71
U-RAS (Sprint)	71
Argus LLPX310R w Mount Pipe (Sprint)	71
Argus LLPX310R w Mount Pipe (Sprint)	71
Argus LLPX310R w Mount Pipe (Sprint)	71
Junction Box (Sprint)	71
(2) Decibel 950F85T2E-M w/ 60" MP (Sprint)	71
(2) Decibel 950F85T2E-M w/ 60" MP (Sprint)	71
(2) Decibel 950F85T2E-M w/ 60" MP (Sprint)	71
12' T-Arm Mount (Sprint)	71
12' T-Arm Mount (Sprint)	71
12' T-Arm Mount (Sprint)	71
2' Dish w/ Radome (Sprint)	71
2' Dish w/ Radome (Sprint)	71
Andrew PX2F-52 (Sprint)	71
EMS DR65-12-05DBL w Mount Pipe (Nextel)	58
EMS DR65-12-05DBL w Mount Pipe (Nextel)	58
EMS DR65-12-05DBL w Mount Pipe (Nextel)	58
12-ft Omni	28
2.5SCH40x72	28
20' Omni	28
2.5SCH40x72	28
10' Omni	28
2.5SCH40x72	28
10' Omni	28
12' T-Arm Mount	28
Side Arm	28
Side Arm	28
12-ft Omni	28
10' Omni	28
2.5SCH40x72	28

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 78 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.

Vertical Solutions, Inc
2002 Production Dr.
Apex, NC 27539
Phone: (888) 321-3167
FAX: (888) 321-1768

Job: Stratford, CT (VZ5-156)			
Project: VSI # 140008.01, Rev. 0 (100%)			
Client: URS Corporation	Drawn by: MER	App'd:	
Code: TIA/EIA-222-F	Date: 01/22/14	Scale: NTS	
Path: [illegible]		Dwg No. E-1	

Vertical Solutions, Inc
2002 Production Dr.
Apex, NC 27539
Phone: (888) 321-3167
FAX: (888) 321-1768

Tower Input Data

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

- Basic wind speed of 90 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 78 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.

Options

Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
√ Leg Bolts Are At Top Of Section
√ Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
Add IBC .6D+W Combination

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
√ Retension Guys To Initial Tension
√ Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
√ Autocalc Torque Arm Areas
SR Members Have Cut Ends
Sort Capacity Reports By Component
√ Triangulate Diamond Inner Bracing

Treat Feedline Bundles As Cylinder
Use ASCE 10 X-Brace Ly Rules
√ Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feedline Torque
Include Angle Block Shear Check
Poles
√ Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets

Tapered Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Splice Length* *ft*	*Number of Sides*	*Top Diameter* *in*	*Bottom Diameter* *in*	*Wall Thickness* *in*	*Bend Radius* *in*	*Pole Grade*
L1	103.0000-90.0833	12.9167	0.00	Round	13.0000	13.0000	0.2500		A53-B-35 (35 ksi)
L2	90.0833-64.1458	25.9375	0.00	18	13.0000	20.9200	0.2500	1.0000	A572-65 (65 ksi)
L3	64.1458-63.6458	0.5000	0.00	18	20.9200	22.4500	0.2709	1.0836	A572-65 (65 ksi)
L4	63.6458-45.0755	18.5703	3.85	18	22.4500	27.7800	0.3384	1.3534	A572-65 (65 ksi)
L5	45.0755-32.1458	16.7786	0.00	18	25.9986	31.7300	0.2964	1.1856	A572-65 (65 ksi)
L6	32.1458-0.1458	32.0000		18	31.7300	41.5000	0.3074	1.2294	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	13.0000	10.0138	203.6400	4.5135	6.5000	31.3292	406.7253	5.0039	0.0000	0
	13.0000	10.0138	203.6400	4.5135	6.5000	31.3292	406.7253	5.0039	0.0000	0
L2	13.2005	10.1171	207.7854	4.5263	6.6040	31.4636	415.8441	5.0595	1.8480	7.392
	21.2427	16.4016	885.3313	7.3379	10.6274	83.3068	1771.8275	8.2024	3.2419	12.968
L3	21.2427	17.7543	956.4073	7.3304	10.6274	89.9948	1914.0731	8.8788	3.2052	11.832
	22.7963	19.0698	1185.1443	7.8736	11.4046	103.9181	2371.8481	9.5367	3.4744	12.826
L4	22.7963	23.7467	1466.8394	7.8496	11.4046	128.6182	2935.6090	11.8756	3.3557	9.918
	28.2086	29.4708	2803.8183	9.7418	14.1122	198.6799	5611.3260	14.7382	4.2938	12.69
L5	27.7347	24.1809	2018.1287	9.1243	13.2073	152.8043	4038.9129	12.0927	4.0541	13.677
	32.2195	29.5731	3691.6628	11.1589	16.1188	229.0278	7388.1832	14.7894	5.0628	17.08
L6	32.2195	30.6539	3823.9196	11.1550	16.1188	237.2329	7652.8709	15.3299	5.0435	16.41
	42.1402	40.1849	8614.6879	14.6234	21.0820	408.6276	17240.7112	20.0963	6.7631	22.004

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 103.0000-90.0833				1	1	1		
L2 90.0833-64.1458				1	1	1		
L3 64.1458-63.6458				1	1	1		
L4 63.6458-45.0755				1	1	1		
L5 45.0755-32.1458				1	1	1		
L6 32.1458-0.1458				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
3/8 RET (AT&T)	B	Surface Ar (CaAa)	92.1458 - 22.1458	1	1	0.000 0.000	0.4400		0.08
**********									
LDF6-50A (1-1/4 FOAM) (Sprint)	A	Surface Ar (CaAa)	71.1458 - 19.6458	6	6	-0.188 0.188	1.5500		0.66
2" Superflex Conduit (Sprint)	C	Surface Ar (CaAa)	71.1458 - 19.6458	3	3	-0.302 -0.124	2.0000		1.00
LDF4RN-50A (1/2 FOAM) (Sprint)	C	Surface Ar (CaAa)	71.1458 - 19.6458	2	2	-0.124 -0.070	0.6300		0.15

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF5-50A (7/8 FOAM) (Metro PCS)	C	No	Inside Pole	101.1458 - 24.1458	12	No Ice	0.0000	0.33
						1/2" Ice	0.0000	0.33

Description	*Face or Leg*	*Allow Shield*	*Component Type*	*Placement* *ft*	*Total Number*		C_AA_A *ft²/ft*	*Weight* *plf*
3/8 RET (Metro PCS)	C	No	Inside Pole	101.1458 - 24.1458	1	No Ice 1/2" Ice	0.0000 0.0000	0.08 0.08
**********								
LDF5-50A (7/8 FOAM) (AT&T)	C	No	Inside Pole	92.1458 - 22.1458	12	No Ice 1/2" Ice	0.0000 0.0000	0.33 0.33
LDF4-50A (1/2 FOAM) (AT&T)	C	No	Inside Pole	92.1458 - 24.1458	1	No Ice 1/2" Ice	0.0000 0.0000	0.15 0.15
7/8" DC Cable (AT&T)	C	No	Inside Pole	92.1458 - 24.1458	2	No Ice 1/2" Ice	0.0000 0.0000	0.33 0.33
**********								
LDF5-50A (7/8 FOAM) (Verizon)	C	No	Inside Pole	82.1458 - 24.1458	12	No Ice 1/2" Ice	0.0000 0.0000	0.33 0.33
LDF4RN-50A (1/2 FOAM) (Verizon)	C	No	Inside Pole	82.1458 - 24.1458	1	No Ice 1/2" Ice	0.0000 0.0000	0.15 0.15
*								
HB158-1-08U8-S8J18 (Verizon)	C	No	Inside Pole	82.1458 - 24.1458	1	No Ice 1/2" Ice	0.0000 0.0000	0.82 0.82
HB114-1-08U4-S4J18 (Verizon)	C	No	Inside Pole	82.1458 - 24.1458	12	No Ice 1/2" Ice	0.0000 0.0000	0.66 0.66
**********								
LDF6-50A (1-1/4 FOAM) (Nextel)	C	No	Inside Pole	58.1458 - 24.1458	12	No Ice 1/2" Ice	0.0000 0.0000	0.66 0.66
**********								
LDF4RN-50A (1/2 FOAM) (Unknown)	C	No	Inside Pole	28.1458 - 19.6458	8	No Ice 1/2" Ice	0.0000 0.0000	0.15 0.15
LDF6-50A (1-1/4 FOAM) (Unknown)	C	No	Inside Pole	28.1458 - 19.6458	1	No Ice 1/2" Ice	0.0000 0.0000	0.66 0.66

Feed Line/Linear Appurtenances Section Areas

Tower Section	*Tower Elevation* *ft*	*Face*	A_R *ft²*	A_F *ft²*	C_AA_A *In Face* *ft²*	C_AA_A *Out Face* *ft²*	*Weight* *K*
L1	103.0000-90.0833	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.091	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.05
L2	90.0833-64.1458	A	0.000	0.000	6.510	0.000	0.03
		B	0.000	0.000	1.141	0.000	0.00
		C	0.000	0.000	5.082	0.000	0.48
L3	64.1458-63.6458	A	0.000	0.000	0.465	0.000	0.00
		B	0.000	0.000	0.022	0.000	0.00
		C	0.000	0.000	0.363	0.000	0.01
L4	63.6458-45.0755	A	0.000	0.000	17.270	0.000	0.07
		B	0.000	0.000	0.817	0.000	0.00
		C	0.000	0.000	13.482	0.000	0.57
L5	45.0755-32.1458	A	0.000	0.000	12.025	0.000	0.05
		B	0.000	0.000	0.569	0.000	0.00
		C	0.000	0.000	9.387	0.000	0.43
L6	32.1458-0.1458	A	0.000	0.000	11.625	0.000	0.05
		B	0.000	0.000	0.440	0.000	0.00
		C	0.000	0.000	9.075	0.000	0.30

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	103.0000-90.0833	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.297	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.05
L2	90.0833-64.1458	A	0.500	0.000	0.000	13.802	0.000	0.06
		B		0.000	0.000	3.735	0.000	0.02
		C		0.000	0.000	14.044	0.000	0.52
L3	64.1458-63.6458	A	0.500	0.000	0.000	0.986	0.000	0.00
		B		0.000	0.000	0.072	0.000	0.00
		C		0.000	0.000	1.003	0.000	0.01
L4	63.6458-45.0755	A	0.500	0.000	0.000	36.614	0.000	0.17
		B		0.000	0.000	2.674	0.000	0.01
		C		0.000	0.000	37.258	0.000	0.65
L5	45.0755-32.1458	A	0.500	0.000	0.000	25.493	0.000	0.12
		B		0.000	0.000	1.862	0.000	0.01
		C		0.000	0.000	25.941	0.000	0.49
L6	32.1458-0.1458	A	0.500	0.000	0.000	24.646	0.000	0.12
		B		0.000	0.000	1.440	0.000	0.01
		C		0.000	0.000	25.079	0.000	0.36

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	103.0000-90.0833	0.0108	-0.0062	0.0323	-0.0187
L2	90.0833-64.1458	-0.1474	0.0500	-0.1280	0.0871
L3	64.1458-63.6458	-0.3955	0.1511	-0.3726	0.2387
L4	63.6458-45.0755	-0.4203	0.1598	-0.4090	0.2613
L5	45.0755-32.1458	-0.4472	0.1693	-0.4511	0.2875
L6	32.1458-0.1458	-0.2257	0.0859	-0.2911	0.1846

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
(2) Kathrein 800-10504 w/ 60" MP (Metro PCS)	A	From Leg	2.0000 0.00 0.00	0.0000	101.0000	No Ice 1/2" Ice	3.4680 3.8438	3.0484 3.6837	0.04 0.07
(2) Kathrein 800-10504 w/ 60" MP (Metro PCS)	B	From Leg	2.0000 0.00 0.00	0.0000	101.0000	No Ice 1/2" Ice	3.4680 3.8438	3.0484 3.6837	0.04 0.07
(2) Kathrein 800-10504 w/ 60" MP (Metro PCS)	C	From Leg	2.0000 0.00 0.00	0.0000	101.0000	No Ice 1/2" Ice	3.4680 3.8438	3.0484 3.6837	0.04 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Valmont 5-ft T-Arm (TA702-1) (Metro PCS)	A	From Leg	1.0000 0.00 0.00	0.0000	101.0000	No Ice 1/2" Ice	2.7800 3.3900	2.2300 2.4300	0.11 0.14
Valmont 5-ft T-Arm (TA702-1) (Metro PCS)	B	From Leg	1.0000 0.00 0.00	0.0000	101.0000	No Ice 1/2" Ice	2.7800 3.3900	2.2300 2.4300	0.11 0.14
Valmont 5-ft T-Arm (TA702-1) (Metro PCS)	C	From Leg	1.0000 0.00 0.00	0.0000	101.0000	No Ice 1/2" Ice	2.7800 3.3900	2.2300 2.4300	0.11 0.14
*****************									
(2) Powerwave 7770.00 with Mount Pipe (AT&T)	A	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	5.9809 6.4387	4.1157 4.7686	0.05 0.10
(2) Powerwave 7770.00 with Mount Pipe (AT&T)	B	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	5.9809 6.4387	4.1157 4.7686	0.05 0.10
(2) Powerwave 7770.00 with Mount Pipe (AT&T)	C	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	5.9809 6.4387	4.1157 4.7686	0.05 0.10
(4) Powerwave LGP21401 (AT&T)	A	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	1.2880 1.4453	0.2326 0.3134	0.01 0.02
(4) Powerwave LGP21401 (AT&T)	B	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	1.2880 1.4453	0.2326 0.3134	0.01 0.02
(4) Powerwave LGP21401 (AT&T)	C	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	1.2880 1.4453	0.2326 0.3134	0.01 0.02
KMW AM-X-CD-16-65-00T-RET (54") w/ 60" MP (AT&T)	A	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	6.7337 7.2005	5.3193 6.0327	0.05 0.11
KMW AM-X-CD-16-65-00T-RET (54") w/ 60" MP (AT&T)	B	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	6.7337 7.2005	5.3193 6.0327	0.05 0.11
KMW AM-X-CD-16-65-00T-RET (54") w/ 60" MP (AT&T)	C	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	6.7337 7.2005	5.3193 6.0327	0.05 0.11
Raycap DC6-48-60-18-8F (AT&T)	C	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	1.4667 1.6667	1.4667 1.6667	0.02 0.04
(2) Ericsson RRUS-11 (AT&T)	A	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	2.9419 3.1718	1.2460 1.4124	0.05 0.07
(2) Ericsson RRUS-11 (AT&T)	B	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	2.9419 3.1718	1.2460 1.4124	0.05 0.07
(2) Ericsson RRUS-11 (AT&T)	C	From Leg	4.0000 0.00 0.00	0.0000	92.0000	No Ice 1/2" Ice	2.9419 3.1718	1.2460 1.4124	0.05 0.07
PiROD 12' Platform w / handrails (AT&T)	C	None		0.0000	92.0000	No Ice 1/2" Ice	26.3000 35.6000	26.3000 35.6000	1.92 2.34
Climbing Ladder (AT&T)	C	None		0.0000	92.0000	No Ice 1/2" Ice	0.2900 0.3700	0.2400 0.3100	0.04 0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
*****************									
RYMSA &MGV3-900T2 (Verizon)	A	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	4.9766 5.4323	3.3160 3.7566	0.02 0.05
RYMSA &MGV3-900T2 (Verizon)	B	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	4.9766 5.4323	3.3160 3.7566	0.02 0.05
RYMSA &MGV3-900T2 (Verizon)	C	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	4.9766 5.4323	3.3160 3.7566	0.02 0.05
PiROD 12' Platform w / handrails (Verizon)	C	None		0.0000	82.0000	No Ice 1/2" Ice	26.3000 35.6000	26.3000 35.6000	1.92 2.34
Climbing Ladder (Verizon)	C	None		0.0000	82.0000	No Ice 1/2" Ice	0.2900 0.3700	0.2400 0.3100	0.04 0.04
*									
Amphenol BXA-171063-8BF-EDIN-X w/ 60" MP (Verizon)	A	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	3.1810 3.5527	3.4664 4.0720	0.04 0.07
Amphenol BXA-171063-8BF-EDIN-X w/ 60" MP (Verizon)	B	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	3.1810 3.5527	3.4664 4.0720	0.04 0.07
Amphenol BXA-171063-8BF-EDIN-X w/ 60" MP (Verizon)	C	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	3.1810 3.5527	3.4664 4.0720	0.04 0.07
Alcatel-Lucent RRH2x40-AWS (Verizon)	A	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	2.5217 2.7530	1.5894 1.7953	0.04 0.06
Alcatel-Lucent RRH2x40-AWS (Verizon)	B	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	2.5217 2.7530	1.5894 1.7953	0.04 0.06
Alcatel-Lucent RRH2x40-AWS (Verizon)	C	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	2.5217 2.7530	1.5894 1.7953	0.04 0.06
DB-T1-6Z-8AB-0Z (Verizon)	C	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	5.3500 5.7500	2.4000 2.7200	0.04 0.07
(2) Amphenol BXA-70063-6CF-EDIN-X w/ 96" MP (Verizon)	A	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	8.4603 9.1551	7.8785 8.9298	0.08 0.15
(2) Amphenol BXA-70063-6CF-EDIN-X w/ 96" MP (Verizon)	B	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	8.4603 9.1551	7.8785 8.9298	0.08 0.15
(2) Amphenol BXA-70063-6CF-EDIN-X w/ 96" MP (Verizon)	C	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	8.4603 9.1551	7.8785 8.9298	0.08 0.15
Alcatel-Lucent RRH2x40-700 (Verizon)	A	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	0.0000 0.0000	1.5894 1.7953	0.04 0.06
Alcatel-Lucent RRH2x40-700 (Verizon)	B	From Leg	4.0000 0.00	0.0000	82.0000	No Ice 1/2" Ice	0.0000 0.0000	1.5894 1.7953	0.04 0.06

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
			0.00						
Alcatel-Lucent RRH2x40-700 (Verizon)	C	From Leg	4.0000 0.00 0.00	0.0000	82.0000	No Ice 1/2" Ice	0.0000 0.0000	1.5894 1.7953	0.04 0.06
*****************									
2SCH40x84" (Sprint)	A	From Leg	4.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	1.6625 2.3906	1.6625 2.3906	0.03 0.04
2SCH40x84" (Sprint)	B	From Leg	4.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	1.6625 2.3906	1.6625 2.3906	0.03 0.04
2SCH40x84" (Sprint)	C	From Leg	4.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	1.6625 2.3906	1.6625 2.3906	0.03 0.04
U-RAS (Sprint)	A	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	1.7500 1.9400	0.7000 0.8500	0.03 0.04
U-RAS (Sprint)	B	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	1.7500 1.9400	0.7000 0.8500	0.03 0.04
U-RAS (Sprint)	C	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	1.7500 1.9400	0.7000 0.8500	0.03 0.04
Argus LLPX310R w Mount Pipe (Sprint)	A	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	5.0459 5.4597	3.2698 3.8161	0.04 0.08
Argus LLPX310R w Mount Pipe (Sprint)	B	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	5.0459 5.4597	3.2698 3.8161	0.04 0.08
Argus LLPX310R w Mount Pipe (Sprint)	C	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	5.0459 5.4597	3.2698 3.8161	0.04 0.08
Junction Box (Sprint)	C	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	4.2778 4.5543	1.7111 1.9099	0.01 0.04
(2) Decibel 950F85T2E-M w/ 60" MP (Sprint)	A	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	2.5347 2.8999	5.4236 6.1158	0.03 0.07
(2) Decibel 950F85T2E-M w/ 60" MP (Sprint)	B	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	2.5347 2.8999	5.4236 6.1158	0.03 0.07
(2) Decibel 950F85T2E-M w/ 60" MP (Sprint)	C	From Leg	5.0000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	2.5347 2.8999	5.4236 6.1158	0.03 0.07
12' T-Arm Mount (Sprint)	A	From Leg	2.5000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	5.8000 7.7500	3.0000 3.3000	0.85 1.10
12' T-Arm Mount (Sprint)	B	From Leg	2.5000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	5.8000 7.7500	3.0000 3.3000	0.85 1.10
12' T-Arm Mount (Sprint)	C	From Leg	2.5000 0.00 0.00	0.0000	71.0000	No Ice 1/2" Ice	5.8000 7.7500	3.0000 3.3000	0.85 1.10
*****************									
EMS DR65-12-05DBL w Mount Pipe (Nextel)	A	From Leg	0.5000 0.00 0.00	0.0000	58.0000	No Ice 1/2" Ice	11.4667 12.0833	9.4778 10.8956	0.06 0.15

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		*C_AA_A Front* ft²	*C_AA_A Side* ft²	*Weight* K
EMS DR65-12-05DBL w Mount Pipe (Nextel)	B	From Leg	0.5000 0.00 0.00	0.0000	58.0000	No Ice 1/2" Ice	11.4667 12.0833	9.4778 10.8956	0.06 0.15
EMS DR65-12-05DBL w Mount Pipe (Nextel)	C	From Leg	0.5000 0.00 0.00	0.0000	58.0000	No Ice 1/2" Ice	11.4667 12.0833	9.4778 10.8956	0.06 0.15
******************									
12-ft Omni	A	From Leg	4.0000 -8.00 6.00	0.0000	28.0000	No Ice 1/2" Ice	3.0000 4.2292	3.0000 4.2292	0.05 0.07
10' Omni	A	From Leg	4.0000 -4.00 5.00	0.0000	28.0000	No Ice 1/2" Ice	3.0000 4.0333	3.0000 4.0333	0.02 0.04
2.5SCH40x72	A	From Leg	4.0000 -4.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	1.7250 2.0883	1.7250 2.0883	0.04 0.05
12-ft Omni	A	From Leg	4.0000 -1.00 6.00	0.0000	28.0000	No Ice 1/2" Ice	3.0000 4.2292	3.0000 4.2292	0.05 0.07
2.5SCH40x72	A	From Leg	4.0000 -1.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	1.7250 2.0883	1.7250 2.0883	0.04 0.05
20' Omni	A	From Leg	4.0000 1.00 10.00	0.0000	28.0000	No Ice 1/2" Ice	6.0000 8.0333	6.0000 8.0333	0.05 0.09
2.5SCH40x72	A	From Leg	4.0000 1.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	1.7250 2.0883	1.7250 2.0883	0.04 0.05
10' Omni	A	From Leg	4.0000 4.00 5.00	0.0000	28.0000	No Ice 1/2" Ice	3.0000 4.0333	3.0000 4.0333	0.02 0.04
2.5SCH40x72	A	From Leg	4.0000 4.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	1.7250 2.0883	1.7250 2.0883	0.04 0.05
10' Omni	A	From Leg	4.0000 8.00 5.00	0.0000	28.0000	No Ice 1/2" Ice	3.0000 4.0333	3.0000 4.0333	0.02 0.04
12' T-Arm Mount	A	From Leg	2.0000 0.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	6.0000 7.5000	3.9000 4.5000	0.85 1.10
Side Arm	A	From Leg	4.0000 5.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	3.5600 5.0000	0.0000 0.0000	0.05 0.12
Side Arm	A	From Leg	4.0000 -5.00 0.00	0.0000	28.0000	No Ice 1/2" Ice	3.5600 5.0000	0.0000 0.0000	0.05 0.12

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
2' Dish w/ Radome (Sprint)	A	Paraboloid w/Radome	From Leg	4.0000 0.00 0.00	0.0000		71.0000	2.0000	No Ice 1/2" Ice	3.1400 3.4100	0.03 0.05
2' Dish w/ Radome (Sprint)	B	Paraboloid w/Radome	From Leg	4.0000 0.00 0.00	0.0000		71.0000	2.0000	No Ice 1/2" Ice	3.1400 3.4100	0.03 0.05
Andrew PX2F-52 (Sprint)	C	Paraboloid w/Radome	From Leg	4.0000 0.00 0.00	0.0000		71.0000	2.0900	No Ice 1/2" Ice	3.4300 3.7100	0.04 0.06

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	103 - 90.0833	Pole	Max Tension	36	0.00	-0.00	0.00
			Max. Compression	14	-5.44	0.15	-0.08
			Max. Mx	11	-3.19	27.26	-0.04
			Max. My	8	-3.19	0.07	-27.22
			Max. Vy	11	-6.71	27.26	-0.04
			Max. Vx	2	-6.71	0.05	27.14
			Max. Torque	7			-0.31
L2	90.0833 - 64.1458	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-16.00	0.72	-0.36
			Max. Mx	11	-10.42	338.08	-1.69
			Max. My	8	-10.44	1.78	-336.00
			Max. Vy	5	16.80	-337.37	1.22
			Max. Vx	2	-16.69	-1.14	336.00
			Max. Torque	7			-1.16
L3	64.1458 - 63.6458	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-16.06	0.73	-0.36
			Max. Mx	11	-10.48	346.49	-1.76
			Max. My	2	-10.50	-1.19	344.35
			Max. Vy	5	16.85	-345.77	1.27
			Max. Vx	2	-16.74	-1.19	344.35
			Max. Torque	13			1.17
L4	63.6458 - 45.0755	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-18.70	0.81	-0.36
			Max. Mx	11	-12.59	618.38	-3.63
			Max. My	2	-12.60	-2.78	614.61
			Max. Vy	5	19.84	-617.64	2.66
			Max. Vx	2	-19.73	-2.78	614.61
			Max. Torque	13			1.23
L5	45.0755 - 32.1458	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21.71	0.92	-0.35
			Max. Mx	11	-15.44	967.63	-5.73
			Max. My	2	-15.45	-4.59	962.00
			Max. Vy	5	21.75	-966.86	4.26
			Max. Vx	2	-21.64	-4.59	962.00
			Max. Torque	13			1.31
L6	32.1458 - 0.145833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-28.69	1.23	7.74
			Max. Mx	11	-21.74	1736.88	-4.53
			Max. My	2	-21.74	-7.81	1741.97
			Max. Vy	5	25.27	-1735.66	12.40
			Max. Vx	2	-25.48	-7.81	1741.97
			Max. Torque	4			4.90

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	103 - 90.0833	23.627	28	2.0504	0.0068

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L2	90.0833 - 64.1458	18.133	28	2.0055	0.0065
L3	64.1458 - 63.6458	8.808	28	1.3409	0.0033
L4	63.6458 - 45.0755	8.668	28	1.3282	0.0032
L5	48.9245 - 32.1458	5.059	28	1.0107	0.0026
L6	32.1458 - 0.145833	2.089	28	0.6470	0.0026

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.0000	(2) Kathrein 800-10504 w/ 60" MP	28	22.766	2.0521	0.0068	31062
92.0000	(2) Powerwave 7770.00 with Mount Pipe	28	18.933	2.0255	0.0067	5647
82.0000	RYMSA &MGV3-900T2	28	14.880	1.8496	0.0055	2869
71.0000	2' Dish w/ Radome	28	10.908	1.5343	0.0040	1852
58.0000	EMS DR65-12-05DBL w Mount Pipe	28	7.174	1.1976	0.0029	2705
28.0000	12-ft Omni	28	1.594	0.5584	0.0024	2212

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	103 - 90.0833	76.135	10	6.6113	0.0223
L2	90.0833 - 64.1458	58.418	10	6.4674	0.0213
L3	64.1458 - 63.6458	28.339	3	4.3309	0.0105
L4	63.6458 - 45.0755	27.889	3	4.2897	0.0104
L5	48.9245 - 32.1458	16.267	3	3.2583	0.0084
L6	32.1458 - 0.145833	6.712	3	2.0799	0.0083

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.0000	(2) Kathrein 800-10504 w/ 60" MP	10	73.359	6.6166	0.0223	9932
92.0000	(2) Powerwave 7770.00 with Mount Pipe	10	60.996	6.5314	0.0217	1804
82.0000	RYMSA &MGV3-900T2	10	47.923	5.9675	0.0178	913
71.0000	2' Dish w/ Radome	10	35.109	4.9558	0.0127	586
58.0000	EMS DR65-12-05DBL w Mount Pipe	3	23.076	3.8654	0.0094	848
28.0000	12-ft Omni	3	5.121	1.7941	0.0078	688

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	103 - 90.0833 (1)	TP13x13x0.25	12.9167	0.0000	0.0	21.000	10.0138	-3.19	210.29	0.015
L2	90.0833 - 64.1458 (2)	TP20.92x13x0.25	25.9375	0.0000	0.0	39.000	16.4016	-10.41	639.66	0.016
L3	64.1458 - 63.6458 (3)	TP22.45x20.92x0.2709	0.5000	0.0000	0.0	39.000	17.7543	-10.43	692.42	0.015
L4	63.6458 - 45.0755 (4)	TP27.78x22.45x0.3384	18.5703	0.0000	0.0	39.000	28.2844	-12.58	1103.09	0.011
L5	45.0755 - 32.1458 (5)	TP31.73x25.9986x0.2964	16.7787	0.0000	0.0	39.000	29.5731	-15.44	1153.35	0.013
L6	32.1458 - 0.145833 (6)	TP41.5x31.73x0.3074	32.0000	0.0000	0.0	39.000	38.7552	-20.96	1511.45	0.014

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	103 - 90.0833 (1)	TP13x13x0.25	27.28	10.449	23.100	0.452	0.00	0.000	23.100	0.000
L2	90.0833 - 64.1458 (2)	TP20.92x13x0.25	339.09	48.845	39.000	1.252	0.00	0.000	39.000	0.000
L3	64.1458 - 63.6458 (3)	TP22.45x20.92x0.2709	339.09	45.215	39.000	1.159	0.00	0.000	39.000	0.000
L4	63.6458 - 45.0755 (4)	TP27.78x22.45x0.3384	620.63	40.717	39.000	1.044	0.00	0.000	39.000	0.000
L5	45.0755 - 32.1458 (5)	TP31.73x25.9986x0.2964	971.24	50.889	39.000	1.305	0.00	0.000	39.000	0.000
L6	32.1458 - 0.145833 (6)	TP41.5x31.73x0.3074	1625.95	51.350	39.000	1.317	0.00	0.000	39.000	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	103 - 90.0833 (1)	TP13x13x0.25	6.71	0.671	14.000	0.096	0.00	0.000	14.000	0.000
L2	90.0833 - 64.1458 (2)	TP20.92x13x0.25	16.88	1.029	26.000	0.079	0.00	0.000	26.000	0.000
L3	64.1458 - 63.6458 (3)	TP22.45x20.92x0.2709	16.93	0.954	26.000	0.068	0.00	0.000	26.000	0.000
L4	63.6458 - 45.0755 (4)	TP27.78x22.45x0.3384	19.92	0.704	26.000	0.054	0.01	0.000	26.000	0.000
L5	45.0755 - 32.1458 (5)	TP31.73x25.9986x0.2964	21.82	0.738	26.000	0.057	0.02	0.001	26.000	0.000
L6	32.1458 - 0.145833 (6)	TP41.5x31.73x0.3074	25.25	0.652	26.000	0.050	3.64	0.056	26.000	0.002

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	103 - 90.0833 (1)	0.015	0.452	0.000	0.096	0.000	0.470 ✔	1.333	H1-3+VT ✔
L2	90.0833 - 64.1458 (2)	0.016	1.252	0.000	0.079	0.000	1.270 ✔	1.333	H1-3+VT ✔

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
L3	64.1458 - 63.6458 (3)	0.015	1.159	0.000	0.068	0.000	1.176 ✔	1.333	H1-3+VT ✔
L4	63.6458 - 45.0755 (4)	0.011	1.044	0.000	0.054	0.000	1.056 ✔	1.333	H1-3+VT ✔
L5	45.0755 - 32.1458 (5)	0.013	1.305	0.000	0.057	0.000	1.319 ✔	1.333	H1-3+VT ✔
L6	32.1458 - 0.145833 (6)	0.014	1.317	0.000	0.050	0.002	1.331 ✔	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	103 - 90.0833	Pole	TP13x13x0.25	1	-3.19	280.32	35.2	Pass
L2	90.0833 - 64.1458	Pole	TP20.92x13x0.25	2	-10.41	852.67	95.3	Pass
L3	64.1458 - 63.6458	Pole	TP22.45x20.92x0.2709	3	-10.43	922.99	88.2	Pass
L4	63.6458 - 45.0755	Pole	TP27.78x22.45x0.3384	4	-12.58	1470.42	79.2	Pass
L5	45.0755 - 32.1458	Pole	TP31.73x25.9986x0.2964	5	-15.44	1537.42	99.0	Pass
L6	32.1458 - 0.145833	Pole	TP41.5x31.73x0.3074	6	-20.96	2014.76	99.9	Pass
							Summary	
						Pole (L6)	99.9	Pass
						RATING =	**99.9**	**Pass**

SSPS REINFORCEMENT DESIGN
TIA-222-F

Design	0

	Initials	Date
Produced By:	MER	1/22/2014
Checked By:	AVF	1/22/2014

SELF-SUPPORTING POLE STRUCTURE REINFORCEMENT DESIGN, TIA-222-F

VSi Job #	140008
Client Site Name:	Stratford, CT
Client Site Number:	VZ5-156
Allowable Stress Increase	133%
Design Percentage	100%
	133%

Pole Geometry									VZ5-156	140008
Section #	Sides # (12,16,18,0)	Elevation (ft) TOP	Elevation (ft) BOTTOM	Dia Across Flats (in) TOP	Dia Across Flats (in) BOTTOM	Splice (ft)	Thickness (in)	Material Specification	Taper (in/ft)	Length (ft)
1	18	90.1	45.1	13.00	26.79	3.85	0.2500	A572-65	0.306	45.01
2	18	48.9	0.1	25.11	40.00	0.00	0.3125	A572-65	0.305	48.78

SSPS REINFORCEMENT DESIGN
TIA-222-F

Bar Reinforcement																										VZS-156	140008
Section Letter	Elevation (ft)	Moment (kip-ft)	Section #	Bar # (3,4)	Bar Width (in)	Bar Thickness (in)	Bar Length (in)	Bar Material Specification	TB / SB Type (in)	TB / SB Size (in)	TB / SB Grade	TB Number	r_{max}	r_b Pole	r_c	r_t Gross	rt Net	r_{BS}	r_p Bar	r_p Pole	r_v	t Model (in)	F_y Model (ksi)	r_f	D_o Model (in)	t_A Model (in)
G	64.15	358	1	3	5.25	1.5	21	A572-50	AJAX	M20	PC8.8	7	88%	39%	67%	55%	66%	29%	14%	67%	88%	0.49	50	100%	22.45	0.41
F	48.92	562	1	3	5.25	1.5	21	A572-50	AJAX	M20	PC8.8	10000	83%	49%	83%	68%	82%	0%	0%	0%	0%	0.45	50	100%	27.11	0.37
E	45.08	618	1	3	5.25	1.5	21	A572-50	AJAX	M20	PC8.8	10000	81%	48%	81%	66%	79%	0%	0%	0%	0%	0.46	50	100%	28.29	0.38
D	32.15	968	2	3	5.25	1.5	21	A572-50	AJAX	M20	PC8.8	10	99%	59%	99%	81%	97%	32%	14%	56%	92%	0.47	50	100%	31.73	0.38
C	32.15	968	2	3	6.00	1.5	15	A572-50	AJAX	M20	PC8.8	10000	89%	57%	87%	77%	89%	0%	0%	0%	0%	0.49	50	100%	31.73	0.44
B	3.90	1651	2	3	6.00	1.5	15	A572-50	AJAX	M20	PC8.8	10000	100%	64%	98%	87%	100%	0%	0%	0%	0%	0.46	50	100%	40.36	0.40
A	0.15	1742	2	3	6.00	1.5	15	A572-50	HSB	1	A490-X	8	99%	65%	99%	88%	99%	30%	25%	99%	94%	0.45	50	100%	41.50	0.40

Job No.:	140008
Date:	01/22/2014
Calculated by:	MER

32.0-ft Splice

SELF-SUPPORTING POLE STRUCTURE REINFORCEMENT BOLTED SPLICE DESIGN, TIA-222-F

Input - Reinforcing Bar Properties

CONSTANTS:

$E \equiv 29000 \cdot ksi$

$b_{bar} := 5.25 \cdot in$ = width of reinforcement

$t_{bar} := 1.5 \cdot in$ = thickness of reinforcement

$F_{yBar} := 50 \cdot ksi$ = specified minimum yield stress of reinforcement

$F_{uBar} := 65 \cdot ksi$ = specified minimum tensile stress of reinforcement

$Design\_\% := 99 \cdot \%$

$ASI := 133\%$ = allowable stress increase

$A_{gBar} := b_{bar} \cdot t_{bar}$ $\quad A_{gBar} = 7.87 \cdot in^2$

Input - Splice & TB's Properties

$d := 20 \cdot mm$ = diameter of ONESIDE AJAX bolts

$d_{sleeve} := 29 \cdot mm$ = outside diameter of sleeve for ONESIDE AJAX bolts

$d_{hole} := 31 \cdot mm$ = diameter of hole for ONESIDE AJAX bolts

$n := 10$ = number of ONESIDE AJAX bolts at termination

$s := 3 \cdot in$ = spacing of termination bolts

$V_{all} := 20.9 \cdot kip$ = shear breaking strength of ONESIDE AJAX

$T_{all} := 74.4 \cdot kN$ = tensile breaking strength of ONESIDE AJAX PC8.8 $\quad T_{all} = 16.7 \cdot kip$

$b_{GPL} := 4.125 \cdot in$ = width of gusset plate

$t_{GPL} := 1.0 \cdot in$ = thickness of gusset plate

$F_{yGPL} := 50 \cdot ksi$ = specified minimum yield stress of gusset plate

$F_{uGPL} := 65 \cdot ksi$ = specified minimum tensile stress of gusset plate

$n_{sPLbolt} := 10$ = number of bar termination bolts for height of gusset plate (bolt providing M_{resist})

$n_{bGPL} := 11$ = number of gusset plate termination bolts

$d_{bGPL} := 0.75 \cdot in$ = diameter of gusset plate termination bolts

$F_{vbGPL} := 21.0 \cdot ksi$ = specified minimum tensile strength of gusset plate termination bolt

$s_{bGPL} := 3 \cdot in$ = spacing of gusset plate termination bolts

$end_{bGPL} := 1.5 \cdot in$ = end distance of gusset plate termination bolts

$K_{GPL} := 1.0$ = effective buckling length factor of gusset plate [Table C-C2.1, LRFD-99]

$b_{SPL} := 4.125 \cdot in$ = width of splice plate

$t_{SPL} := 1.0 \cdot in$ = thickness of splice plate

$F_{ySPL} := 50 \cdot ksi$ = specified minimum yield stress of splice plate

$F_{uSPL} := 65 \cdot ksi$ = specified minimum tensile stress of splice plate

$K_{SPL} := 1.0$ = effective buckling length factor of splice plate [Table C-C2.1, LRFD-99]

$L_{SPL} := 3.25 \cdot in$ = maximum spacing between gusset/splice plate bolts

$F_{EXX} := 70 \cdot ksi$ = ultimate stress of weld electrode

$t_{groove} := 0.375 \cdot in$ = thickness of groove for PJP gusset weld

$H_{GPL} := \left(n_{sPLbolt} + 1\right) \cdot s$ = height of gusset plate $\qquad H_{GPL} = 33.00 \cdot in$

$b'_{bar} := \begin{cases} b_{bar} & \text{if } b_{bar} \geq 4.5 \cdot in \\ 4.5 \cdot in & \text{if } b_{bar} < 4.5 \cdot in \end{cases} \qquad b'_{bar} = 5.25 \cdot in$

$H_{GPLcheck} := 2 \cdot end_{bGPL} + \left(n_{bGPL} - 1\right) \cdot s_{bGPL} \qquad H_{GPLcheck} = 33.00 \cdot in$

$Length_{SPL} := L_{SPL} + 2 \cdot end_{bGPL} + 2 \cdot \left[\left(n_{bGPL} - 1\right) \cdot s_{bGPL}\right] \qquad Length_{SPL} = 66.25 \cdot in$

Output: Tension on Gross

$F_{tGross} := 0.6 \cdot F_{yBar} \qquad F_{tGross} = 30.0 \cdot ksi$

$P_{tGross} := F_{tGross} \cdot A_{gBar} \qquad P_{tGross} = 236.3 \cdot kip$

Output: Tension on Net

$A_{en} := \left[b_{bar} - \left(d_{hole} + \frac{1}{16} \cdot in\right)\right] \cdot t_{bar} \qquad A_{en} = 5.951 \cdot in^2$

$F_{tNet} := 0.5 \cdot F_{uBar} \qquad F_{tNet} = 32.5 \cdot ksi$

$P_{tNet} := F_{tNet} \cdot A_{en} \qquad P_{tNet} = 193.4 \cdot kip$

SPLICE:

Output - Shear Strength of Bar Termination Bolts

$V_{max} := \min\left(P_{tGross}, P_{tNet}\right) \cdot ASI \cdot (Design\_\%) \qquad V_{max} = 254.6 \cdot kip$

$A_{bolt} := \frac{\pi}{4} \cdot d^2 \qquad A_{bolt} = 0.487 \cdot in^2$

$t_{sleeve} := \frac{d_{sleeve} - d}{2} \qquad t_{sleeve} = 0.177 \cdot in$

$A_{sleeve} := \frac{\pi}{4} \cdot \left[d_{sleeve}^{\ 2} - \left(d_{sleeve} - 2 \cdot t_{sleeve}\right)^2\right] \qquad A_{sleeve} = 0.537 \cdot in^2$

$A_{assembly} := A_{sleeve} + A_{bolt} \qquad A_{assembly} = 1.024 \cdot in^2$

$F_v := \frac{V_{all}}{A_{assembly}} \qquad F_v = 20.4 \cdot ksi$

$f_v := \frac{V_{max}}{n \cdot A_{assembly}} \qquad f_v = 24.9 \cdot ksi$

$r_v := \frac{f_v}{F_v} \qquad r_v = 122 \cdot \%$

Output - Combined Tension & Shear Strength Bar Termination Bolts

- Eccentricity Normal to the Plane of the Faying Surface: Case I-NA not at CG

$P_{bMax} := V_{max}$ $\quad P_{bMax} = 255 \cdot kip$

$edge_{bGPL} := \frac{b_{GPL}}{2}$ $\quad edge_{bGPL} = 2.063 \cdot in$

$e := t_{bar} + (b_{GPL} - edge_{bGPL})$ $\quad e = 3.56 \cdot in$

$$b_{eff} := \begin{cases} 8 \cdot t_{GPL} & \text{if } 8 \cdot t_{GPL} \le b'_{bar} \\ b'_{bar} & \text{otherwise} \end{cases}$$ 6.145 $\quad b_{eff} = 5.25 \cdot in$

$d_1 := 6.395 \cdot in$ ***** adjust until d_1 is the same (Eq 1 = Eq 2)**

$$n' := \begin{cases} n_{sPLbolt} & \text{if } d_1 < s \\ (n_{sPLbolt} - 1) & \text{if } d_1 \ge s \wedge d_1 < 2 \cdot s \\ (n_{sPLbolt} - 2) & \text{if } d_1 \ge 2 \cdot s \wedge d_1 \le 3 \cdot s \\ \text{"ERROR"} & \text{otherwise} \end{cases}$$ $\quad n' = 8$

$y := \left(\frac{n'}{2} + 0.5\right) \cdot s - \left[d_1 - (n_{sPLbolt} - n') \cdot s\right]$ $\quad y = 13.105 \cdot in$

$A_b := A_{assembly}$ $\quad A_b = 1.02 \cdot in^2$

$\Sigma A_b := n' \cdot A_b$ $\quad \Sigma A_b = 8.19 \cdot in^2$

Given

$\Sigma A_b \cdot y = b_{eff} \cdot d_1 \cdot \frac{d_1}{2}$

$Find(d_1) = 6.395 \cdot in$ ***

$Eq1 := \Sigma A_b \cdot y$ $\quad Eq1 = 107.34 \cdot in^3$

$Eq2 := b_{eff} \cdot d_1 \cdot \frac{d_1}{2}$ $\quad Eq2 = 107.35 \cdot in^3$

$c := n_{sPLbolt} \cdot s - d_1$ $\quad c = 23.61 \cdot in$

$$y_i := \begin{bmatrix} c \\ (n_{sPLbolt} - 1) \cdot s - d_1 \\ (n_{sPLbolt} - 2) \cdot s - d_1 \\ (n_{sPLbolt} - 3) \cdot s - d_1 \\ (n_{sPLbolt} - 4) \cdot s - d_1 \\ (n_{sPLbolt} - 5) \cdot s - d_1 \\ (n_{sPLbolt} - 6) \cdot s - d_1 \\ (n_{sPLbolt} - 7) \cdot s - d_1 \\ 0 \end{bmatrix}$$ *** increase/decrease rows as needed**

$$y_i = \begin{pmatrix} 23.605 \\ 20.605 \\ 17.605 \\ 14.605 \\ 11.605 \\ 8.605 \\ 5.605 \\ 2.605 \\ 0 \end{pmatrix} \cdot in$$

$$I_x := n' \cdot \left(\frac{\pi \cdot d^4}{64}\right) + \sum\left(A_b \cdot y_i^2\right) + \frac{b_{eff} \cdot d_1^3}{12} + b_{eff} \cdot d_1 \cdot \left(\frac{d_1}{2}\right)^2$$ $I_x = 2251.47 \cdot in^4$

$$T_{bMax} := \frac{P_{bMax} \cdot e \cdot c}{I_x} \cdot A_b$$ $T_{bMax} = 9.7 \cdot kip$

$$F_t := \frac{T_{all}}{A_{bolt}}$$ $F_t = 34.3 \cdot ksi$

$$F'_t := \left[\sqrt{\left(\frac{ASI \cdot F_t}{ksi}\right)^2 - 2.15 \cdot \left(\frac{f_v}{ksi}\right)^2}\right] \cdot ksi$$ $F'_t = 27.5 \cdot ksi$

$$f_t := \frac{T_{bMax}}{A_{bolt}}$$ $f_t = 20.0 \cdot ksi$

$$r_{combVT} := \frac{f_t}{F'_t}$$ $r_{combVT} = 73 \cdot \%$

Output - Bearing Strength: Reinforcing Bar

$$P_{max} := V_{max}$$

$$F_{pBar} := 1.2 \cdot F_{uBar}$$ $F_{pBar} = 78.0 \cdot ksi$

$$f_{pBar} := \frac{P_{max}}{n \cdot t_{bar} \cdot d_{sleeve}}$$ $f_{pBar} = 14.9 \cdot ksi$

$$r_{pBar} := \frac{f_{pBar}}{F_{pBar}}$$ $r_{pBar} = 19 \cdot \%$

Output - Flexural Strength of Gusset Plate

$$P_{maxGPL} := \frac{P_{max}}{2}$$ $P_{maxGPL} = 127.3 \cdot kip$

$$S_{GPL} := \frac{t_{GPL} \cdot H_{GPL}^2}{6}$$ $S_{GPL} = 181.5 \cdot in^3$

$$f_{bGPL} := \frac{P_{maxGPL} \cdot e}{S_{GPL}}$$ $f_{bGPL} = 2.5 \cdot ksi$

$$F_{bGPL} := 0.75 \cdot F_{yGPL}$$ $F_{bGPL} = 37.5 \cdot ksi$

$$r_{mGPL} := \frac{f_{bGPL}}{F_{bGPL}}$$ $r_{mGPL} = 7 \cdot \%$

$$compact_{GPL} := \begin{cases} \text{"YES"} & \text{if } \frac{b_{GPL}}{t_{GPL}} < 0.38 \cdot \sqrt{\frac{E}{F_{yGPL}}} \\ \text{"NO"} & \text{otherwise} \end{cases}$$ $compact_{GPL} = \text{"YES"}$

Output - Compression Strength of Gusset Plate

$$r_{GPL} := \frac{t_{GPL}}{\sqrt{12}}$$ $r_{GPL} = 0.289 \cdot in$

$$A_{gGPL} := b_{GPL} \cdot t_{GPL}$$ $A_{gGPL} = 4.13 \cdot in^2$

$$KLr := K_{GPL} \cdot \frac{s_{bGPL}}{r_{GPL}}$$ $KLr = 10.4$

$$C_{cGPL} := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_{yGPL}}}$$ $C_{cGPL} = 107.0$

$$F_{aGPL} := \begin{cases} \dfrac{\left(1 - \dfrac{KLr^2}{2 \cdot C_{cGPL}^2}\right) \cdot F_{yGPL}}{\dfrac{5}{3} + \dfrac{3}{8} \cdot \left(\dfrac{KLr}{C_{cGPL}}\right) - \dfrac{KLr^3}{8 \cdot C_{cGPL}^3}} & \text{if } KLr \le C_{cGPL} \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot KLr^2} & \text{otherwise} \end{cases}$$ $F_{aGPL} = 29.2 \cdot ksi$

$$f_{aGPL} := \frac{P_{maxGPL}}{A_{gGPL}}$$ $f_{aGPL} = 30.9 \cdot ksi$

$$r_{cGPL} := \frac{f_{aGPL}}{F_{aGPL}}$$ $r_{cGPL} = 106 \cdot \%$

Output - Combined Flexure & Compression Strength of Gusset Plate

$$C_m := 0.85$$

$$F'_{eGPL} := \frac{12 \cdot \pi^2 \cdot E}{23 \cdot KLr^2}$$ $F'_{eGPL} = 1382.7 \cdot ksi$

$$Eq_{H11GPL} := \frac{f_{aGPL}}{F_{aGPL}} + \frac{C_m \cdot f_{bGPL}}{\left(1 - \dfrac{f_{aGPL}}{F'_{eGPL}}\right) \cdot F_{bGPL}}$$ $Eq_{H11GPL} = 1.114$

$$Eq_{H12GPL} := \frac{f_{aGPL}}{0.6 \cdot F_{yGPL}} + \frac{f_{bGPL}}{F_{bGPL}}$$ $Eq_{H12GPL} = 1.095$

$$Eq_{H13GPL} := \frac{f_{aGPL}}{F_{aGPL}} + \frac{f_{bGPL}}{F_{bGPL}}$$ $Eq_{H13GPL} = 1.123$

$$r_{CcombGPL} := \begin{cases} Eq_{H13GPL} & \text{if } \frac{f_{aGPL}}{F_{aGPL}} \le 0.15 \\ Eq_{H11GPL} & \text{if } \frac{f_{aGPL}}{F_{aGPL}} > 0.15 \land Eq_{H11GPL} \ge Eq_{H12GPL} \\ Eq_{H12GPL} & \text{if } \frac{f_{aGPL}}{F_{aGPL}} > 0.15 \land Eq_{H12GPL} > Eq_{H11GPL} \end{cases}$$ $r_{CcombGPL} = 111 \cdot \%$

Output - Shear Strength of Gusset Plate Bolts

$V_{maxGPL} := P_{maxGPL}$ $V_{maxGPL} = 127.3 \cdot kip$

$A_{bGPL} := \frac{\pi \cdot d_{bGPL}^2}{4}$ $A_{bGPL} = 0.442 \cdot in^2$

$f_{vbGPL} := \frac{V_{maxGPL}}{n_{bGPL} \cdot A_{bGPL}}$ $f_{vbGPL} = 26.2 \cdot ksi$

$r_{vbGPL} := \frac{f_{vbGPL}}{F_{vbGPL}}$ $r_{vbGPL} = 125 \cdot \%$

Output - Bearing Strength: Gusset Plate

$F_{pGPL} := 1.2 \cdot F_{uGPL}$ $F_{pGPL} = 78.0 \cdot ksi$

$f_{pGPL} := \frac{P_{maxGPL}}{n_{bGPL} \cdot t_{GPL} \cdot d_{bGPL}}$ $f_{pGPL} = 15.4 \cdot ksi$

$r_{bGPL} := \frac{f_{pGPL}}{F_{pGPL}}$ $r_{bGPL} = 20 \cdot \%$

Output - Tension Strength of Gusset Plate

$T_{maxGPL} := P_{maxGPL}$ $T_{maxGPL} = 127.3 \cdot kip$

- Gross Area:

$F_{tGrossGPL} := 0.6 \cdot F_{yGPL}$ $F_{tGrossGPL} = 30.0 \cdot ksi$

$f_{tGrossGPL} := \frac{T_{maxGPL}}{A_{gGPL}}$ $f_{tGrossGPL} = 30.9 \cdot ksi$

$r_{tGrossGPL} := \frac{f_{tGrossGPL}}{F_{tGrossGPL}}$ $r_{tGrossGPL} = 103 \cdot \%$

- Net Area

$A_{enGPL} := \left[b_{GPL} - \left(d_{bGPL} + \frac{1}{8} \cdot in + \frac{1}{16} \cdot in\right)\right] \cdot t_{GPL}$ $A_{enGPL} = 3.19 \cdot in^2$

$f_{tNetGPL} := f_{tGrossGPL} \cdot \frac{A_{gGPL}}{A_{enGPL}}$ $f_{tNetGPL} = 39.9 \cdot ksi$

$F_{tNetGPL} := 0.5 \cdot F_{uGPL}$ $F_{tNetGPL} = 32.5 \cdot ksi$

$r_{tNetGPL} := \frac{f_{tNetGPL}}{F_{tNetGPL}}$ $r_{tNetGPL} = 123 \cdot \%$

Output - Combined Flexure & Tension Strength of Gusset Plate

$Eq_{H21GPLgross} := \frac{f_{tGrossGPL}}{F_{tGrossGPL}} + \frac{f_{bGPL}}{F_{bGPL}}$ $Eq_{H21GPLgross} = 1.095$

$Eq_{H21GPLnet} := \frac{f_{tNetGPL}}{F_{tNetGPL}} + \frac{f_{bGPL}}{F_{bGPL}}$ $Eq_{H21GPLnet} = 1.296$

$r_{TcombGPL} := \max(Eq_{H21GPLgross}, Eq_{H21GPLnet})$ $r_{TcombGPL} = 130 \cdot \%$

Output - Shear Strength Gusset Plate

- Gross Area:

$F_{vGrossGPL} := 0.4 \cdot F_{yGPL}$ $F_{vGrossGPL} = 20.0 \cdot ksi$

$A_{vGPL} := H_{GPL} \cdot t_{GPL}$ $A_{vGPL} = 33.00 \cdot in^2$

$f_{vGrossGPL} := \frac{V_{maxGPL}}{A_{vGPL}}$ $f_{vGrossGPL} = 3.9 \cdot ksi$

$r_{vGrossGPL} := \frac{f_{vGrossGPL}}{F_{vGrossGPL}}$ $r_{vGrossGPL} = 19 \cdot \%$

- Net Area

$A_{nvGPL} := \left[H_{GPL} - \left(d_{bGPL} + \frac{1}{8} \cdot in + \frac{1}{16} \cdot in\right) \cdot n_{bGPL}\right] \cdot t_{GPL}$ $A_{nvGPL} = 22.69 \cdot in^2$

$f_{vNetGPL} := f_{vGrossGPL} \cdot \frac{A_{vGPL}}{A_{nvGPL}}$ $f_{vNetGPL} = 5.6 \cdot ksi$

$F_{vNetGPL} := 0.3 \cdot F_{uGPL}$ $F_{vNetGPL} = 19.5 \cdot ksi$

$r_{vNetGPL} := \frac{f_{vNetGPL}}{F_{vNetGPL}}$ $r_{vNetGPL} = 29 \cdot \%$

Output - Block Shear Strength of Gusset Plate

$A_{gv} := \left[(n_{bGPL} - 1) \cdot s_{bGPL} + edge_{bGPL}\right] \cdot t_{GPL}$ $A_{gv} = 32.06 \cdot in^2$

$A_{nv} := A_{gv} - \left[\left[d_{bGPL} + \left(\frac{1}{8} \cdot in\right) + \left(\frac{1}{16} \cdot in\right)\right] \cdot (n_{bGPL} - 0.5) \cdot (t_{GPL})\right]$ $A_{nv} = 22.22 \cdot in^2$

$A_{nt} := \left[edge_{bGPL} - \frac{\left[d_{bGPL} + \left(\frac{1}{8} \cdot in\right)\right]}{2}\right] \cdot (t_{GPL})$ $A_{nt} = 1.63 \cdot in^2$

$F_{vbsGPL} := 0.30 \cdot F_{uGPL}$ $F_{vbsGPL} = 19.5 \cdot ksi$

$F_{tbsGPL} := 0.50 \cdot F_{uGPL}$ $F_{tbsGPL} = 32.5 \cdot ksi$

$T_{bsGPLall} := A_{nv} \cdot F_{vbsGPL} + A_{nt} \cdot F_{tbsGPL}$ $T_{bsGPLall} = 486.1 \cdot kip$

$r_{bsGPL} := \frac{T_{maxGPL}}{T_{bsGPLall}}$ $r_{bsGPL} = 26 \cdot \%$

Output - Strength of Gusset Plate Welds

$V_{maxW} := \frac{P_{max}}{2}$ $V_{maxW} = 127 \cdot kip$

$T_{maxW} := \frac{6 \cdot (V_{maxW} \cdot e)}{H_{GPL}}$ $T_{maxW} = 82.469 \cdot kip$

- Shear:

$\theta_v \equiv 0 \cdot deg$

$F_{w\_v} := (0.30 \cdot F_{EXX}) \cdot \left(1.0 + 0.50 \cdot \sin(\theta_v)^{1.5}\right)$ $F_{w\_v} = 21.0 \cdot ksi$

$t_{VW} := t_{groove} - \left(\frac{1}{8} \cdot in\right)$ $t_{VW} = 0.250 \cdot in$

$A_{w\_V} := t_{VW} \cdot H_{GPL}$ $A_{w\_V} = 8.25 \cdot in^2$

$V'_{all\_Vw} := F_{w\_v} \cdot A_{w\_V}$ $V'_{all\_Vw} = 173 \cdot kip$

$r_{v\_Vw} := \frac{V_{maxW}}{V'_{all\_Vw}}$ $r_{v\_Vw} = 73 \cdot \%$

- Tension/Flexure:

$\theta_t \equiv 90 \cdot deg$

$F_{w\_t} := (0.30 \cdot F_{EXX}) \cdot \left(1.0 + 0.50 \cdot \sin(\theta_t)^{1.5}\right)$ $F_{w\_t} = 31.5 \cdot ksi$

$T'_{all\_Vw} := F_{w\_t} \cdot A_{w\_V}$ $T'_{all\_Vw} = 260 \cdot kip$

$r_{t\_Vw} := \frac{T_{maxW}}{T'_{all\_Vw}}$ $r_{t\_Vw} = 32 \cdot \%$

- Combined

$r_{Vw} := \left(\frac{T_{maxW}}{T'_{all\_Vw}}\right) + \left(\frac{V_{maxW}}{V'_{all\_Vw}}\right)^2$ $r_{Vw} = 86 \cdot \%$

Output - Compression Strength of Splice Plate

$P_{maxSPL} := \frac{P_{max}}{2}$ $P_{maxSPL} = 127.3 \cdot kip$

$r_{SPL} := \frac{t_{SPL}}{\sqrt{12}}$ $r_{SPL} = 0.289 \cdot in$

$A_{gSPL} := b_{SPL} \cdot t_{SPL}$ $A_{gSPL} = 4.13 \cdot in^2$

$$KLr := K_{SPL} \cdot \frac{L_{SPL}}{r_{SPL}}$$ $KLr = 11.3$

$$C_{cSPL} := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_{ySPL}}}$$ $C_{cSPL} = 107.0$

$$F_{aSPL} := \begin{cases} \dfrac{\left(1 - \dfrac{KLr^2}{2 \cdot C_{cSPL}^2}\right) \cdot F_{ySPL}}{\dfrac{5}{3} + \dfrac{3}{8} \cdot \left(\dfrac{KLr}{C_{cSPL}}\right) - \dfrac{KLr^3}{8 \cdot C_{cSPL}^3}} & \text{if } KLr \le C_{cSPL} \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot KLr^2} & \text{otherwise} \end{cases}$$ $F_{aSPL} = 29.1 \cdot ksi$

$$f_{aSPL} := \frac{P_{maxSPL}}{A_{gSPL}}$$ $f_{aSPL} = 30.9 \cdot ksi$

$$r_{cSPL} := \frac{f_{aSPL}}{F_{aSPL}}$$ $r_{cSPL} = 106 \cdot \%$

Output - Tension Strength of Splice Plate

$$T_{maxSPL} := P_{maxGPL}$$ $T_{maxSPL} = 127.3 \cdot kip$

- Gross Area:

$$F_{tGrossSPL} := 0.6 \cdot F_{ySPL}$$ $F_{tGrossSPL} = 30.0 \cdot ksi$

$$f_{tGrossSPL} := \frac{T_{maxSPL}}{A_{gSPL}}$$ $f_{tGrossSPL} = 30.9 \cdot ksi$

$$r_{tGrossSPL} := \frac{f_{tGrossSPL}}{F_{tGrossSPL}}$$ $r_{tGrossSPL} = 103 \cdot \%$

- Net Area

$$A_{enSPL} := \left[b_{SPL} - \left(d_{bGPL} + \frac{1}{8} \cdot in + \frac{1}{16} \cdot in\right)\right] \cdot t_{SPL}$$ $A_{enSPL} = 3.19 \cdot in^2$

$$f_{tNetSPL} := f_{tGrossSPL} \cdot \frac{A_{gSPL}}{A_{enSPL}}$$ $f_{tNetSPL} = 39.9 \cdot ksi$

$$F_{tNetSPL} := 0.5 \cdot F_{uSPL}$$ $F_{tNetSPL} = 32.5 \cdot ksi$

$$r_{tNetSPL} := \frac{f_{tNetSPL}}{F_{tNetSPL}}$$ $r_{tNetSPL} = 123 \cdot \%$

Output - Block Shear Strength of Splice Plate

$$A_{gv} := \left[\left(n_{bGPL} - 1\right) \cdot s_{bGPL} + edge_{bGPL}\right] \cdot t_{SPL}$$ $A_{gv} = 32.06 \cdot in^2$

$$A_{nv} := A_{gv} - \left[\left[d_{bGPL} + \left(\frac{1}{8} \cdot in\right) + \left(\frac{1}{16} \cdot in\right)\right] \cdot \left(n_{bGPL} - 0.5\right) \cdot \left(t_{SPL}\right)\right]$$ $A_{nv} = 22.22 \cdot in^2$

$$A_{nt} := \left[edge_{bGPL} - \frac{\left[d_{bGPL} + \left(\frac{1}{8} \cdot in \right) \right]}{2} \right] \cdot (t_{SPL})$$ $A_{nt} = 1.63 \cdot in^2$

$F_{vbsSPL} := 0.30 \cdot F_{uSPL}$ $F_{vbsSPL} = 19.5 \cdot ksi$

$F_{tbsSPL} := 0.50 \cdot F_{uSPL}$ $F_{tbsSPL} = 32.5 \cdot ksi$

$T_{bsSPLall} := A_{nv} \cdot F_{vbsSPL} + A_{nt} \cdot F_{tbsSPL}$ $T_{bsSPLall} = 486.1 \cdot kip$

$$r_{bsSPL} := \frac{T_{maxSPL}}{T_{bsSPLall}}$$ $r_{bsGPL} = 26 \cdot \%$

Output - Bearing Strength: Splice Plate

$F_{pSPL} := 1.2 \cdot F_{uSPL}$ $F_{pGPL} = 78.0 \cdot ksi$

$$f_{pSPL} := \frac{P_{maxSPL}}{n_{bGPL} \cdot t_{SPL} \cdot d_{bGPL}}$$ $f_{pSPL} = 15.4 \cdot ksi$

$$r_{bSPL} := \frac{f_{pSPL}}{F_{pSPL}}$$ $r_{bSPL} = 20 \cdot \%$

Output - Design Summary:

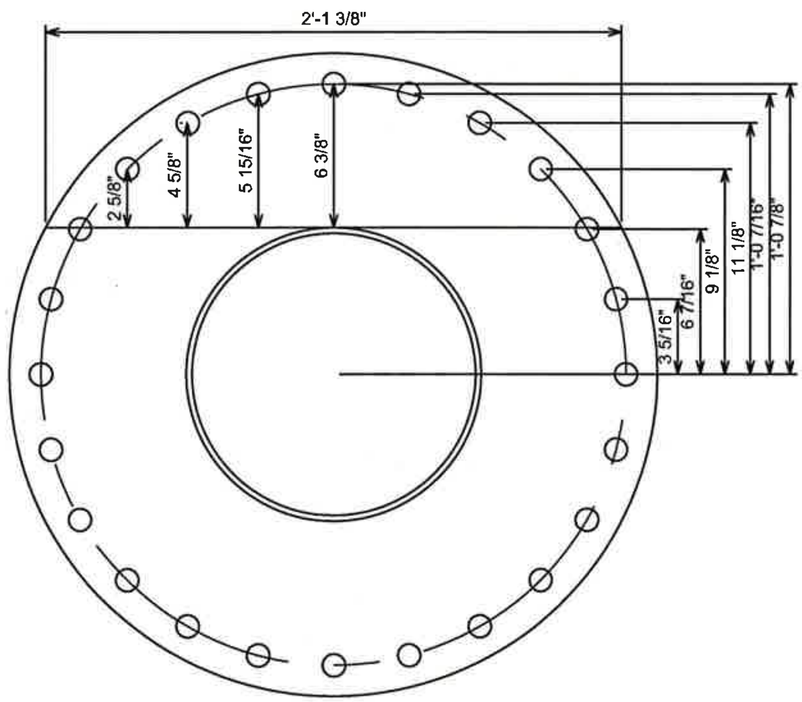
$$results_{TB} := \begin{pmatrix} \frac{r_v}{ASI} \\ r_{combVT} \end{pmatrix} \qquad results_{TB} = \begin{pmatrix} 92 \\ 73 \end{pmatrix} \cdot \% \qquad results_{Bar} := \frac{r_{pBar}}{ASI} \qquad results_{Bar} = 14 \cdot \%$$

$$results_{GPL} := \begin{pmatrix} r_{mGPL} \\ r_{cGPL} \\ r_{CcombGPL} \\ r_{vbGPL} \\ r_{bsGPL} \\ r_{tGrossGPL} \\ r_{tNetGPL} \\ r_{TcombGPL} \\ r_{vGrossGPL} \\ r_{vNetGPL} \\ r_{bGPL} \\ r_{v\_Vw} \\ r_{t\_Vw} \\ r_{Vw} \end{pmatrix} \cdot \left(\frac{1}{ASI} \right) \qquad results_{GPL} = \begin{pmatrix} 5 \\ 79 \\ 84 \\ 94 \\ 20 \\ 77 \\ 92 \\ 97 \\ 15 \\ 22 \\ 15 \\ 55 \\ 24 \\ 64 \end{pmatrix} \cdot \%$$

$$results_{SPL} := \begin{pmatrix} r_{cSPL} \\ r_{tGrossSPL} \\ r_{tNetSPL} \\ r_{bsSPL} \\ r_{bSPL} \end{pmatrix} \cdot \left(\frac{1}{ASI} \right) \qquad results_{SPL} = \begin{pmatrix} 80 \\ 77 \\ 92 \\ 20 \\ 15 \end{pmatrix} \cdot \%$$

$Max_{Utilization} := \max(results_{Bar}, results_{TB}, results_{GPL}, results_{SPL})$

$Max_{Utilization} = 97 \cdot \%$



90.1-FT FLANGE PLATE LAYOUT

SCALE: 1-1/2" = 1'

PROJECT INFORMATION:

STRATFORD, CT
VZ5-156

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0	01-27-14	PSAR
REV	DATE:	Issued For:

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vertical solutions

FLANGE PLATE DESIGN, DEFORMATION METHOD (DIFFERENT AREAS)

Input -

$M := 27.28 \cdot kip \cdot ft$ = moment at top of flange plate

$P := 3.19 \cdot kip$ = axial load (use zero if base plate is grouted)

$F_y := 60 \cdot ksi$ = yield stress of flange plate

$b_{eff} := 25.375 \cdot in$ = effective width of flange plate in flexure

$t := 1.5 \cdot in$ = thickness of flange plate

$ASI := 133 \cdot \%$ = allowable stress increase

$$Q := \begin{pmatrix} 2 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 2 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad d := \begin{pmatrix} 1 \cdot 12 + \frac{7}{8} \\ 1 \cdot 12 + \frac{7}{16} \\ 11 + \frac{1}{8} \\ 9 + \frac{1}{8} \\ 6 + \frac{7}{16} \\ 3 + \frac{5}{16} \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot in \quad A_{stiff} := \begin{pmatrix} 0.785 \\ 0.785 \\ 0.785 \\ 0.785 \\ 0.785 \\ 0.785 \\ 0.785 \\ 0 \\ 0 \\ 0 \end{pmatrix} in^2 \quad A_{stress} := \begin{pmatrix} 0.606 \\ 0.606 \\ 0.606 \\ 0.606 \\ 0.606 \\ 0.606 \\ 0.606 \\ 0 \\ 0 \\ 0 \end{pmatrix} in^2 \quad F_t := \begin{pmatrix} 0.33 \cdot 125 \\ 0.33 \cdot 125 \\ 0.33 \cdot 125 \\ 0.33 \cdot 125 \\ 0.33 \cdot 125 \\ 0.33 \cdot 125 \\ 0.33 \cdot 125 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot ksi$$

$$\sum \overrightarrow{(Q)} = 24$$

$$sumQAd := \sum \overrightarrow{\left(Q \cdot d^2 \cdot A_{stiff}\right)} \qquad sumQAd = 1561 \cdot in^4$$

$$R := \frac{M \cdot \overrightarrow{\left(d \cdot A_{stiff}\right)}}{sumQAd} + \frac{P \cdot A_{stiff}}{\sum \overrightarrow{\left(A_{stiff} \cdot Q\right)}}$$

$$f_t := \overrightarrow{\left(\frac{R}{A_{stress}}\right)} \qquad r := \overrightarrow{\left(\frac{f_t}{ASI \cdot F_t}\right)}$$

$$R = \begin{pmatrix} 2.3 \\ 2.2 \\ 2.0 \\ 1.6 \\ 1.2 \\ 0.7 \\ 0.1 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot kip \quad f_t = \begin{pmatrix} 3.7 \\ 3.6 \\ 3.2 \\ 2.7 \\ 2.0 \\ 1.1 \\ 0.2 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot ksi \quad r = \begin{pmatrix} 7 \\ 7 \\ 6 \\ 5 \\ 4 \\ 2 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot \%$$

Q = quantity of fasteners
d = distance from center
A = area of fastener
f_t = allowable tension stress

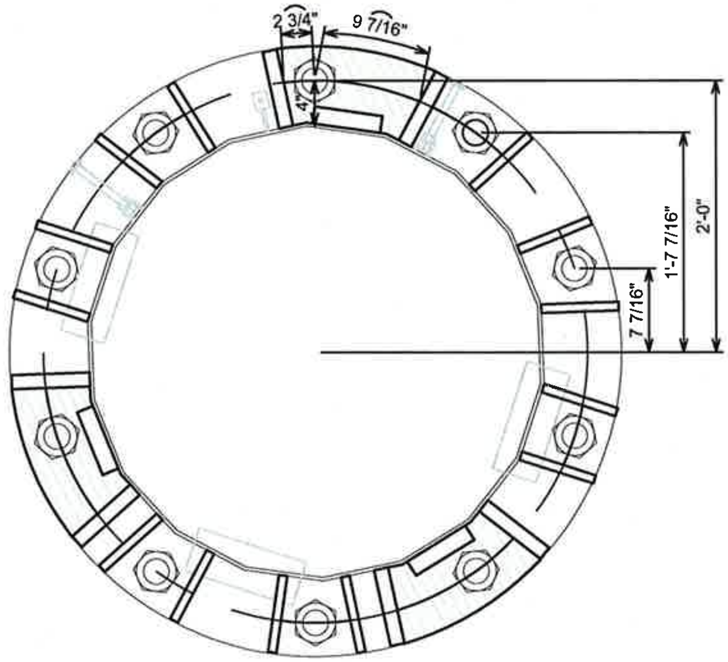
$$m := \begin{pmatrix} 6+\frac{3}{8} \\ 5+\frac{15}{16} \\ 4+\frac{5}{8} \\ 2+\frac{5}{8} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot in \qquad M_{PL} := \overrightarrow{\left[\left[\left(\frac{Q}{2}\right)\cdot R\cdot m\right]\right]} \qquad M_{PL} = \begin{pmatrix} 1.2 \\ 2.2 \\ 1.5 \\ 0.7 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot kip\cdot ft \qquad \sum M_{PL} = 67.0\cdot kip\cdot in$$

$$f_b := \frac{\sum M_{PL}}{\left(\frac{b_{eff}\cdot t^2}{6}\right)} \qquad f_b = 7.0\cdot ksi$$

$$F'_b := ASI\cdot 0.75\cdot F_y \qquad F'_b = 59.9\cdot ksi$$

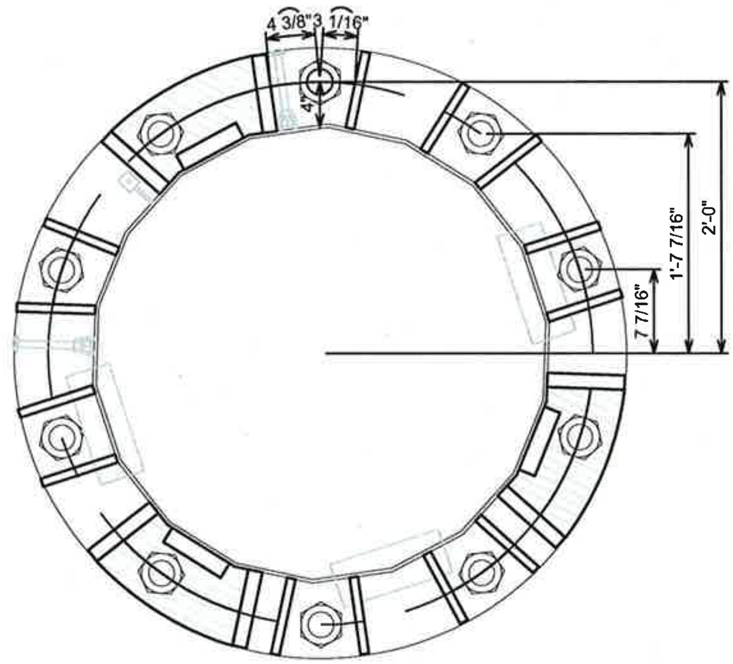
$$r_b := \frac{f_b}{F'_b} \qquad r_b = 12\cdot\%$$

$$Max_{Utilization} := \max(r, r_b) \qquad Max_{Utilization} = 12\cdot\%$$



BASE PLATE LAYOUT - CASE #1: WORST CASE BP & TSP

SCALE: 3/4" = 1'



BASE PLATE LAYOUT - CASE #2: WORST CASE BPL & SP

SCALE: 3/4" = 1'

PROJECT INFORMATION:

STRATFORD, CT
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(FAIRFIELD COUNTY)

REV	DATE:	Issued For:
0	01-22-14	PSAR

DRAWN BY: MER | CHECKED BY: AVF

SHEET NUMBER: **BPL**

REVISION: 0

VSI #: 140008

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Input

Design
Analysis

CONSTANTS:

$E \equiv 29000 \cdot ksi$

$K \equiv 0.8$

$ASI \equiv \frac{4}{3}$

- Reactions & Forces:

$M := 1747 \cdot kip \cdot ft$ = max moment reaction at top of base plate

$P := 22 \cdot kip$ = max axial reaction at top of base plate

$P_{ADD1} := 0 \cdot kip$ = additional axial force to SP on opposite side of SP (left side)

$P_{ADD2} := 59.2 \cdot kip$ = additional axial force to SP on opposite side of SP (right side)

- Shaft:

$t_{shaft} := 0.3125 \cdot in$ = thickness of shaft

$F_{y\_shaft} := 65 \cdot ksi$ = specified minimum yield stress of shaft

- Base Plate:

$t_{bpl} := 2.125 \cdot in$ = thickness of base plate

$F_y := 60 \cdot ksi$ = specified minimum yield stress of shaft

$a := 2.75 \cdot in$ = distance from edge of stiffener plate on left side to center of anchor rod

$b := 9.4375 \cdot in$ = distance from edge of stiffener plate on right side to center of anchor rod

$y := 4.0 \cdot in$ = distance from shaft wall to center of anchor rod

- Bar:

$P_{bar} := 316.4 \cdot kip$ = axial force from bar (see Pole Tool-F v1.6.xls)

$d_{1Bar} := 4.625 \cdot in$ = distance from center of bar to edge of TSP (left side)

$d_{2Bar} := 4.625 \cdot in$ = distance from center of bar to edge of TSP (right side)

$n := 8$ = number of termination bolts

$z := 6 \cdot in$ = height above base plate to bottom of bar / height above SP

$h := 3 \cdot in$ = height above top termination bolt to top of TSP

- Transition / Stiffener Plates:

- TSP / SP on Left Side of AR:

TSP
SP

$b_{SP1} := 6.875 \cdot in$ = width of stiffener plate

$t_{SP1} := 1.375 \cdot in$ = thickness of stiffener plate

$L_{SP1} := 33.0 \cdot in$ = length of stiffener plate

$clip_1 := 0.75 \cdot in$ = length of clip

$t_{VW1} := 0.3125 \cdot in$ = thickness of vertical weld

$F_{y\_SP1} := 50 \cdot ksi$ = specified minimum yield stress of SP material

$F_{EXX1} := 70 \cdot ksi$ = specified minimum ultimate stress of weld electrode

$k_1 := b_{SP1} - y$ = distance from center of anchor rod to edge of base plate / edge of stiffener plate

$k_1 = 2.875 \cdot in$

- TSP / SP on Right Side of AR:

TSP
SP

$b_{SP2} := 6.875 \cdot in$ = width of stiffener plate

$t_{SP2} := 1.375 \cdot in$ = thickness of stiffener plate

$L_{SP2} := 33.0 \cdot in$ = length of stiffener plate

$clip_2 := 0.75 \cdot in$ = length of clip

$t_{VW2} := 0.3125 \cdot in$ = thickness of vertical weld

$F_{y\_SP2} := 50 \cdot ksi$ = specified minimum yield stress of SP material

$F_{EXX2} := 70 \cdot ksi$ = specified minimum ultimate stress of weld electrode

$k_2 := b_{SP2} - y$ = distance from center of anchor rod to edge of base plate / edge of stiffener plate

$k_2 = 2.875 \cdot in$

- Anchor Rods:

$$Q := \begin{pmatrix} 2 \\ 4 \\ 4 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad d := \begin{pmatrix} 2 \cdot 12 \\ 1 \cdot 12 + 7 + \frac{7}{16} \\ 7 + \frac{7}{16} \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot in \quad A_{stiff} := \begin{pmatrix} 3.98 \\ 3.98 \\ 3.98 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} in^2 \quad A_{stress} := \begin{pmatrix} 3.25 \\ 3.25 \\ 3.25 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} in^2 \quad F_t := \begin{pmatrix} 0.6 \cdot 75 \\ 0.6 \cdot 75 \\ 0.6 \cdot 75 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot ksi$$

$$\sum \overrightarrow{(Q)} = 10$$

Output - Anchor Rod, Deformation Method:

$$R := \frac{M \cdot \overrightarrow{(d \cdot A_{stiff})}}{sumQAd} + \frac{P \cdot A_{stiff}}{\sum \overrightarrow{(A_{stiff} \cdot Q)}}$$

$$sumQAd := \sum \overrightarrow{\left(Q \cdot d^2 \cdot A_{stiff}\right)}$$

$$sumQAd = 11480 \cdot in^4$$

ϕRnt = nominal tension strength
d = distance from center
A = area of fastener
Q = quantity of fasteners

$$f_t := \overrightarrow{\left(\frac{R}{A_{stress}}\right)} \qquad r_{AR} := \overrightarrow{\left(\frac{f_t}{ASI \cdot F_t}\right)}$$

$$R = \begin{pmatrix} 176.6 \\ 143.5 \\ 56.3 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot kip \qquad f_t = \begin{pmatrix} 54.3 \\ 44.1 \\ 17.3 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot ksi \qquad r_{AR} = \begin{pmatrix} 91 \\ 74 \\ 29 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot \%$$

Output - Check Base Plate Flexure:

$$P_{max\_AR} := \begin{cases} \max\left[1.054449\cdot\overrightarrow{(F_t\cdot A_{stress})}\cdot ASI\right] & \text{if } Case = \text{"Design"} \\ \max(R) & \text{if } Case = \text{"Analysis"} \end{cases}$$ $P_{max\_AR} = 176.6\cdot kip$

$t := t_{bpl}$ $t = 2.125\cdot in$

$k := \min(k_1, k_2)$ $k = 2.88\cdot in$

$$I_x := \frac{(a+b)\cdot t^3}{12}$$ $I_x = 9.75\cdot in^4$

$$k_x := \frac{3\cdot I_x}{y^3}$$ $k_x = 0.46\cdot in$

$$S_x := \frac{I_x}{\left(\frac{t}{2}\right)}$$ $S_x = 9.17\cdot in^3$

$$I_y := \frac{(y+k)\cdot t^3}{12}$$ $I_y = 5.50\cdot in^4$

$$k_y := \begin{cases} \dfrac{3\cdot I_y\cdot(3\cdot a+b)^2}{2\cdot a^3\cdot b^2} & \text{if } a \ge b \\ \dfrac{3\cdot I_y\cdot(3\cdot b+a)^2}{2\cdot b^3\cdot a^2} & \text{if } a < b \end{cases}$$ $k_y = 1.25\cdot in$

$$S_y := \frac{I_y}{\left(\frac{t}{2}\right)}$$ $S_y = 5.17\cdot in^3$

$$M_{x\_max} := \left(\frac{k_x}{k_x+k_y}\right)\cdot(P_{max\_AR}\cdot y)$$ $M_{x\_max} = 15.7\cdot kip\cdot ft$

$M'_{x\_All} := ASI\cdot\left[(0.75\cdot F_y)\cdot S_x\right]$ $M'_{x\_All} = 45.9\cdot kip\cdot ft$

$$r_x := \frac{M_{x\_max}}{M'_{x\_All}}$$ $r_x = 34\cdot\%$

$$M_{y\_max} := \begin{cases} \dfrac{k_y}{k_x+k_y}\cdot\left[\dfrac{P_{max\_AR}\cdot a\cdot b^2}{(a+b)^2}\right] & \text{if } a \le b \\ \dfrac{k_y}{k_x+k_y}\cdot\left[\dfrac{P_{max\_AR}\cdot a^2\cdot b}{(a+b)^2}\right] & \text{if } a > b \end{cases}$$ $M_{y\_max} = 17.8\cdot kip\cdot ft$

$M'_{y\_All} := ASI\cdot\left[(0.75\cdot F_y)\cdot S_y\right]$ $M'_{y\_All} = 25.9\cdot kip\cdot ft$

$$r_y := \frac{M_{y\_max}}{M'_{y\_All}}$$ $r_y = 69\cdot\%$

$r_{BPL} := \sqrt{r_x^2 + r_y^2}$ $r_{BPL} = 77 \cdot \%$

$P_{max\_shaft} := \left(\frac{k_x}{k_x + k_y}\right) \cdot P_{max\_AR}$ $P_{max\_shaft} = 47.2 \cdot kip$

$P_{t\_max\_SP} := \left(\frac{k_y}{k_x + k_y}\right) \cdot P_{max\_AR}$ $P_{t\_max\_SP} = 129.4 \cdot kip$

Output - Calculate Forces in TSP / SP's:

$l := a + b$ $l = 12.2 \cdot in$

$P_{max\_SP1} := \frac{P_{t\_max\_SP} \cdot b^2}{l^3} \cdot (b + 3 \cdot a)$ $P_{max\_SP1} = 112.6 \cdot kip$

$P_{max\_SP2} := \frac{P_{t\_max\_SP} \cdot a^2}{l^3} \cdot (a + 3 \cdot b)$ $P_{max\_SP2} = 16.8 \cdot kip$

$P'_{bar} := \begin{cases} 1.0549 \cdot P_{bar} & \text{if Case = "Design"} \\ P_{bar} & \text{if Case = "Analysis"} \end{cases}$ $P'_{bar} = 316 \cdot kip$

$P_{bar1} := \begin{cases} \left(1 - \frac{d_{1Bar}}{d_{1Bar} + d_{2Bar}}\right) \cdot P'_{bar} & \text{if Type1 = "TSP"} \\ 0 & \text{if Type1 = "SP"} \end{cases}$ $P_{bar1} = 158.2 \cdot kip$

$P_{bar2} := \begin{cases} \left(1 - \frac{d_{2Bar}}{d_{1Bar} + d_{2Bar}}\right) \cdot P'_{bar} & \text{if Type2 = "TSP"} \\ 0 & \text{if Type2 = "SP"} \end{cases}$ $P_{bar2} = 158.2 \cdot kip$

$P_{t\_max\_SP1} := P_{max\_SP1} + P_{bar1} + P_{ADD1}$ $P_{t\_max\_SP1} = 270.8 \cdot kip$

$P_{t\_max\_SP2} := P_{max\_SP2} + P_{bar2} + P_{ADD2}$ $P_{t\_max\_SP2} = 234.2 \cdot kip$

Output - Calculate SP Section Properties *(LEFT Side)*:

$L_{VW1} := L_{SP1} - clip_1$ $L_{VW1} = 32.25 \cdot in$

$L_{HW1} := b_{SP1} - clip_1$ $L_{HW1} = 6.13 \cdot in$

$\theta_1 := atan\left(\frac{b_{SP1}}{L_{SP1}}\right)$ $\theta_1 = 11.77 \cdot deg$

$B_1 := L_{SP1} \cdot \sin(\theta_1)$ $B_1 = 6.73 \cdot in$

$N_{B1} := \frac{clip_1}{(\sin(\theta_1) + \cos(\theta_1))}$ $N_{B1} = 0.634 \cdot in$

$N_1 := \frac{N_{B1}}{B_1}$ $N_1 = 0.094$

$L_1 := \sqrt{L_{SP1}^2 + b_{SP1}^2}$ $L_1 = 33.71 \cdot in$

$r_1 := \frac{t_{SP1}}{\sqrt{12}}$ $r_1 = 0.397 \cdot in$

$x_1 := \frac{b_{SP1}}{2}$ $x_1 = 3.44 \cdot in$

Output - Calculate Compressive Strength of SP:

$C_{c1} := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_{y\_SP1}}}$ $C_{c1} = 107.0$

$KLr_1 := \frac{K \cdot L_1}{r_1}$ $KLr_1 = 67.9$

$$F_{cr\_B1} := \begin{cases} \left[\dfrac{\left[1 - \dfrac{(KLr_1)^2}{2 \cdot C_{c1}^2}\right] \cdot F_{y\_SP1}}{\dfrac{5}{3} + \dfrac{3}{8} \cdot \left(\dfrac{KLr_1}{C_{c1}}\right) - \dfrac{(KLr_1)^3}{8 \cdot C_{c1}^3}} \right] & \text{if } KLr_1 < C_{c1} \\ \left[\dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot (KLr_1)^2} \right] & \text{if } KLr_1 \geq C_{c1} \end{cases}$$ $F_{cr\_B1} = 21.3 \cdot ksi$

$\Delta F_{cr1} := F_{y\_SP1} - F_{cr\_B1}$ $\Delta F_{cr1} = 28.7 \cdot ksi$

$$P'_{all\_SP1} := \left[\frac{t_{SP1} \cdot B_1^2}{6 \cdot x_1} \cdot \left[3 \cdot F_{y\_SP1} \cdot \left(1 - N_1^2\right) - 2 \cdot \left(\Delta F_{cr1}\right) \cdot \left(1 - N_1^3\right)\right] \right] \cdot ASI$$ $P'_{all\_SP1} = 367.8 \cdot kip$

$r_{cSP1} := \frac{P_{t\_max\_SP1}}{P'_{all\_SP1}}$ $r_{cSP1} = 74 \cdot \%$

Output - Calculate Shear and Tensile Strength of CAN-SP:

- Calculate Forces in SP:

$h_{V1} := clip_1 + \frac{L_{VW1}}{2}$ $h_{V1} = 16.88 \cdot in$

$V_{max\_V1} := P_{t\_max\_SP1}$ = shear on Vertical leg $V_{max\_V1} = 270.8 \cdot kip$

$T_{max\_V1} := \frac{P_{t\_max\_SP1} \cdot x_1}{h_{V1}}$ = max tension on Vertical leg $T_{max\_V1} = 55.2 \cdot kip$

$V_{max\_H1} := \frac{P_{t\_max\_SP1} \cdot x_1}{h_{V1}}$ = shear on Horizontal leg $V_{max\_H1} = 55.2 \cdot kip$

$T_{max\_H1} := P_{t\_max\_SP1}$ = tension on Horizontal leg $T_{max\_H1} = 270.8 \cdot kip$

- Shear Strength of *Vertical* Leg of SP:

$V'_{all\_V1} := \left[\left(0.4 \cdot F_{y\_SP1}\right) \cdot \left(L_{VW1} \cdot t_{SP1}\right)\right] \cdot ASI$ $V'_{all\_V1} = 1182.5 \cdot kip$

$r_{v\_V1} := \frac{V_{max\_V1}}{V'_{all\_V1}}$ $r_{v\_V1} = 23 \cdot \%$

- Tensile Strength of *Vertical* Leg of SP:

$T_{all\_V1} := \left[\left(0.6 \cdot F_{y\_SP1}\right) \cdot \left(L_{VW1} \cdot t_{SP1}\right)\right] \cdot ASI$ $T_{all\_V1} = 1773.7 \cdot kip$

$r_{t\_V1} := \frac{T_{max\_V1}}{T_{all\_V1}}$ $r_{t\_V1} = 3 \cdot \%$

- Combined Tension & Shear Strength of *Vertical* Leg of SP:

$r_{V1} := \left(\frac{T_{max\_V1}}{T_{all\_V1}}\right) + \left(\frac{V_{max\_V1}}{V'_{all\_V1}}\right)^2$ $r_{V1} = 8 \cdot \%$

- Shear Strength of *Horizontal* Leg of SP:

$V'_{all\_H1} := \left[\left(0.4 \cdot F_{y\_SP1}\right) \cdot \left(L_{HW1} \cdot t_{SP1}\right)\right] \cdot ASI$ $V'_{all\_H1} = 224.6 \cdot kip$

$r_{v\_H1} := \frac{V_{max\_H1}}{V'_{all\_H1}}$ $r_{v\_H1} = 25 \cdot \%$

- Tensile Strength of *Horizontal* Leg of SP:

$T'_{all\_H1} := \left[\left(0.6 \cdot F_{y\_SP1}\right) \cdot \left(L_{HW1} \cdot t_{SP1}\right)\right] \cdot ASI$ T'_{all_H1}

$r_{t\_H1} := \frac{T_{max\_H1}}{T'_{all\_H1}}$ $r_{t\_H1} = 80 \cdot \%$

- Combined Tension & Shear Strength of *Horizontal* Leg of SP:

$r_{H1} := \left(\frac{T_{max\_H1}}{T'_{all\_H1}}\right) + \left(\frac{V_{max\_H1}}{V'_{all\_H1}}\right)^2$ $r_{H1} = 86 \cdot \%$

Output - Check Shear and Tensile Strength of Vertical SP Weld:

$\theta_v \equiv 0 \cdot deg$

$F_{w\_v1} := 0.30 \cdot F_{EXX1} \cdot \left(1.0 + 0.50 \cdot \sin\left(\theta_v\right)^{1.5}\right)$ $F_{w\_v1} = 21.0 \cdot ksi$

$\theta_t \equiv 90 \cdot deg$

$F_{w\_t1} := 0.30 \cdot F_{EXX1} \cdot \left(1.0 + 0.50 \cdot \sin\left(\theta_t\right)^{1.5}\right)$ $F_{w\_t1} = 31.5 \cdot ksi$

- Shear Strength of Vertical Weld:

$A_{w\_V1} := \left(0.707 \cdot t_{VW1}\right) \cdot L_{VW1}$ $A_{w\_V1} = 7.13 \cdot in^2$

$V'_{all\_Vw1} := \left[2 \cdot \left(F_{w\_v1} \cdot A_{w\_V1}\right)\right] \cdot ASI$ $V'_{all\_Vw1} = 399 \cdot kip$

$r_{v\_Vw1} := \frac{V_{max\_V1}}{V'_{all\_Vw1}}$ $r_{v\_Vw1} = 68 \cdot \%$

- Tensile Strength of Vertical Weld:

$T'_{all\_Vw1} := [2 \cdot (F_{w\_t1} \cdot A_{w\_V1})] \cdot ASI$ $\qquad T'_{all\_Vw1} = 599 \cdot kip$

$r_{t\_Vw1} := \frac{T_{max\_V1}}{T'_{all\_Vw1}}$ $\qquad r_{t\_Vw1} = 9 \cdot \%$

- Combined Tension & Shear Strength of Vertical Weld:

$r_{Vw1} := \left(\frac{T_{max\_V1}}{T'_{all\_Vw1}}\right) + \left(\frac{V_{max\_V1}}{V'_{all\_Vw1}}\right)^2$ $\qquad r_{Vw1} = 55 \cdot \%$

Output - Check Design Shaft Punching Shear:

$V_{max\_PS1} := T_{max\_V1}$ $\qquad V_{max\_PS1} = 55.2 \cdot kip$

$V'_{all1} := 2 \cdot [(0.4 \cdot F_{y\_shaft}) \cdot (t_{shaft} \cdot L_{VW1})] \cdot ASI$ $\qquad V'_{all1} = 698.7 \cdot kip$

$r_{v\_PS1} := \frac{V_{max\_PS1}}{V'_{all1}}$ $\qquad r_{v\_PS1} = 8 \cdot \%$

Output - Calculate SP Section Properties *(RIGHT Side)*:

$L_{VW2} := L_{SP2} - clip_2$ $\qquad L_{VW2} = 32.25 \cdot in$

$L_{HW2} := b_{SP2} - clip_2$ $\qquad L_{HW2} = 6.13 \cdot in$

$\theta_2 := atan\left(\frac{b_{SP2}}{L_{SP2}}\right)$ $\qquad \theta_2 = 11.77 \cdot deg$

$B_2 := L_{SP2} \cdot \sin(\theta_2)$ $\qquad B_2 = 6.73 \cdot in$

$N_{B2} := \frac{clip_2}{(\sin(\theta_2) + \cos(\theta_2))}$ $\qquad N_{B2} = 0.634 \cdot in$

$N_2 := \frac{N_{B2}}{B_2}$ $\qquad N_2 = 0.094$

$L_2 := \sqrt{L_{SP2}^2 + b_{SP2}^2}$ $\qquad L_2 = 33.71 \cdot in$

$r_2 := \frac{t_{SP2}}{\sqrt{12}}$ $\qquad r_2 = 0.397 \cdot in$

$x_2 := \frac{b_{SP2}}{2}$ $\qquad x_2 = 3.44 \cdot in$

Output - Calculate Compressive Strength of SP:

$C_{c2} := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_{y\_SP2}}}$ $\qquad C_{c2} = 107.0$

$KLr_2 := \frac{K \cdot L_2}{r_2}$ $\qquad KLr_2 = 67.9$

$$F_{cr\_B2} := \left| \begin{array}{l} \left[\dfrac{\left[1 - \dfrac{(KLr_2)^2}{2 \cdot C_{c2}^{\ 2}}\right] \cdot F_{y\_SP2}}{\dfrac{5}{3} + \dfrac{3}{8} \cdot \left(\dfrac{KLr_2}{C_{c2}}\right) - \dfrac{(KLr_2)^3}{8 \cdot C_{c2}^{\ 3}}} \right] \text{ if } KLr_2 < C_{c2} \\ \left[\dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot (KLr_2)^2} \right] \text{ if } KLr_2 \geq C_{c2} \end{array} \right.$$

$F_{cr\_B2} = 21.3 \cdot ksi$

$$\Delta F_{cr2} := F_{y\_SP2} - F_{cr\_B2}$$

$\Delta F_{cr2} = 28.7 \cdot ksi$

$$P'_{all\_SP2} := \left[\frac{t_{SP2} \cdot B_2^{\ 2}}{6 \cdot x_2} \cdot \left[3 \cdot F_{y\_SP2} \cdot \left(1 - N_2^{\ 2}\right) - 2 \cdot \left(\Delta F_{cr2}\right) \cdot \left(1 - N_2^{\ 3}\right)\right] \right] \cdot ASI$$

$P'_{all\_SP2} = 367.8 \cdot kip$

$$r_{cSP2} := \frac{P_{t\_max\_SP2}}{P'_{all\_SP2}}$$

$r_{cSP2} = 64 \cdot \%$

Output - Calculate Shear and Tensile Strength of CAN-SP:

- Calculate Forces in SP:

$$h_{V2} := clip_2 + \frac{L_{VW2}}{2}$$

$h_{V2} = 16.88 \cdot in$

$V_{max\_V2} := P_{t\_max\_SP2}$ = shear on Vertical leg

$V_{max\_V2} = 234.2 \cdot kip$

$T_{max\_V2} := \dfrac{P_{t\_max\_SP2} \cdot x_2}{h_{V2}}$ = max tension on Vertical leg

$T_{max\_V2} = 47.7 \cdot kip$

$V_{max\_H2} := \dfrac{P_{t\_max\_SP2} \cdot x_2}{h_{V2}}$ = shear on Horizontal leg

$V_{max\_H2} = 47.7 \cdot kip$

$T_{max\_H2} := P_{t\_max\_SP2}$ = tension on Horizontal leg

$T_{max\_H2} = 234.2 \cdot kip$

- Shear Strength of *Vertical* Leg of SP:

$$V'_{all\_V2} := \left[\left(0.4 \cdot F_{y\_SP2}\right) \cdot \left(L_{VW2} \cdot t_{SP2}\right)\right] \cdot ASI$$

$V'_{all\_V2} = 1182.5 \cdot kip$

$$r_{v\_V2} := \frac{V_{max\_V2}}{V'_{all\_V2}}$$

$r_{v\_V2} = 20 \cdot \%$

- Tensile Strength of *Vertical* Leg of SP:

$$T_{all\_V2} := \left[\left(0.6 \cdot F_{y\_SP2}\right) \cdot \left(L_{VW2} \cdot t_{SP2}\right)\right] \cdot ASI$$

$T_{all\_V2} = 1773.7 \cdot kip$

$$r_{t\_V2} := \frac{T_{max\_V2}}{T_{all\_V2}}$$

$r_{t\_V2} = 3 \cdot \%$

- Combined Tension & Shear Strength of *Vertical* Leg of SP:

$$r_{V2} := \left(\frac{T_{max\_V2}}{T_{all\_V2}}\right) + \left(\frac{V_{max\_V2}}{V'_{all\_V2}}\right)^2$$ $r_{V2} = 7 \cdot \%$

- Shear Strength of *Horizontal* Leg of SP:

$$V'_{all\_H2} := \left[\left(0.4 \cdot F_{y\_SP2}\right) \cdot \left(L_{HW2} \cdot t_{SP2}\right)\right] \cdot ASI$$ $V'_{all\_H2} = 224.6 \cdot kip$

$$r_{v\_H2} := \frac{V_{max\_H2}}{V'_{all\_H2}}$$ $r_{v\_H2} = 21 \cdot \%$

- Tensile Strength of *Horizontal* Leg of SP:

$$T'_{all\_H2} := \left[\left(0.6 \cdot F_{y\_SP2}\right) \cdot \left(L_{HW2} \cdot t_{SP2}\right)\right] \cdot ASI$$ $T'_{all\_H2} = 336.9 \cdot kip$

$$r_{t\_H2} := \frac{T_{max\_H2}}{T'_{all\_H2}}$$ $r_{t\_H2} = 70 \cdot \%$

- Combined Tension & Shear Strength of *Horizontal* Leg of SP:

$$r_{H2} := \left(\frac{T_{max\_H2}}{T'_{all\_H2}}\right) + \left(\frac{V_{max\_H2}}{V'_{all\_H2}}\right)^2$$ $r_{H2} = 74 \cdot \%$

Output - Check Shear and Tensile Strength of Vertical SP Weld:

$$\theta_v \equiv 0 \cdot deg$$

$$F_{w\_v2} := 0.30 \cdot F_{EXX2} \cdot \left(1.0 + 0.50 \cdot \sin\left(\theta_v\right)^{1.5}\right)$$ $F_{w\_v2} = 21.0 \cdot ksi$

$$\theta_t \equiv 90 \cdot deg$$

$$F_{w\_t2} := 0.30 \cdot F_{EXX2} \cdot \left(1.0 + 0.50 \cdot \sin\left(\theta_t\right)^{1.5}\right)$$ $F_{w\_t2} = 31.5 \cdot ksi$

- Shear Strength of Vertical Weld:

$$A_{w\_V2} := \left(0.707 \cdot t_{VW2}\right) \cdot L_{VW2}$$ $A_{w\_V2} = 7.13 \cdot in^2$

$$V'_{all\_Vw2} := \left[2 \cdot \left(F_{w\_v2} \cdot A_{w\_V2}\right)\right] \cdot ASI$$ $V'_{all\_Vw2} = 399 \cdot kip$

$$r_{v\_Vw2} := \frac{V_{max\_V2}}{V'_{all\_Vw2}}$$ $r_{v\_Vw2} = 59 \cdot \%$

- Tensile Strength of Vertical Weld:

$$T'_{all\_Vw2} := \left[2 \cdot \left(F_{w\_t2} \cdot A_{w\_V2}\right)\right] \cdot ASI$$ $T'_{all\_Vw2} = 599 \cdot kip$

$$r_{t\_Vw2} := \frac{T_{max\_V2}}{T'_{all\_Vw2}}$$ $r_{t\_Vw2} = 8 \cdot \%$

- Combined Tension & Shear Strength of Vertical Weld:

$$r_{Vw2} := \left(\frac{T_{max\_V2}}{T'_{all\_Vw2}}\right) + \left(\frac{V_{max\_V2}}{V'_{all\_Vw2}}\right)^2$$ $r_{Vw2} = 42 \cdot \%$

Output - Check Design Shaft Punching Shear:

$V_{max\_PS2} := T_{max\_V2}$ $V_{max\_PS2} = 47.7 \cdot kip$

$V'_{all2} := 2 \cdot \left[\left(0.4 \cdot F_{y\_shaft}\right) \cdot \left(t_{shaft} \cdot L_{VW2}\right)\right] \cdot ASI$ $V'_{all2} = 698.7 \cdot kip$

$r_{v\_PS2} := \frac{V_{max\_PS2}}{V'_{all2}}$ $r_{v\_PS2} = 7 \cdot \%$

Output - Results Summary:

- Anchor Rods & Base Plate:

$result_{AR} := max\left(r_{AR}\right)$ $result_{AR} = 91 \cdot \%$

$result_{BPL} := \begin{pmatrix} r_x \\ r_y \\ r_{BPL} \end{pmatrix}$ $result_{BPL} = \begin{pmatrix} 34 \\ 69 \\ 77 \end{pmatrix} \cdot \%$

$Max_{Utilization\_AR\_BPL} := max\left(result_{AR}, result_{BPL}\right)$ $Max_{Utilization\_AR\_BPL} = 91 \cdot \%$

- SP on Left Side:

$result_{SP1} := \begin{pmatrix} r_{cSP1} \\ r_{v\_V1} \\ r_{t\_V1} \\ r_{V1} \\ r_{v\_H1} \\ r_{t\_H1} \\ r_{H1} \end{pmatrix}$ $result_{SP1} = \begin{pmatrix} 74 \\ 23 \\ 3 \\ 8 \\ 25 \\ 80 \\ 86 \end{pmatrix} \cdot \%$

$result_{SP\_weld1} := \begin{pmatrix} r_{v\_Vw1} \\ r_{t\_Vw1} \\ r_{Vw1} \end{pmatrix}$ $result_{SP\_weld1} = \begin{pmatrix} 68 \\ 9 \\ 55 \end{pmatrix} \cdot \%$

$result_{shaft1} := r_{v\_PS1}$ $result_{shaft1} = 8 \cdot \%$

$L_{SP1\_reqd} := \begin{cases} [z + n \cdot (3 \cdot in) + h] & \text{if } Type1 = \text{"TSP"} \\ \text{"N/A"} & \text{if } Type1 = \text{"SP"} \end{cases}$ $L_{SP1\_reqd} = 33 \cdot in$

$L_{SP1\_check} := \begin{cases} \text{"N/A"} & \text{if } Type1 = \text{"SP"} \\ \text{if } Type1 = \text{"TSP"} & \begin{cases} \text{"OK"} & \text{if } L_{SP1} \geq L_{SP1\_reqd} \\ \text{"NG"} & \text{if } L_{SP1} < L_{SP1\_reqd} \end{cases} \end{cases}$ $L_{SP1\_check} = \text{"OK"}$

$Max_{Utilization\_SP1} := max\left(result_{SP1}, result_{SP\_weld1}, result_{shaft1}\right)$ $Max_{Utilization\_SP1} = 86 \cdot \%$

- SP on Right Side:

$$result_{SP2} := \begin{pmatrix} r_{cSP2} \\ r_{v\_V2} \\ r_{t\_V2} \\ r_{V2} \\ r_{v\_H2} \\ r_{t\_H2} \\ r_{H2} \end{pmatrix} \qquad result_{SP2} = \begin{pmatrix} 64 \\ 20 \\ 3 \\ 7 \\ 21 \\ 70 \\ 74 \end{pmatrix} \cdot \%$$

$$result_{SP\_weld2} := \begin{pmatrix} r_{v\_Vw2} \\ r_{t\_Vw2} \\ r_{Vw2} \end{pmatrix} \qquad result_{SP\_weld2} = \begin{pmatrix} 59 \\ 8 \\ 42 \end{pmatrix} \cdot \%$$

$$result_{shaft2} := r_{v\_PS2} \qquad result_{shaft2} = 7 \cdot \%$$

$$L_{SP2\_reqd} := \begin{vmatrix} [z + n\cdot(3\cdot in) + h] \text{ if } Type2 = \text{"TSP"} \\ \text{"N/A" if } Type2 = \text{"SP"} \end{vmatrix} \qquad L_{SP2\_reqd} = 33.00\cdot in$$

$$L_{SP2\_check} := \begin{vmatrix} \text{"N/A" if } Type2 = \text{"SP"} \\ \text{if } Type2 = \text{"TSP"} \\ \quad \begin{vmatrix} \text{"OK" if } L_{SP2} \ge L_{SP2\_reqd} \\ \text{"NG" if } L_{SP2} < L_{SP2\_reqd} \end{vmatrix} \end{vmatrix} \qquad L_{SP2\_check} = \text{"OK"}$$

$$Max_{Utilization\_SP2} := \max(result_{SP2}, result_{SP\_weld2}, result_{shaft2}) \qquad Max_{Utilization\_SP2} = 74\cdot\%$$

$$Max\_Utilization_{AR\_BPL} := \max(Max_{Utilization\_AR\_BPL}) \qquad Max\_Utilization_{AR\_BPL} = 91\cdot\%$$

$$Max\_Utilization_{SP} := \max(Max_{Utilization\_SP1}, Max_{Utilization\_SP2}) \qquad Max\_Utilization_{SP} = 86\cdot\%$$

$$P_{add1} := P_{max\_SP1} + P_{bar1} \qquad P_{add1} = 270.8\cdot kip$$

$$P_{add2} := P_{max\_SP2} + P_{bar2} \qquad P_{add2} = 175.0\cdot kip$$

$t_{SP1} = 1.375\cdot in$	$t_{SP2} = 1.375\cdot in$
$b_{SP1} = 6.875\cdot in$	$b_{SP2} = 6.875\cdot in$
$L_{SP1} = 33.00\cdot in$	$L_{SP2} = 33.00\cdot in$

Input

Design
Analysis

CONSTANTS:

$E \equiv 29000 \cdot ksi$

$K \equiv 0.8$

$ASI \equiv \frac{4}{3}$

- Reactions & Forces:

$M := 1747 \cdot kip \cdot ft$ = max moment reaction at top of base plate

$P := 22 \cdot kip$ = max axial reaction at top of base plate

$P_{ADD1} := 175.0 \cdot kip$ = additional axial force to SP on opposite side of SP (left side)

$P_{ADD2} := 0 \cdot kip$ = additional axial force to SP on opposite side of SP (right side)

- Shaft:

$t_{shaft} := 0.3125 \cdot in$ = thickness of shaft

$F_{y\_shaft} := 65 \cdot ksi$ = specified minimum yield stress of shaft

- Base Plate:

$t_{bpl} := 1.75 \cdot in$ = thickness of base plate

$F_y := 60 \cdot ksi$ = specified minimum yield stress of shaft

$a := 4.375 \cdot in$ = distance from edge of stiffener plate on left side to center of anchor rod

$b := 3.0625 \cdot in$ = distance from edge of stiffener plate on right side to center of anchor rod

$y := 4.0 \cdot in$ = distance from shaft wall to center of anchor rod

- Bar:

$P_{bar} := 0 \cdot kip$ = axial force from bar (see Pole Tool-F v1.6.xls)

$d_{1Bar} := 0 \cdot in$ = distance from center of bar to edge of TSP (left side)

$d_{2Bar} := 0 \cdot in$ = distance from center of bar to edge of TSP (right side)

$n := 0$ = number of termination bolts

$z := 0 \cdot in$ = height above base plate to bottom of bar / height above SP

$h := 0 \cdot in$ = height above top termination bolt to top of TSP

- Transition / Stiffener Plates:

- TSP / SP on Left Side of AR:

TSP
SP

$b_{SP1} := 6.875 \cdot in$ = width of stiffener plate

$t_{SP1} := 1.375 \cdot in$ = thickness of stiffener plate

$L_{SP1} := 33.0 \cdot in$ = length of stiffener plate

$clip_1 := 0.75 \cdot in$ = length of clip

$t_{VW1} := 0.3125 \cdot in$ = thickness of vertical weld

$F_{y\_SP1} := 50 \cdot ksi$ = specified minimum yield stress of SP material

$F_{EXX1} := 70 \cdot ksi$ = specified minimum ultimate stress of weld electrode

$k_1 := b_{SP1} - y$ = distance from center of anchor rod to edge of base plate / edge of stiffener plate

$k_1 = 2.875 \cdot in$

- TSP / SP on Right Side of AR:

TSP
SP

$b_{SP2} := 6.875 \cdot in$ = width of stiffener plate

$t_{SP2} := 0.75 \cdot in$ = thickness of stiffener plate

$L_{SP2} := 14.0 \cdot in$ = length of stiffener plate

$clip_2 := 0.75 \cdot in$ = length of clip

$t_{VW2} := 0.3125 \cdot in$ = thickness of vertical weld

$F_{y\_SP2} := 50 \cdot ksi$ = specified minimum yield stress of SP material

$F_{EXX2} := 70 \cdot ksi$ = specified minimum ultimate stress of weld electrode

$k_2 := b_{SP2} - y$ = distance from center of anchor rod to edge of base plate / edge of stiffener plate

$k_2 = 2.875 \cdot in$

- Anchor Rods:

$$Q := \begin{pmatrix} 2 \\ 4 \\ 4 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad d := \begin{pmatrix} 2 \cdot 12 \\ 1 \cdot 12 + 7 + \frac{7}{16} \\ 7 + \frac{7}{16} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot in \quad A_{stiff} := \begin{pmatrix} 3.98 \\ 3.98 \\ 3.98 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} in^2 \quad A_{stress} := \begin{pmatrix} 3.25 \\ 3.25 \\ 3.25 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} in^2 \quad F_t := \begin{pmatrix} 0.6 \cdot 75 \\ 0.6 \cdot 75 \\ 0.6 \cdot 75 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot ksi$$

$\sum \overrightarrow{(Q)} = 10$

Output - Anchor Rod, Deformation Method:

$$R := \frac{M \cdot \overrightarrow{(d \cdot A_{stiff})}}{sumQAd} + \frac{P \cdot A_{stiff}}{\sum \overrightarrow{(A_{stiff} \cdot Q)}} \qquad sumQAd := \sum \overrightarrow{(Q \cdot d^2 \cdot A_{stiff})}$$

$sumQAd = 11480 \cdot in^4$

ϕRnt = nominal tension strength
d = distance from center
A = area of fastener
Q = quantity of fasteners

$$f_t := \overrightarrow{\left(\frac{R}{A_{stress}}\right)} \qquad r_{AR} := \overrightarrow{\left(\frac{f_t}{ASI \cdot F_t}\right)}$$

$$R = \begin{pmatrix} 176.6 \\ 143.5 \\ 56.3 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot kip \quad f_t = \begin{pmatrix} 54.3 \\ 44.1 \\ 17.3 \\ 0.0 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot ksi \quad r_{AR} = \begin{pmatrix} 91 \\ 74 \\ 29 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot \%$$

Output - Check Base Plate Flexure:

$$P_{max\_AR} := \begin{cases} \max\left[1.054449\cdot\overrightarrow{(F_t\cdot A_{stress})}\cdot ASI\right] & \text{if } Case = \text{"Design"} \\ \max(R) & \text{if } Case = \text{"Analysis"} \end{cases}$$ $P_{max\_AR} = 176.6\cdot kip$

$t := t_{bpl}$ $t = 1.75\cdot in$

$k := \min(k_1, k_2)$ $k = 2.88\cdot in$

$$I_x := \frac{(a + b)\cdot t^3}{12}$$ $I_x = 3.32\cdot in^4$

$$k_x := \frac{3\cdot I_x}{y^3}$$ $k_x = 0.16\cdot in$

$$S_x := \frac{I_x}{\left(\frac{t}{2}\right)}$$ $S_x = 3.80\cdot in^3$

$$I_y := \frac{(y + k)\cdot t^3}{12}$$ $I_y = 3.07\cdot in^4$

$$k_y := \begin{cases} \dfrac{3\cdot I_y\cdot(3\cdot a + b)^2}{2\cdot a^3\cdot b^2} & \text{if } a \ge b \\ \dfrac{3\cdot I_y\cdot(3\cdot b + a)^2}{2\cdot b^3\cdot a^2} & \text{if } a < b \end{cases}$$ $k_y = 1.54\cdot in$

$$S_y := \frac{I_y}{\left(\frac{t}{2}\right)}$$ $S_y = 3.51\cdot in^3$

$$M_{x\_max} := \left(\frac{k_x}{k_x + k_y}\right)\cdot(P_{max\_AR}\cdot y)$$ $M_{x\_max} = 5.4\cdot kip\cdot ft$

$M'_{x\_All} := ASI\cdot\left[(0.75\cdot F_y)\cdot S_x\right]$ $M'_{x\_All} = 19.0\cdot kip\cdot ft$

$$r_x := \frac{M_{x\_max}}{M'_{x\_All}}$$ $r_x = 29\cdot\%$

$$M_{y\_max} := \begin{cases} \dfrac{k_y}{k_x + k_y}\cdot\left[\dfrac{P_{max\_AR}\cdot a\cdot b^2}{(a + b)^2}\right] & \text{if } a \le b \\ \dfrac{k_y}{k_x + k_y}\cdot\left[\dfrac{P_{max\_AR}\cdot a^2\cdot b}{(a + b)^2}\right] & \text{if } a > b \end{cases}$$ $M_{y\_max} = 14.2\cdot kip\cdot ft$

$M'_{y\_All} := ASI\cdot\left[(0.75\cdot F_y)\cdot S_y\right]$ $M'_{y\_All} = 17.5\cdot kip\cdot ft$

$$r_y := \frac{M_{y\_max}}{M'_{y\_All}}$$ $r_y = 81\cdot\%$

$$r_{BPL} := \sqrt{r_x^{\,2} + r_y^{\,2}}$$ $r_{BPL} = 86 \cdot \%$

$$P_{max\_shaft} := \left(\frac{k_x}{k_x + k_y}\right) \cdot P_{max\_AR}$$ $P_{max\_shaft} = 16.3 \cdot kip$

$$P_{t\_max\_SP} := \left(\frac{k_y}{k_x + k_y}\right) \cdot P_{max\_AR}$$ $P_{t\_max\_SP} = 160.4 \cdot kip$

Output - Calculate Forces in TSP / SP's:

$l := a + b$ $l = 7.4 \cdot in$

$$P_{max\_SP1} := \frac{P_{t\_max\_SP} \cdot b^2}{l^3} \cdot (b + 3 \cdot a)$$ $P_{max\_SP1} = 59.2 \cdot kip$

$$P_{max\_SP2} := \frac{P_{t\_max\_SP} \cdot a^2}{l^3} \cdot (a + 3 \cdot b)$$ $P_{max\_SP2} = 101.2 \cdot kip$

$$P'_{bar} := \begin{cases} 1.0549 \cdot P_{bar} & \text{if } Case = \text{"Design"} \\ P_{bar} & \text{if } Case = \text{"Analysis"} \end{cases}$$ $P'_{bar} = 0 \cdot kip$

$$P_{bar1} := \begin{cases} \left(1 - \frac{d_{1Bar}}{d_{1Bar} + d_{2Bar}}\right) \cdot P'_{bar} & \text{if } Type1 = \text{"TSP"} \\ 0 & \text{if } Type1 = \text{"SP"} \end{cases}$$ $P_{bar1} = 0.0 \cdot kip$

$$P_{bar2} := \begin{cases} \left(1 - \frac{d_{2Bar}}{d_{1Bar} + d_{2Bar}}\right) \cdot P'_{bar} & \text{if } Type2 = \text{"TSP"} \\ 0 & \text{if } Type2 = \text{"SP"} \end{cases}$$ $P_{bar2} = 0.0 \cdot kip$

$P_{t\_max\_SP1} := P_{max\_SP1} + P_{bar1} + P_{ADD1}$ $P_{t\_max\_SP1} = 234.2 \cdot kip$

$P_{t\_max\_SP2} := P_{max\_SP2} + P_{bar2} + P_{ADD2}$ $P_{t\_max\_SP2} = 101.2 \cdot kip$

Output - Calculate SP Section Properties *(LEFT Side)*:

$L_{VW1} := L_{SP1} - clip_1$ $L_{VW1} = 32.25 \cdot in$

$L_{HW1} := b_{SP1} - clip_1$ $L_{HW1} = 6.13 \cdot in$

$$\theta_1 := atan\left(\frac{b_{SP1}}{L_{SP1}}\right)$$ $\theta_1 = 11.77 \cdot deg$

$B_1 := L_{SP1} \cdot \sin(\theta_1)$ $B_1 = 6.73 \cdot in$

$$N_{B1} := \frac{clip_1}{(\sin(\theta_1) + \cos(\theta_1))}$$ $N_{B1} = 0.634 \cdot in$

$$N_1 := \frac{N_{B1}}{B_1}$$ $N_1 = 0.094$

$L_1 := \sqrt{L_{SP1}^2 + b_{SP1}^2}$ $L_1 = 33.71 \cdot in$

$r_1 := \frac{t_{SP1}}{\sqrt{12}}$ $r_1 = 0.397 \cdot in$

$x_1 := \frac{b_{SP1}}{2}$ $x_1 = 3.44 \cdot in$

Output - Calculate Compressive Strength of SP:

$C_{c1} := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_{y\_SP1}}}$ $C_{c1} = 107.0$

$KLr_1 := \frac{K \cdot L_1}{r_1}$ $KLr_1 = 67.9$

$$F_{cr\_B1} := \begin{cases} \left[\frac{\left[1 - \frac{(KLr_1)^2}{2 \cdot C_{c1}^2}\right] \cdot F_{y\_SP1}}{\frac{5}{3} + \frac{3}{8} \cdot \left(\frac{KLr_1}{C_{c1}}\right) - \frac{(KLr_1)^3}{8 \cdot C_{c1}^3}} \right] & \text{if } KLr_1 < C_{c1} \\ \left[\frac{12 \cdot \pi^2 \cdot E}{23 \cdot (KLr_1)^2} \right] & \text{if } KLr_1 \ge C_{c1} \end{cases}$$ $F_{cr\_B1} = 21.3 \cdot ksi$

$\Delta F_{cr1} := F_{y\_SP1} - F_{cr\_B1}$ $\Delta F_{cr1} = 28.7 \cdot ksi$

$$P'_{all\_SP1} := \left[\frac{t_{SP1} \cdot B_1^2}{6 \cdot x_1} \cdot \left[3 \cdot F_{y\_SP1} \cdot \left(1 - N_1^2\right) - 2 \cdot (\Delta F_{cr1}) \cdot \left(1 - N_1^3\right)\right] \right] \cdot ASI$$ $P'_{all\_SP1} = 367.8 \cdot kip$

$r_{cSP1} := \frac{P_{t\_max\_SP1}}{P'_{all\_SP1}}$ $r_{cSP1} = 64 \cdot \%$

Output - Calculate Shear and Tensile Strength of CAN-SP:

- Calculate Forces in SP:

$h_{V1} := clip_1 + \frac{L_{VW1}}{2}$ $h_{V1} = 16.88 \cdot in$

$V_{max\_V1} := P_{t\_max\_SP1}$ = shear on Vertical leg $V_{max\_V1} = 234.2 \cdot kip$

$T_{max\_V1} := \frac{P_{t\_max\_SP1} \cdot x_1}{h_{V1}}$ = max tension on Vertical leg $T_{max\_V1} = 47.7 \cdot kip$

$V_{max\_H1} := \frac{P_{t\_max\_SP1} \cdot x_1}{h_{V1}}$ = shear on Horizontal leg $V_{max\_H1} = 47.7 \cdot kip$

$T_{max\_H1} := P_{t\_max\_SP1}$ = tension on Horizontal leg $T_{max\_H1} = 234.2 \cdot kip$

- Shear Strength of *Vertical* Leg of SP:

$V'_{all\_V1} := \left[\left(0.4\cdot F_{y\_SP1}\right)\cdot\left(L_{VW1}\cdot t_{SP1}\right)\right]\cdot ASI$ $\quad V'_{all\_V1} = 1182.5\cdot kip$

$r_{v\_V1} := \dfrac{V_{max\_V1}}{V'_{all\_V1}}$ $\quad r_{v\_V1} = 20\cdot\%$

- Tensile Strength of *Vertical* Leg of SP:

$T_{all\_V1} := \left[\left(0.6\cdot F_{y\_SP1}\right)\cdot\left(L_{VW1}\cdot t_{SP1}\right)\right]\cdot ASI$ $\quad T_{all\_V1} = 1773.7\cdot kip$

$r_{t\_V1} := \dfrac{T_{max\_V1}}{T_{all\_V1}}$ $\quad r_{t\_V1} = 3\cdot\%$

- Combined Tension & Shear Strength of *Vertical* Leg of SP:

$r_{V1} := \left(\dfrac{T_{max\_V1}}{T_{all\_V1}}\right) + \left(\dfrac{V_{max\_V1}}{V'_{all\_V1}}\right)^2$ $\quad r_{V1} = 7\cdot\%$

- Shear Strength of *Horizontal* Leg of SP:

$V'_{all\_H1} := \left[\left(0.4\cdot F_{y\_SP1}\right)\cdot\left(L_{HW1}\cdot t_{SP1}\right)\right]\cdot ASI$ $\quad V'_{all\_H1} = 224.6\cdot kip$

$r_{v\_H1} := \dfrac{V_{max\_H1}}{V'_{all\_H1}}$ $\quad r_{v\_H1} = 21\cdot\%$

- Tensile Strength of *Horizontal* Leg of SP:

$T'_{all\_H1} := \left[\left(0.6\cdot F_{y\_SP1}\right)\cdot\left(L_{HW1}\cdot t_{SP1}\right)\right]\cdot ASI$ $\quad T'_{all\_H1}$

$r_{t\_H1} := \dfrac{T_{max\_H1}}{T'_{all\_H1}}$ $\quad r_{t\_H1} = 70\cdot\%$

- Combined Tension & Shear Strength of *Horizontal* Leg of SP:

$r_{H1} := \left(\dfrac{T_{max\_H1}}{T'_{all\_H1}}\right) + \left(\dfrac{V_{max\_H1}}{V'_{all\_H1}}\right)^2$ $\quad r_{H1} = 74\cdot\%$

Output - Check Shear and Tensile Strength of Vertical SP Weld:

$\theta_v \equiv 0\cdot deg$

$F_{w\_v1} := 0.30\cdot F_{EXX1}\cdot\left(1.0 + 0.50\cdot \sin\left(\theta_v\right)^{1.5}\right)$ $\quad F_{w\_v1} = 21.0\cdot ksi$

$\theta_t \equiv 90\cdot deg$

$F_{w\_t1} := 0.30\cdot F_{EXX1}\cdot\left(1.0 + 0.50\cdot \sin\left(\theta_t\right)^{1.5}\right)$ $\quad F_{w\_t1} = 31.5\cdot ksi$

- Shear Strength of Vertical Weld:

$A_{w\_V1} := \left(0.707\cdot t_{VW1}\right)\cdot L_{VW1}$ $\quad A_{w\_V1} = 7.13\cdot in^2$

$V'_{all\_Vw1} := \left[2\cdot\left(F_{w\_v1}\cdot A_{w\_V1}\right)\right]\cdot ASI$ $\quad V'_{all\_Vw1} = 399\cdot kip$

$r_{v\_Vw1} := \dfrac{V_{max\_V1}}{V'_{all\_Vw1}}$ $\quad r_{v\_Vw1} = 59\cdot\%$

- Tensile Strength of Vertical Weld:

$T'_{all\_Vw1} := \left[2\cdot\left(F_{w\_t1}\cdot A_{w\_V1}\right)\right]\cdot ASI$ $\qquad T'_{all\_Vw1} = 599\cdot kip$

$r_{t\_Vw1} := \frac{T_{max\_V1}}{T'_{all\_Vw1}}$ $\qquad r_{t\_Vw1} = 8\cdot\%$

- Combined Tension & Shear Strength of Vertical Weld:

$r_{Vw1} := \left(\frac{T_{max\_V1}}{T'_{all\_Vw1}}\right) + \left(\frac{V_{max\_V1}}{V'_{all\_Vw1}}\right)^2$ $\qquad r_{Vw1} = 42\cdot\%$

Output - Check Design Shaft Punching Shear:

$V_{max\_PS1} := T_{max\_V1}$ $\qquad V_{max\_PS1} = 47.7\cdot kip$

$V'_{all1} := 2\cdot\left[\left(0.4\cdot F_{y\_shaft}\right)\cdot\left(t_{shaft}\cdot L_{VW1}\right)\right]\cdot ASI$ $\qquad V'_{all1} = 698.7\cdot kip$

$r_{v\_PS1} := \frac{V_{max\_PS1}}{V'_{all1}}$ $\qquad r_{v\_PS1} = 7\cdot\%$

Output - Calculate SP Section Properties *(RIGHT Side)*:

$L_{VW2} := L_{SP2} - clip_2$ $\qquad L_{VW2} = 13.25\cdot in$

$L_{HW2} := b_{SP2} - clip_2$ $\qquad L_{HW2} = 6.13\cdot in$

$\theta_2 := atan\left(\frac{b_{SP2}}{L_{SP2}}\right)$ $\qquad \theta_2 = 26.15\cdot deg$

$B_2 := L_{SP2}\cdot\sin\left(\theta_2\right)$ $\qquad B_2 = 6.17\cdot in$

$N_{B2} := \frac{clip_2}{\left(\sin\left(\theta_2\right) + \cos\left(\theta_2\right)\right)}$ $\qquad N_{B2} = 0.560\cdot in$

$N_2 := \frac{N_{B2}}{B_2}$ $\qquad N_2 = 0.091$

$L_2 := \sqrt{L_{SP2}^{\ 2} + b_{SP2}^{\ 2}}$ $\qquad L_2 = 15.60\cdot in$

$r_2 := \frac{t_{SP2}}{\sqrt{12}}$ $\qquad r_2 = 0.217\cdot in$

$x_2 := \frac{b_{SP2}}{2}$ $\qquad x_2 = 3.44\cdot in$

Output - Calculate Compressive Strength of SP:

$C_{c2} := \sqrt{\frac{2\cdot\pi^2\cdot E}{F_{y\_SP2}}}$ $\qquad C_{c2} = 107.0$

$KLr_2 := \frac{K\cdot L_2}{r_2}$ $\qquad KLr_2 = 57.6$

$$F_{cr\_B2} := \begin{cases} \left[\dfrac{\left[1 - \dfrac{(KLr_2)^2}{2 \cdot C_{c2}^{\,2}}\right] \cdot F_{y\_SP2}}{\left[\dfrac{5}{3} + \dfrac{3}{8} \cdot \left(\dfrac{KLr_2}{C_{c2}}\right) - \dfrac{(KLr_2)^3}{8 \cdot C_{c2}^{\,3}}\right]}\right] & \text{if } KLr_2 < C_{c2} \\ \left[\dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot (KLr_2)^2}\right] & \text{if } KLr_2 \ge C_{c2} \end{cases}$$

$F_{cr\_B2} = 23.1 \cdot ksi$

$\Delta F_{cr2} := F_{y\_SP2} - F_{cr\_B2}$ $\Delta F_{cr2} = 26.9 \cdot ksi$

$$P'_{all\_SP2} := \left[\frac{t_{SP2} \cdot B_2^{\,2}}{6 \cdot x_2} \cdot \left[3 \cdot F_{y\_SP2} \cdot \left(1 - N_2^{\,2}\right) - 2 \cdot \left(\Delta F_{cr2}\right) \cdot \left(1 - N_2^{\,3}\right)\right]\right] \cdot ASI$$

$P'_{all\_SP2} = 175.5 \cdot kip$

$r_{cSP2} := \dfrac{P_{t\_max\_SP2}}{P'_{all\_SP2}}$ $r_{cSP2} = 58 \cdot \%$

Output - Calculate Shear and Tensile Strength of CAN-SP:

- Calculate Forces in SP:

$h_{V2} := clip_2 + \dfrac{L_{VW2}}{2}$ $h_{V2} = 7.37 \cdot in$

$V_{max\_V2} := P_{t\_max\_SP2}$ = shear on Vertical leg $V_{max\_V2} = 101.2 \cdot kip$

$T_{max\_V2} := \dfrac{P_{t\_max\_SP2} \cdot x_2}{h_{V2}}$ = max tension on Vertical leg $T_{max\_V2} = 47.2 \cdot kip$

$V_{max\_H2} := \dfrac{P_{t\_max\_SP2} \cdot x_2}{h_{V2}}$ = shear on Horizontal leg $V_{max\_H2} = 47.2 \cdot kip$

$T_{max\_H2} := P_{t\_max\_SP2}$ = tension on Horizontal leg $T_{max\_H2} = 101.2 \cdot kip$

- Shear Strength of *Vertical* Leg of SP:

$V'_{all\_V2} := \left[\left(0.4 \cdot F_{y\_SP2}\right) \cdot \left(L_{VW2} \cdot t_{SP2}\right)\right] \cdot ASI$ $V'_{all\_V2} = 265.0 \cdot kip$

$r_{v\_V2} := \dfrac{V_{max\_V2}}{V'_{all\_V2}}$ $r_{v\_V2} = 38 \cdot \%$

- Tensile Strength of *Vertical* Leg of SP:

$T_{all\_V2} := \left[\left(0.6 \cdot F_{y\_SP2}\right) \cdot \left(L_{VW2} \cdot t_{SP2}\right)\right] \cdot ASI$ $T_{all\_V2} = 397.5 \cdot kip$

$r_{t\_V2} := \dfrac{T_{max\_V2}}{T_{all\_V2}}$ $r_{t\_V2} = 12 \cdot \%$

- Combined Tension & Shear Strength of *Vertical* Leg of SP:

$$r_{V2} := \left(\frac{T_{max\_V2}}{T_{all\_V2}}\right) + \left(\frac{V_{max\_V2}}{V'_{all\_V2}}\right)^2 \qquad r_{V2} = 26\cdot\%$$

- Shear Strength of *Horizontal* Leg of SP:

$$V'_{all\_H2} := \left[\left(0.4\cdot F_{y\_SP2}\right)\cdot\left(L_{HW2}\cdot t_{SP2}\right)\right]\cdot ASI \qquad V'_{all\_H2} = 122.5\cdot kip$$

$$r_{v\_H2} := \frac{V_{max\_H2}}{V'_{all\_H2}} \qquad r_{v\_H2} = 39\cdot\%$$

- Tensile Strength of *Horizontal* Leg of SP:

$$T'_{all\_H2} := \left[\left(0.6\cdot F_{y\_SP2}\right)\cdot\left(L_{HW2}\cdot t_{SP2}\right)\right]\cdot ASI \qquad T'_{all\_H2} = 183.8\cdot kip$$

$$r_{t\_H2} := \frac{T_{max\_H2}}{T'_{all\_H2}} \qquad r_{t\_H2} = 55\cdot\%$$

- Combined Tension & Shear Strength of *Horizontal* Leg of SP:

$$r_{H2} := \left(\frac{T_{max\_H2}}{T'_{all\_H2}}\right) + \left(\frac{V_{max\_H2}}{V'_{all\_H2}}\right)^2 \qquad r_{H2} = 70\cdot\%$$

Output - Check Shear and Tensile Strength of Vertical SP Weld:

$$\theta_v \equiv 0\cdot deg$$

$$F_{w\_v2} := 0.30\cdot F_{EXX2}\cdot\left(1.0 + 0.50\cdot\sin\left(\theta_v\right)^{1.5}\right) \qquad F_{w\_v2} = 21.0\cdot ksi$$

$$\theta_t \equiv 90\cdot deg$$

$$F_{w\_t2} := 0.30\cdot F_{EXX2}\cdot\left(1.0 + 0.50\cdot\sin\left(\theta_t\right)^{1.5}\right) \qquad F_{w\_t2} = 31.5\cdot ksi$$

- Shear Strength of Vertical Weld:

$$A_{w\_V2} := \left(0.707\cdot t_{VW2}\right)\cdot L_{VW2} \qquad A_{w\_V2} = 2.93\cdot in^2$$

$$V'_{all\_Vw2} := \left[2\cdot\left(F_{w\_v2}\cdot A_{w\_V2}\right)\right]\cdot ASI \qquad V'_{all\_Vw2} = 164\cdot kip$$

$$r_{v\_Vw2} := \frac{V_{max\_V2}}{V'_{all\_Vw2}} \qquad r_{v\_Vw2} = 62\cdot\%$$

- Tensile Strength of Vertical Weld:

$$T'_{all\_Vw2} := \left[2\cdot\left(F_{w\_t2}\cdot A_{w\_V2}\right)\right]\cdot ASI \qquad T'_{all\_Vw2} = 246\cdot kip$$

$$r_{t\_Vw2} := \frac{T_{max\_V2}}{T'_{all\_Vw2}} \qquad r_{t\_Vw2} = 19\cdot\%$$

- Combined Tension & Shear Strength of Vertical Weld:

$$r_{Vw2} := \left(\frac{T_{max\_V2}}{T'_{all\_Vw2}}\right) + \left(\frac{V_{max\_V2}}{V'_{all\_Vw2}}\right)^2 \qquad r_{Vw2} = 57\cdot\%$$

Output - Check Design Shaft Punching Shear:

$V_{max\_PS2} := T_{max\_V2}$ $\qquad V_{max\_PS2} = 47.2 \cdot kip$

$V'_{all2} := 2 \cdot \left[\left(0.4 \cdot F_{y\_shaft}\right) \cdot \left(t_{shaft} \cdot L_{VW2}\right) \right] \cdot ASI$ $\qquad V'_{all2} = 287.1 \cdot kip$

$r_{v\_PS2} := \frac{V_{max\_PS2}}{V'_{all2}}$ $\qquad r_{v\_PS2} = 16 \cdot \%$

Output - Results Summary:

- Anchor Rods & Base Plate:

$result_{AR} := max\left(r_{AR}\right)$ $\qquad result_{AR} = 91 \cdot \%$

$result_{BPL} := \begin{pmatrix} r_x \\ r_y \\ r_{BPL} \end{pmatrix}$ $\qquad result_{BPL} = \begin{pmatrix} 29 \\ 81 \\ 86 \end{pmatrix} \cdot \%$

$Max_{Utilization\_AR\_BPL} := max\left(result_{AR}, result_{BPL}\right)$ $\qquad Max_{Utilization\_AR\_BPL} = 91 \cdot \%$

- SP on Left Side:

$result_{SP1} := \begin{pmatrix} r_{cSP1} \\ r_{v\_V1} \\ r_{t\_V1} \\ r_{V1} \\ r_{v\_H1} \\ r_{t\_H1} \\ r_{H1} \end{pmatrix}$ $\qquad result_{SP1} = \begin{pmatrix} 64 \\ 20 \\ 3 \\ 7 \\ 21 \\ 70 \\ 74 \end{pmatrix} \cdot \%$

$result_{SP\_weld1} := \begin{pmatrix} r_{v\_Vw1} \\ r_{t\_Vw1} \\ r_{Vw1} \end{pmatrix}$ $\qquad result_{SP\_weld1} = \begin{pmatrix} 59 \\ 8 \\ 42 \end{pmatrix} \cdot \%$

$result_{shaft1} := r_{v\_PS1}$ $\qquad result_{shaft1} = 7 \cdot \%$

$L_{SP1\_reqd} := \begin{cases} [z + n \cdot (3 \cdot in) + h] & \text{if } Type1 = \text{"TSP"} \\ \text{"N/A"} & \text{if } Type1 = \text{"SP"} \end{cases}$ $\qquad L_{SP1\_reqd} = 0 \cdot in$

$L_{SP1\_check} := \begin{cases} \text{"N/A"} & \text{if } Type1 = \text{"SP"} \\ \text{if } Type1 = \text{"TSP"} & \begin{cases} \text{"OK"} & \text{if } L_{SP1} \ge L_{SP1\_reqd} \\ \text{"NG"} & \text{if } L_{SP1} < L_{SP1\_reqd} \end{cases} \end{cases}$ $\qquad L_{SP1\_check} = \text{"OK"}$

$Max_{Utilization\_SP1} := max\left(result_{SP1}, result_{SP\_weld1}, result_{shaft1}\right)$ $\qquad Max_{Utilization\_SP1} = 74 \cdot \%$

- SP on Right Side:

$$result_{SP2} := \begin{pmatrix} r_{cSP2} \\ r_{v\_V2} \\ r_{t\_V2} \\ r_{V2} \\ r_{v\_H2} \\ r_{t\_H2} \\ r_{H2} \end{pmatrix} \qquad result_{SP2} = \begin{pmatrix} 58 \\ 38 \\ 12 \\ 26 \\ 39 \\ 55 \\ 70 \end{pmatrix} \cdot \%$$

$$result_{SP\_weld2} := \begin{pmatrix} r_{v\_Vw2} \\ r_{t\_Vw2} \\ r_{Vw2} \end{pmatrix} \qquad result_{SP\_weld2} = \begin{pmatrix} 62 \\ 19 \\ 57 \end{pmatrix} \cdot \%$$

$$result_{shaft2} := r_{v\_PS2} \qquad result_{shaft2} = 16 \cdot \%$$

$$L_{SP2\_reqd} := \begin{cases} [z + n\cdot(3\cdot in) + h] & \text{if } Type2 = \text{"TSP"} \\ \text{"N/A"} & \text{if } Type2 = \text{"SP"} \end{cases} \qquad L_{SP2\_reqd} = \text{"N/A"} \cdot in$$

$$L_{SP2\_check} := \begin{cases} \text{"N/A"} & \text{if } Type2 = \text{"SP"} \\ \text{if } Type2 = \text{"TSP"} & \begin{cases} \text{"OK"} & \text{if } L_{SP2} \geq L_{SP2\_reqd} \\ \text{"NG"} & \text{if } L_{SP2} < L_{SP2\_reqd} \end{cases} \end{cases} \qquad L_{SP2\_check} = \text{"N/A"}$$

$$Max_{Utilization\_SP2} := max(result_{SP2}, result_{SP\_weld2}, result_{shaft2}) \qquad Max_{Utilization\_SP2} = 70 \cdot \%$$

$$Max\_Utilization_{AR\_BPL} := max(Max_{Utilization\_AR\_BPL}) \qquad Max\_Utilization_{AR\_BPL} = 91 \cdot \%$$

$$Max\_Utilization_{SP} := max(Max_{Utilization\_SP1}, Max_{Utilization\_SP2}) \qquad Max\_Utilization_{SP} = 74 \cdot \%$$

$$P_{add1} := P_{max\_SP1} + P_{bar1} \qquad P_{add1} = 59.2 \cdot kip$$

$$P_{add2} := P_{max\_SP2} + P_{bar2} \qquad P_{add2} = 101.2 \cdot kip$$

$t_{SP1} = 1.375 \cdot in$	$t_{SP2} = 0.750 \cdot in$
$b_{SP1} = 6.875 \cdot in$	$b_{SP2} = 6.875 \cdot in$
$L_{SP1} = 33.00 \cdot in$	$L_{SP2} = 14.00 \cdot in$

VSi Job No.: 140008
Date: 01/23/2014
Calculated by: MER

ROCK UNCONFINED COMPRESSIVE STRENGTH BASE ON ALLOWABLE BEARING
FOUNDATION DESIGN: PRINCIPLES AND PRACTICES (2ND EDTION), BY DONALD CODUTO

Input

Carbonate rocks
Lithified argillaceous rocks
Arenaceous rocks
Fine-grained igneous rocks
Coarse-grained igneous and metamorphic rocks

= description of rock or intermediate geomaterial

(see - **Table 14.2:** Description of Rock and Intermediate Geomaterial Types for Use in Table 14.3 (O'Neill and Reese, 1999) - pg. 512)

$RQD := 27\%$ = rock quality designation

$q'_t := 6.0 \cdot \frac{tonf}{ft^2}$ = allowable end bearing

$SF := 3$ = additional safety factor for undrained shear strength (cohesion)

Input - Table from "*Foundation Design: Principles and Practices (2nd Edition)*" by Donald Coduto:

Table 14.3: Values of *m* and *t* for Equation 14.17 (O'Neill and Reese, 1999) - pg. 512

"Quality"	"t"	"A"	"B"	"C"	"D"	"E"
"Excellent"	1	7	10	25	17	25
"Very Good"	0.1	3.5	5	7.5	8.5	12.5
"Good"	0.04	0.7	1	1.5	1.7	2.5
"Fair"	$1\cdot10^{-3}$	0.14	0.2	0.3	0.34	0.5
"Poor"	$1\cdot10^{-4}$	0.04	0.05	0.08	0.09	0.13
"Very Poor"	0	$7\cdot10^{-3}$	0.01	0.015	0.017	0.025

Output - Unconfined Compressive Strength (USC) & Undrained Shear Strength:

```
Quality_of_Rock := | i ← 0
                   | while i ≤ rows(Table_RQD) − 1
                   |   | if (Table_RQD^<0>)_i ≥ RQD
                   |   |   | Quality_of_Rock ← (Table_RQD^<1>)_i
                   |   |   | i ← rows(Table_RQD) − 1
                   |   | Quality_of_Rock ← "Not Found"   otherwise
                   |   | i ← i + 1
                   | Quality_of_Rock
```

Quality_of_Rock = "Poor"

$t := vlookup(Quality\_of\_Rock, Table_{14\_3}, 1)_0$

$t = 0.0001$

$$\text{Lookup}(v, M, \text{Description}) := \begin{array}{|l} s1 \leftarrow \text{match}\left(v, M^{\langle 0 \rangle}\right)_0 \\ s2 \leftarrow \text{match}(\text{Description}, M)_0 \\ \text{Table14\_3}_{s1, s2_1} \end{array}$$

$$m := \text{Lookup}\left(\text{Quality\_of\_Rock}, \text{Table}_{14\_3}, \text{Description}\right)$$

$m = 0.1300$

- Unconfined Compressive Strength - Equation 14.17:

$$q_u := \begin{array}{|l} 0 \ \text{ if Quality\_of\_Rock} = \text{"Very Poor"} \\ \dfrac{q'_t}{t^{0.5} + \left(m \cdot t^{0.5} + t\right)^{0.5}} \ \text{ otherwise} \end{array}$$

$q_u = 1757 \cdot \text{psi}$

- Undrained Shear Strength (Cohesion):

$$s_u := \frac{\left(\frac{q_u}{2}\right)}{SF}$$

$s_u = 42.18 \cdot \text{ksf}$

```
CAISSON Version 12.10     4:52:09 PM Wednesday, January 22, 2014
Vertical Solutions Inc.
*************************************************************************************************
*                                                                                               *
* CAISSON - Pier Foundations Analysis and Design -  Copyright Power Line Systems, Inc. 1993-2011 *
*                                                                                               *
*************************************************************************************************
```

Project Title: Stratford, CT (VZ5-156)
Project Notes: 140008.01, Revision 0

Calculation Method: Full 8CD

******* I N P U T   D A T A

Pier Properties

Diameter (ft)	Distance of Top of Pier above Ground (ft)	Concrete Strength (ksi)	Steel Yield Strength (ksi)
6.00	1.00	4.00	60.00

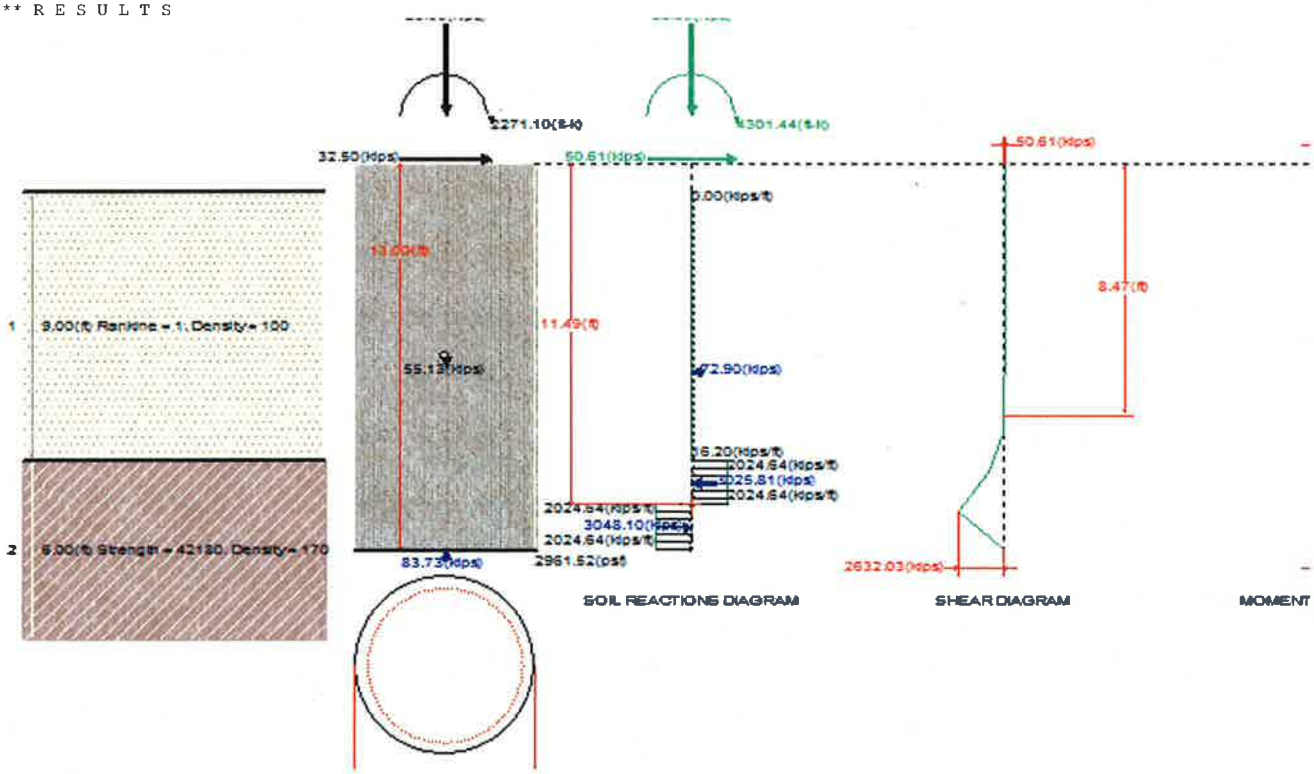
Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Sand	9.00	0.00	100.0		1.000	
2	Clay	6.00	9.00	170.0	42180.0		

Design (Factored) Loads at Top of Pier

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
2271.1	28.6	32.50	1.54

******* R E S U L T S



Calculated Pier Properties

Length (ft)	Weight (kips)	Pressure Due To Axial Load (psf)	Pressure Due To Weight (psf)	Total End-Bearing Pressure (psf)
13.000	55.135	1011.5	1950.0	2961.5

Ultimate Resisting Forces Along Pier

Type	Distance of Top of Layer to Top of Pier (ft)	Thickness (ft)	Density (lbs/ft^3)	CU (psf)	KP	Force (kips)	Arm (ft)
Sand	1.00	9.00	100.0		1.000	72.90	7.00
Clay	10.00	1.49	170.0	42180.0		3025.81	10.75
Clay	11.49	1.51	170.0	42180.0		-3048.10	12.25

Shear and Moments Along Pier

Distance below Top of Pier (ft)	Shear (with Safety Factor) (kips)	Moment (with Safety Factor) (ft-k)	Shear (without Safety Factor) (kips)	Moment (without Safety Factor) (ft-k)
0.00	50.6	4301.4	32.9	2793.1
1.30	50.5	4367.2	32.8	2835.9
2.60	48.3	4431.8	31.4	2877.8
3.90	43.0	4491.5	27.9	2916.6
5.20	34.7	4542.4	22.6	2949.6
6.50	23.4	4580.5	15.2	2974.3
7.80	9.0	4601.8	5.8	2988.2
9.10	-8.4	4602.5	-5.5	2988.7
10.40	-832.1	4417.9	-540.4	2868.8
11.70	-2632.0	1710.8	-1709.1	1110.9
13.00	-0.0	0.0	-0.0	0.0

Reinforcement and Capacity

Total Reinforcement Percent	Reinforcement Area (in^2)	Usable Axial Capacity (kips)	Usable Moment Capacity (ft-k)
0.58	23.61	28.6	3078.9

US Standard Re-Bars (Select one of the following)

Quantity	Name	Area (in^2)	Diameter (in)	Spacing (in)
119	#4	0.20	0.500	1.64
77	#5	0.31	0.625	2.53
54	#6	0.44	0.750	3.61
40	#7	0.60	0.875	4.87
30	#8	0.79	1.000	6.49
24	#9	1.00	1.128	8.12
19	#10	1.27	1.270	10.25
16	#11	1.56	1.410	12.17
11	#14	2.25	1.693	17.71

LPILE Plus for Windows, Version 5.0 (5.0.47)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

This program is licensed to:

MER
Vertical Solutions, Inc.

Files Used for Analysis

```
Path to file locations:      L:\2014\0008_VZ5-156 Stratford_CT\Task 1\Models\LPile\
Name of input data file:     VZ5-156-ERP - DESIGN.lpd
Name of output file:         VZ5-156-ERP - DESIGN.lpo
Name of plot output file:    VZ5-156-ERP - DESIGN.lpp
Name of runtime file:        VZ5-156-ERP - DESIGN.lpr
```

Time and Date of Analysis

Date: January 23, 2014   Time: 9:36:05

Problem Title

Stratford, CT (VZ5-156) - 140008.01, Rev. 0 - DESIGN

Program Options

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 3:
- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
```
- Number of pile increments            =        100
- Maximum number of iterations allowed =        500
- Deflection tolerance for convergence =  1.0000E-04 in
- Maximum allowable deflection         =  1.0000E+02 in
```

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

Pile Structural Properties and Geometry

```
Pile Length                              =    192.00 in

Depth of ground surface below top of pile =    12.00 in

Slope angle of ground surface            =      0.00 deg.
```

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	72.00000000	1319167.	4071.5000	3604996.
2	192.0000	72.00000000	1319167.	4071.5000	3604996.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of moment of inertia and modulus of are not used for any computations other than total stress due to combined axial loading and bending.

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

```
Layer  1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer      =      12.000 in
Distance from top of pile to bottom of layer   =      60.000 in
p-y subgrade modulus k for top of soil layer   =      25.000 lbs/in**3
p-y subgrade modulus k for bottom of layer     =      25.000 lbs/in**3

Layer  2 is weak rock, p-y criteria by Reese, 1997
Distance from top of pile to top of layer      =      60.000 in
Distance from top of pile to bottom of layer   =     120.000 in
Initial modulus of rock at top of layer        =  6.0000E+05 lbs/in**2
Initial modulus of rock at bottom of layer     =  6.0000E+05 lbs/in**2

Layer  3 is strong rock (vuggy limestone)
Distance from top of pile to top of layer      =     120.000 in
Distance from top of pile to bottom of layer   =     192.000 in
```

(Depth of lowest layer extends   0.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	0.05787
2	60.00	0.05787
3	60.00	0.09838
4	120.00	0.09838
5	120.00	0.09838
6	192.00	0.09838

**** WARNING - POSSIBLE INPUT DATA ERROR ****

Values entered for effective unit weights of soil were outside the limits of 0.011574 pci (20 pcf) or 0.0810019 pci (140 pcf)
This data may be erroneous. Please check your data.

Shear Strength of Soils

Shear strength parameters with depth defined using 6 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	12.000	0.00000	20.00	------	------
2	60.000	0.00000	20.00	------	------
3	60.000	100.00000	0.00	0.00050	10.0
4	120.000	100.00000	0.00	0.00050	10.0
5	120.000	1757.00000	0.00	------	------
6	192.000	1757.00000	0.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

Loading Type

Static loading criteria was used for computation of p-y curves.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 25000.000 lbs
Bending moment at pile head = 20964000.000 in-lbs
Axial load at pile head = 22000.000 lbs

Non-zero moment at pile head for this load case indicates the pile-head may rotate under the applied pile-head loading, but is not a free-head (zero moment) condition.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Number of sections = 1

Pile Section No. 1

The sectional shape is a circular drilled shaft (bored pile).

Outside Diameter = 72.0000 in

Material Properties:

Compressive Strength of Concrete = 4.000 kip/in**2
Yield Stress of Reinforcement = 60. kip/in**2
Modulus of Elasticity of Reinforcement = 29000. kip/in**2
Number of Reinforcing Bars = 14
Area of Single Bar = 1.56000 in**2
Number of Rows of Reinforcing Bars = 7
Area of Steel = 21.840 in**2
Area of Shaft = 4071.504 in**2
Percentage of Steel Reinforcement = 0.536 percent
Cover Thickness (edge to bar center) = 5.330 in

Unfactored Axial Squash Load Capacity = 15079.26 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	3.120	29.901
2	3.120	23.979
3	3.120	13.307
4	3.120	0.000
5	3.120	-13.307
6	3.120	-23.979
7	3.120	-29.901

Axial Thrust Force = 0.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
4234510.	5.081412E+12	8.333333E-07	0.00003010	36.12136352	106.79600	725.54140
8425298.	5.055179E+12	0.00000167	0.00006020	36.12110817	211.88636	1451.07045
12572364.	5.028946E+12	0.00000250	0.00009030	36.12085068	315.27115	2176.58701
16675708.	5.002712E+12	0.00000333	0.00012040	36.12058890	416.95039	2902.09070
16675708.	4.002170E+12	0.00000417	0.00006331	15.19369590	217.53661	6127.13730
16675708.	3.335142E+12	0.00000500	0.00007602	15.20317161	260.34657	7351.19078
16675708.	2.858693E+12	0.00000583	0.00008874	15.21269023	302.92232	8574.77901
16675708.	2.501356E+12	0.00000667	0.00010148	15.22225392	345.26315	9797.89846

16675708.	2.223428E+12	0.00000750	0.00011424	15.23185837	387.36816	11020.54680
16675708.	2.001085E+12	0.00000833	0.00012701	15.24150789	429.23668	12242.72003
16675708.	1.819168E+12	0.00000917	0.00013980	15.25120246	470.86789	13464.41490
16675708.	1.667571E+12	0.00001000	0.00015261	15.26094210	512.26100	14685.62812
16675708.	1.539296E+12	0.00001083	0.00016543	15.27072465	553.41512	15906.35711
16675708.	1.429346E+12	0.00001167	0.00017827	15.28055441	594.32956	17126.59731
16675708.	1.334057E+12	0.00001250	0.00019113	15.29042923	635.00340	18346.34606
16675708.	1.250678E+12	0.00001333	0.00020400	15.30035126	675.43590	19565.59928
16675708.	1.177109E+12	0.00001417	0.00021690	15.31031835	715.62608	20784.35443
16675708.	1.111714E+12	0.00001500	0.00022981	15.32033479	755.57329	22002.60636
16675708.	1.053203E+12	0.00001583	0.00024273	15.33039844	795.27655	23220.35249
16675708.	1.000542E+12	0.00001667	0.00025568	15.34050930	834.73497	24437.58939
16675708.	9.528976E+11	0.00001750	0.00026864	15.35066950	873.94775	25654.31255
16675708.	9.095841E+11	0.00001833	0.00028162	15.36087692	912.91389	26870.51954
16675708.	8.700369E+11	0.00001917	0.00029461	15.37113583	951.63268	28086.20455
16675708.	8.337854E+11	0.00002000	0.00030763	15.38144410	990.10310	29301.36508
16675708.	8.004340E+11	0.00002083	0.00032066	15.39180386	1028.32431	30515.99627
16675708.	7.696480E+11	0.00002167	0.00033371	15.40221298	1066.29525	31730.09573
16675708.	7.411426E+11	0.00002250	0.00034679	15.41267574	1104.01523	32943.65707
16675708.	7.146732E+11	0.00002333	0.00035987	15.42319000	1141.48312	34156.67787
17027375.	7.045810E+11	0.00002417	0.00037298	15.43375576	1178.69794	35369.15439
17605650.	7.042260E+11	0.00002500	0.00038611	15.44437516	1215.65885	36581.08133
18183297.	7.038696E+11	0.00002583	0.00039926	15.45504820	1252.36483	37792.45482
18760312.	7.035117E+11	0.00002667	0.00041242	15.46577489	1288.81486	39003.27096
19336690.	7.031524E+11	0.00002750	0.00042561	15.47655523	1325.00791	40213.52586
19912432.	7.027917E+11	0.00002833	0.00043881	15.48739350	1360.94325	41423.21211
20487527.	7.024295E+11	0.00002917	0.00045203	15.49828541	1396.61949	42632.32913
21061977.	7.020659E+11	0.00003000	0.00046528	15.50923526	1432.03590	43840.86931
21635773.	7.017008E+11	0.00003083	0.00047854	15.52024090	1467.19121	45048.83036
22208914.	7.013341E+11	0.00003167	0.00049182	15.53130448	1502.08451	46256.20626
22781398.	7.009661E+11	0.00003250	0.00050513	15.54242814	1536.71487	47462.99080
23924362.	7.002252E+11	0.00003417	0.00053180	15.56484926	1605.18165	49874.77474
25064631.	6.994781E+11	0.00003583	0.00055855	15.58750856	1672.58273	52284.14379
26182953.	6.982121E+11	0.00003750	0.00058500	15.59999907	1737.91647	54702.38100
27272781.	6.963263E+11	0.00003917	0.00061100	15.59999907	1800.87469	57133.59793
28356323.	6.944406E+11	0.00004083	0.00063700	15.59999907	1862.61738	59564.81486
29247367.	6.881733E+11	0.00004250	0.00066300	15.59999907	1923.14453	60000.00000
30026070.	6.798356E+11	0.00004417	0.00068770	15.57057202	1979.40263	60000.00000
30761086.	6.711510E+11	0.00004583	0.00071163	15.52655375	2032.80043	60000.00000
31301278.	6.589743E+11	0.00004750	0.00073376	15.44767964	2081.09616	60000.00000
31703032.	6.448074E+11	0.00004917	0.00075461	15.34809029	2125.67215	60000.00000
32103755.	6.315493E+11	0.00005083	0.00077550	15.25580084	2169.56742	60000.00000
32503431.	6.191130E+11	0.00005250	0.00079643	15.17012036	2212.77792	60000.00000
32902056.	6.074226E+11	0.00005417	0.00081740	15.09044802	2255.30013	60000.00000
33299614.	5.964110E+11	0.00005583	0.00083841	15.01624954	2297.12984	60000.00000
33696099.	5.860191E+11	0.00005750	0.00085946	14.94705713	2338.26333	60000.00000
34091508.	5.761945E+11	0.00005917	0.00088055	14.88245666	2378.69692	60000.00000
34384427.	5.652235E+11	0.00006083	0.00090038	14.80070937	2415.88499	60000.00000
34563669.	5.530187E+11	0.00006250	0.00091879	14.70066941	2449.66331	60000.00000
34742257.	5.414378E+11	0.00006417	0.00093724	14.60626423	2482.90484	60000.00000
34920180.	5.304331E+11	0.00006583	0.00095571	14.51706684	2515.60683	60000.00000
35097444.	5.199621E+11	0.00006750	0.00097421	14.43269742	2547.76715	60000.00000
35438638.	5.123659E+11	0.00006917	0.00099600	14.40000021	2585.20435	60000.00000
35479639.	5.008890E+11	0.00007083	0.00101605	14.34430254	2618.77363	60000.00000
35650847.	4.917358E+11	0.00007250	0.00103404	14.26256382	2648.09468	60000.00000
35821455.	4.829859E+11	0.00007417	0.00105205	14.18488705	2676.90321	60000.00000
35991441.	4.746124E+11	0.00007583	0.00107008	14.11100185	2705.19605	60000.00000
36160812.	4.665911E+11	0.00007750	0.00108815	14.04067004	2732.97115	60000.00000
36329567.	4.588998E+11	0.00007917	0.00110625	13.97367060	2760.22605	60000.00000
36497691.	4.515178E+11	0.00008083	0.00112438	13.90979755	2786.95784	60000.00000
36665188.	4.444265E+11	0.00008250	0.00114253	13.84886634	2813.16418	60000.00000
36832054.	4.376086E+11	0.00008417	0.00116072	13.79070532	2838.84249	60000.00000
36998284.	4.310480E+11	0.00008583	0.00117893	13.73515570	2863.99007	60000.00000
37163868.	4.247299E+11	0.00008750	0.00119718	13.68206942	2888.60402	60000.00000
37328808.	4.186408E+11	0.00008917	0.00121546	13.63131344	2912.68192	60000.00000
37493098.	4.127680E+11	0.00009083	0.00123377	13.58276117	2936.22086	60000.00000
37635029.	4.068652E+11	0.00009250	0.00125160	13.53079498	2958.55148	60000.00000
37696907.	4.003211E+11	0.00009417	0.00126759	13.46113479	2977.97775	60000.00000
37758390.	3.940006E+11	0.00009583	0.00128360	13.39413321	2996.99519	60000.00000
37819467.	3.878920E+11	0.00009750	0.00129964	13.32965291	3015.60170	60000.00000
37880131.	3.819845E+11	0.00009917	0.00131570	13.26756728	3033.79537	60000.00000
37880131.	3.695623E+11	0.00010250	0.00135300	13.19999921	3074.71342	60000.00000
38161077.	3.605771E+11	0.00010583	0.00138844	13.11911023	3111.23994	60000.00000
38268785.	3.505538E+11	0.00010917	0.00141915	12.99986565	3140.86833	60000.00000
38375054.	3.411116E+11	0.00011250	0.00144995	12.88846171	3168.97590	60000.00000
38479869.	3.322003E+11	0.00011583	0.00148084	12.78423107	3195.54902	60000.00000
38583204.	3.237751E+11	0.00011917	0.00151182	12.68657935	3220.57357	60000.00000
38685062.	3.157964E+11	0.00012250	0.00154289	12.59498298	3244.03576	60000.00000
38785406.	3.082284E+11	0.00012583	0.00157404	12.50896561	3265.92065	60000.00000
38884215.	3.010391E+11	0.00012917	0.00160530	12.42810452	3286.21348	60000.00000
38981492.	2.941999E+11	0.00013250	0.00163664	12.35202420	3304.89955	60000.00000
39077204.	2.876849E+11	0.00013583	0.00166808	12.28037918	3321.96318	60000.00000
39171323.	2.814706E+11	0.00013917	0.00169962	12.21285832	3337.38854	60000.00000
39263853.	2.755358E+11	0.00014250	0.00173126	12.14918697	3351.15994	60000.00000
39354748.	2.698611E+11	0.00014583	0.00176299	12.08910549	3363.26059	60000.00000
39444015.	2.644292E+11	0.00014917	0.00179483	12.03238857	3373.67406	60000.00000
39638210.	2.599227E+11	0.00015250	0.00183000	12.00000036	3383.21826	60000.00000
39982936.	2.565750E+11	0.00015583	0.00187000	12.00000036	3391.52279	60000.00000

39982936.	2.512017E+11	0.00015917	0.00190802	11.98757422	3396.80217	60000.00000
39982936.	2.460488E+11	0.00016250	0.00193913	11.93310392	3399.22463	60000.00000
39982936.	2.411031E+11	0.00016583	0.00197035	11.88151109	3399.74072	60000.00000
39982936.	2.363523E+11	0.00016917	0.00200169	11.83264339	3391.98865	60000.00000
40037340.	2.321005E+11	0.00017250	0.00203315	11.78635275	3384.20521	60000.00000
40107652.	2.281004E+11	0.00017583	0.00206473	11.74251258	3385.61098	60000.00000
40177234.	2.242450E+11	0.00017917	0.00209643	11.70099413	3391.04933	60000.00000
40246088.	2.205265E+11	0.00018250	0.00212826	11.66168797	3395.22015	60000.00000
40314203.	2.169374E+11	0.00018583	0.00216022	11.62449110	3398.10456	60000.00000
40340972.	2.132562E+11	0.00018917	0.00218897	11.57162368	3399.55463	60000.00000
40351722.	2.096193E+11	0.00019250	0.00221652	11.51441109	3399.95909	60000.00000
40361166.	2.060996E+11	0.00019583	0.00224434	11.46046650	3394.19431	60000.00000
40370394.	2.026965E+11	0.00019917	0.00227222	11.40864837	3388.41265	60000.00000
40379418.	1.994045E+11	0.00020250	0.00230017	11.35885799	3382.61377	60000.00000
40388217.	1.962181E+11	0.00020583	0.00232818	11.31099665	3376.79768	60000.00000
40396802.	1.931321E+11	0.00020917	0.00235626	11.26497853	3380.63695	60000.00000
40405166.	1.901420E+11	0.00021250	0.00238440	11.22071993	3385.29648	60000.00000
40413300.	1.872431E+11	0.00021583	0.00241262	11.17814147	3389.32946	60000.00000
40421200.	1.844313E+11	0.00021917	0.00244090	11.13717020	3392.72885	60000.00000
40428872.	1.817028E+11	0.00022250	0.00246925	11.09773958	3395.48751	60000.00000
40436302.	1.790537E+11	0.00022583	0.00249767	11.05978310	3397.59803	60000.00000
40443500.	1.764807E+11	0.00022917	0.00252616	11.02324283	3399.05296	60000.00000
40450446.	1.739804E+11	0.00023250	0.00255472	10.98805869	3399.84461	60000.00000
40462386.	1.691807E+11	0.00023917	0.00261233	10.92263854	3393.40435	60000.00000
40473122.	1.646364E+11	0.00024583	0.00267028	10.86214721	3383.37763	60000.00000
40483341.	1.603301E+11	0.00025250	0.00272842	10.80560410	3373.30062	60000.00000
40483341.	1.562058E+11	0.00025917	0.00279900	10.79999936	3375.30202	60000.00000
40483341.	1.522884E+11	0.00026583	0.00287100	10.79999936	3387.05715	60000.00000
40483341.	1.485627E+11	0.00027250	0.00294300	10.79999936	3395.04704	60000.00000
40556570.	1.452773E+11	0.00027917	0.00300831	10.77602041	3398.87181	60000.00000
40560328.	1.419020E+11	0.00028583	0.00306454	10.72143424	3399.96710	60000.00000
40562615.	1.386756E+11	0.00029250	0.00312144	10.67159665	3393.90349	60000.00000
40564427.	1.355914E+11	0.00029917	0.00317858	10.62478459	3386.20397	60000.00000
40566063.	1.326411E+11	0.00030583	0.00323584	10.58040369	3378.47291	60000.00000
40567518.	1.298161E+11	0.00031250	0.00329322	10.53830588	3370.70969	60000.00000
40568786.	1.271085E+11	0.00031917	0.00335073	10.49835598	3362.91364	60000.00000
40569861.	1.245111E+11	0.00032583	0.00340836	10.46042955	3355.08413	60000.00000
40570738.	1.220173E+11	0.00033250	0.00346612	10.42441285	3361.39371	60000.00000
40571418.	1.196209E+11	0.00033917	0.00352401	10.39020288	3369.41155	60000.00000
40571900.	1.173163E+11	0.00034583	0.00358204	10.35770524	3376.53831	60000.00000
40572163.	1.150983E+11	0.00035250	0.00364021	10.32682765	3382.75696	60000.00000
40572230.	1.129621E+11	0.00035917	0.00369852	10.29749501	3388.05084	60000.00000
40572230.	1.109036E+11	0.00036583	0.00375697	10.26962578	3392.40150	60000.00000
40572230.	1.089187E+11	0.00037250	0.00381558	10.24315560	3395.79072	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 40547.25696 in-kip

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Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head = 25000.000 lbs
Specified moment at pile head = 20964000.000 in-lbs
Specified axial load at pile head = 22000.000 lbs

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. p lbs/in	Es*h F/L
0.000	0.229796	2.10E+07	25000.	-0.003730	577.510	7.02E+11	0.000	0.000
1.920	0.222689	2.10E+07	25000.	-0.003673	578.824	7.02E+11	0.000	0.000
3.840	0.215692	2.11E+07	25000.	-0.003616	580.138	7.02E+11	0.000	0.000
5.760	0.208805	2.11E+07	25000.	-0.003558	581.452	7.02E+11	0.000	0.000
7.680	0.202030	2.12E+07	25000.	-0.003500	582.766	7.02E+11	0.000	0.000
9.600	0.195365	2.12E+07	25000.	-0.003442	584.080	7.02E+11	0.000	0.000
11.520	0.188812	2.13E+07	25000.	-0.003384	585.394	7.02E+11	0.000	0.000
13.440	0.182370	2.13E+07	24994.	-0.003326	586.708	7.02E+11	-6.565	69.120
15.360	0.176041	2.13E+07	24973.	-0.003268	588.021	7.02E+11	-14.787	161.280
17.280	0.169823	2.14E+07	24937.	-0.003209	589.332	7.02E+11	-22.417	253.440
19.200	0.163718	2.14E+07	24888.	-0.003150	590.641	7.02E+11	-29.469	345.600
21.120	0.157725	2.15E+07	24825.	-0.003092	591.948	7.02E+11	-35.961	437.760
23.040	0.151846	2.15E+07	24750.	-0.003033	593.250	7.02E+11	-41.909	529.920
24.960	0.146079	2.16E+07	24664.	-0.002974	594.548	7.02E+11	-47.330	622.080
26.880	0.140426	2.16E+07	24569.	-0.002915	595.842	7.02E+11	-52.239	714.240
28.800	0.134887	2.17E+07	24464.	-0.002855	597.130	7.02E+11	-56.652	806.400
30.720	0.129461	2.17E+07	24352.	-0.002796	598.412	7.02E+11	-60.588	898.560
32.640	0.124150	2.18E+07	24232.	-0.002737	599.688	7.02E+11	-64.061	990.720
34.560	0.118953	2.18E+07	24106.	-0.002677	600.957	7.02E+11	-67.089	1082.880
36.480	0.113871	2.19E+07	23975.	-0.002617	602.220	7.02E+11	-69.689	1175.040
38.400	0.108903	2.19E+07	23839.	-0.002557	603.476	7.02E+11	-71.876	1267.200
40.320	0.104051	2.20E+07	23699.	-0.002497	604.724	7.01E+11	-73.668	1359.360
42.240	0.099315	2.20E+07	23556.	-0.002437	605.965	7.01E+11	-75.082	1451.520
44.160	0.094693	2.21E+07	23411.	-0.002377	607.198	7.01E+11	-76.133	1543.680

46.080	0.090188	2.21E+07	23264.	-0.002316	608.424	7.01E+11	-76.840	1635.840
48.000	0.085799	2.21E+07	23117.	-0.002256	609.642	7.01E+11	-77.219	1728.000
49.920	0.081526	2.22E+07	22968.	-0.002195	610.852	7.01E+11	-77.287	1820.160
51.840	0.077370	2.22E+07	22820.	-0.002134	612.054	7.01E+11	-77.061	1912.320
53.760	0.073331	2.23E+07	22673.	-0.002073	613.248	7.01E+11	-76.558	2004.480
55.680	0.069409	2.23E+07	22526.	-0.002012	614.434	7.01E+11	-75.795	2096.640
57.600	0.065604	2.24E+07	22382.	-0.001951	615.613	7.01E+11	-74.789	2188.800
59.520	0.061917	2.24E+07	22239.	-0.001890	616.784	7.01E+11	-73.557	2280.960
61.440	0.058347	2.24E+07	18425.	-0.001828	617.948	7.01E+11	-3899.537	1.28E+05
63.360	0.054896	2.25E+07	10861.	-0.001767	618.719	7.01E+11	-3980.077	1.39E+05
65.280	0.051562	2.25E+07	3146.487	-0.001705	619.090	7.01E+11	-4055.604	1.51E+05
67.200	0.048347	2.25E+07	-4707.885	-0.001644	619.053	7.01E+11	-4126.034	1.64E+05
69.120	0.045250	2.25E+07	-12693.	-0.001582	618.601	7.01E+11	-4191.285	1.78E+05
71.040	0.042272	2.24E+07	-20797.	-0.001521	617.727	7.01E+11	-4251.274	1.93E+05
72.960	0.039411	2.24E+07	-29012.	-0.001459	616.425	7.01E+11	-4305.917	2.10E+05
74.880	0.036668	2.23E+07	-37327.	-0.001398	614.690	7.01E+11	-4355.136	2.28E+05
76.800	0.034042	2.22E+07	-45731.	-0.001337	612.516	7.01E+11	-4398.852	2.48E+05
78.720	0.031533	2.22E+07	-54213.	-0.001276	609.901	7.01E+11	-4436.992	2.70E+05
80.640	0.029141	2.20E+07	-62763.	-0.001216	606.838	7.01E+11	-4469.488	2.94E+05
82.560	0.026864	2.19E+07	-71370.	-0.001156	603.326	7.02E+11	-4496.282	3.21E+05
84.480	0.024703	2.18E+07	-80024.	-0.001096	599.362	7.02E+11	-4517.327	3.51E+05
86.400	0.022656	2.16E+07	-88711.	-0.001037	594.943	7.02E+11	-4532.589	3.84E+05
88.320	0.020722	2.14E+07	-97423.	-0.000978	590.068	7.02E+11	-4542.059	4.21E+05
90.240	0.018901	2.12E+07	-1.06E+05	-0.000919	584.736	7.02E+11	-4545.753	4.62E+05
92.160	0.017192	2.10E+07	-1.15E+05	-0.000862	578.946	7.02E+11	-4543.722	5.07E+05
94.080	0.015593	2.08E+07	-1.24E+05	-0.000804	572.700	7.02E+11	-4536.067	5.59E+05
96.000	0.014103	2.05E+07	-1.32E+05	-0.000748	565.997	7.02E+11	-4522.950	6.16E+05
97.920	0.012720	2.03E+07	-1.41E+05	-0.000692	558.839	7.03E+11	-4504.613	6.80E+05
99.840	0.011444	2.00E+07	-1.50E+05	-0.000637	551.227	7.03E+11	-4481.402	7.52E+05
101.760	0.010274	1.97E+07	-1.58E+05	-0.000583	543.165	7.03E+11	-4453.797	8.32E+05
103.680	0.009206	1.94E+07	-1.67E+05	-0.000530	534.655	7.03E+11	-4422.451	9.22E+05
105.600	0.008240	1.91E+07	-1.75E+05	-0.000477	525.700	7.03E+11	-4388.228	1.02E+06
107.520	0.007374	1.87E+07	-1.84E+05	-0.000425	516.303	7.04E+11	-4352.263	1.13E+06
109.440	0.006606	1.84E+07	-1.92E+05	-0.000375	506.468	7.04E+11	-4316.009	1.25E+06
111.360	0.005934	1.80E+07	-2.00E+05	-0.000325	496.199	7.04E+11	-4281.294	1.39E+06
113.280	0.005357	1.76E+07	-2.08E+05	-0.000277	485.499	7.04E+11	-4250.358	1.52E+06
115.200	0.004872	1.72E+07	-2.16E+05	-0.000240	474.372	1.33E+12	-4225.857	1.67E+06
117.120	0.004434	1.68E+07	-2.25E+05	-0.000223	462.820	2.95E+12	-4201.822	1.82E+06
119.040	0.004017	1.63E+07	-2.33E+05	-0.000214	450.844	5.00E+12	-4171.917	1.99E+06
120.960	0.003612	1.59E+07	-2.43E+05	-0.000208	438.449	5.01E+12	-6346.456	3.37E+06
122.880	0.003219	1.54E+07	-2.54E+05	-0.000202	425.416	5.01E+12	-5655.713	3.37E+06
124.800	0.002837	1.49E+07	-2.64E+05	-0.000196	411.814	5.01E+12	-4984.869	3.37E+06
126.720	0.002466	1.44E+07	-2.73E+05	-0.000190	397.710	5.02E+12	-4333.270	3.37E+06
128.640	0.002106	1.38E+07	-2.81E+05	-0.000185	383.170	5.02E+12	-3700.235	3.37E+06
130.560	0.001756	1.33E+07	-2.88E+05	-0.000180	368.258	5.02E+12	-3085.063	3.37E+06
132.480	0.001416	1.27E+07	-2.93E+05	-0.000175	353.035	5.03E+12	-2487.036	3.37E+06
134.400	0.001084	1.22E+07	-2.97E+05	-0.000170	337.563	5.03E+12	-1905.420	3.37E+06
136.320	0.000762	1.16E+07	-3.00E+05	-0.000166	321.898	5.03E+12	-1339.475	3.37E+06
138.240	0.000449	1.10E+07	-3.02E+05	-0.000161	306.099	5.04E+12	-788.454	3.37E+06
140.160	0.000143	1.04E+07	-3.03E+05	-0.000157	290.221	5.04E+12	-251.602	3.37E+06
142.080	-0.000155	9.85E+06	-3.03E+05	-0.000153	274.317	5.04E+12	271.836	3.37E+06
144.000	-0.000445	9.27E+06	-3.02E+05	-0.000150	258.440	5.05E+12	782.620	3.37E+06
145.920	-0.000729	8.69E+06	-3.00E+05	-0.000146	242.643	5.05E+12	1281.507	3.37E+06
147.840	-0.001007	8.12E+06	-2.97E+05	-0.000143	226.974	5.06E+12	1769.250	3.37E+06
149.760	-0.001279	7.55E+06	-2.93E+05	-0.000140	211.483	5.06E+12	2246.592	3.37E+06
151.680	-0.001545	6.99E+06	-2.89E+05	-0.000137	196.218	5.06E+12	2714.265	3.37E+06
153.600	-0.001806	6.44E+06	-2.83E+05	-0.000135	181.227	5.06E+12	3172.989	3.37E+06
155.520	-0.002062	5.91E+06	-2.77E+05	-0.000132	166.554	5.07E+12	3623.471	3.37E+06
157.440	-0.002314	5.38E+06	-2.69E+05	-0.000130	152.246	5.07E+12	4066.404	3.37E+06
159.360	-0.002563	4.87E+06	-2.61E+05	-0.000128	138.347	5.07E+12	4502.462	3.37E+06
161.280	-0.002807	4.38E+06	-2.52E+05	-0.000127	124.901	5.08E+12	4932.303	3.37E+06
163.200	-0.003049	3.90E+06	-2.42E+05	-0.000125	111.951	5.08E+12	5356.561	3.37E+06
165.120	-0.003287	3.45E+06	-2.31E+05	-0.000124	99.541	5.08E+12	5775.842	3.37E+06
167.040	-0.003523	3.02E+06	-2.20E+05	-0.000122	87.711	5.08E+12	6190.726	3.37E+06
168.960	-0.003757	2.61E+06	-2.08E+05	-0.000121	76.504	5.08E+12	6601.766	3.37E+06
170.880	-0.003989	2.22E+06	-1.94E+05	-0.000120	65.961	5.08E+12	7009.485	3.37E+06
172.800	-0.004220	1.86E+06	-1.81E+05	-0.000120	56.123	5.08E+12	7414.375	3.37E+06
174.720	-0.004449	1.53E+06	-1.66E+05	-0.000119	47.031	5.08E+12	7816.896	3.37E+06
176.640	-0.004677	1.22E+06	-1.51E+05	-0.000119	38.726	5.08E+12	8217.473	3.37E+06
178.560	-0.004904	9.47E+05	-1.34E+05	-0.000118	31.247	5.08E+12	8616.494	3.37E+06
180.480	-0.005131	7.05E+05	-1.18E+05	-0.000118	24.635	5.08E+12	9014.307	3.37E+06
182.400	-0.005356	4.96E+05	-99850.	-0.000118	18.930	5.08E+12	9411.222	3.37E+06
184.320	-0.005582	3.21E+05	-81400.	-0.000117	14.172	5.08E+12	9807.506	3.37E+06
186.240	-0.005807	1.83E+05	-62189.	-0.000117	10.400	5.08E+12	10203.	3.37E+06
188.160	-0.006032	82509.	-42219.	-0.000117	7.655	5.08E+12	10599.	3.37E+06
190.080	-0.006258	20989.	-21489.	-0.000117	5.976	5.08E+12	10995.	3.37E+06
192.000	-0.006483	0.000	0.000	-0.000117	5.403	5.08E+12	11390.	1.69E+06

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of total stress due to combined axial stress and bending may not be representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

```
Output Summary for Load Case No.  1:

Pile-head deflection              =     0.22979638 in
Computed slope at pile head       =    -0.00373043
Maximum bending moment            =      22487660. lbs-in
Maximum shear force               =  -303288.07195 lbs
Depth of maximum bending moment   =    65.28000000 in
Depth of maximum shear force      =   140.16000000 in
Number of iterations              =             35
Number of zero deflection points  =              1
```

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

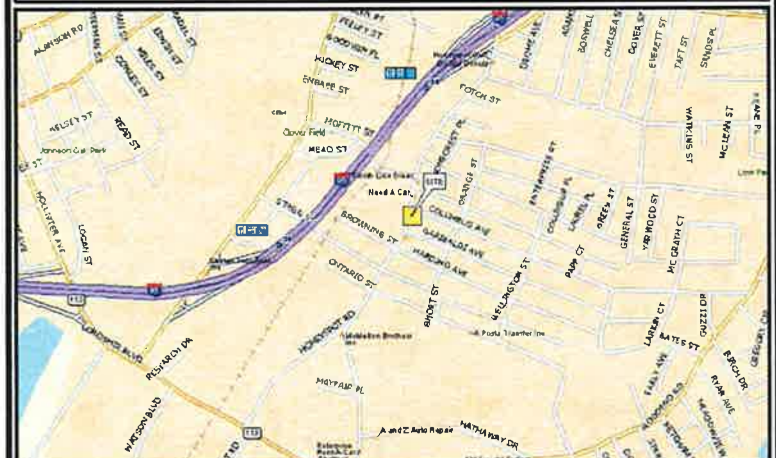
```
Type 1 = Shear and Moment,           y = pile-head displacment in
Type 2 = Shear and Slope,            M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness,   V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment,      S = Pile-head Slope, radians
Type 5 = Deflection and Slope,       R = Rot. Stiffness of Pile-head in-lbs/rad
```

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 25000.	M= 2.10E+07	22000.0000	[redacted]	[redacted]	[redacted]

The analysis ended normally.

r(M) = 2436 / 3041 = 80%
r(delta) = 0.23 / 1.5 = 15%
r(V) = 394 / 527 = 75%

PROXIMITY MAP



LOCATION MAP

START AT JOHN F KENNEDY INTL AIRPORT. GO STRAIGHT (WNW) ON J F K ACCESS RD. IN 1.53 MI TURN RIGHT (WNW) ON TO RAMP. IN 0.32 MI KEEP RIGHT (SW) ON TO <UNNAMED>. IN 0.17 MI GO STRAIGHT (N) ON TO I-678 N (VAN WYCK EXPY) RAMP. IN 13.62 MI GO STRAIGHT (NNE) ON TO HUTCHINSON RIVER PKWY. IN 4.38 MI KEEP RIGHT (NE) ON TO I-95 N (NEW ENGLAND THWY) RAMP. IN 12.26 MI GO STRAIGHT (ENE) ON TO I-95 N (CONNECTICUT TPKE) NY/CT STATE BORDER. IN 31.78 MI GO STRAIGHT (ENE) ON TO HONEYSPOT RD RAMP. IN 0.14 MI KEEP RIGHT (ESE) ON HONEYSPOT RD RAMP. IN 0.02 MI KEEP RIGHT (SSW) ON TO HONEYSPOT RD. IN 0.36 MI FINISH AT SITE.

DRIVING DIRECTIONS

PROJECT INFORMATION:

PROJECT NAME:

STRATFORD, CT

SITE NUMBER:

VZ5-156

PROJECT LOCATION:

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

LATITUDE	N41° 10' 36.86"
LONGITUDE	W073° 08' 46.50"
GROUND ELEVATION	24'±

2-C CERTIFICATION

SITE CONSTRUCTON MANAGER:

NAME	URS COOPERATION
ADDRESS	500 ENTERPRISE DR, STE 3B
CITY, STATE, ZIP	ROCKY HILL, CT 06067
CONTACT	MICHAEL J. EGAN III
PHONE	(860) 990-6737

SITE APPLICANT:

NAME	VERIZON
ADDRESS	99 EAST RIVER DRIVE
CITY, STATE, ZIP	EAST HARTFORD, CT 06108
CONTACT	-
PHONE	-

SURVEYOR:

NAME	N/A
ADDRESS	N/A
CITY, STATE, ZIP	N/A
CONTACT	N/A
PHONE	N/A

CIVIL ENGINEER:

NAME	VERTICAL SOLUTIONS
ADDRESS	2002 PRODUCTION DRIVE
CITY, STATE, ZIP	APEX, NC 27539
CONTACT	MIKE LASSITER
PHONE	(888) 321-6167

ELECTRICAL ENGINEER:

NAME	N/A
ADDRESS	N/A
CITY, STATE, ZIP	N/A
CONTACT	N/A
PHONE	N/A

PROPERTY INFORMATION:

NAME	STRATFORD, CT
ADDRESS	627 HONEYSPOT ROAD
CITY, STATE, ZIP	STRATFORD, CT 06615
CONTACT	MICHAEL J. EGAN III
PHONE	(860) 990-6737

UTILITIES:

POWER COMPANY	N/A
CONTACT	N/A
PHONE	N/A
TELEPHONE COMPANY	N/A
CONTACT	N/A
PHONE	N/A
PHONE # NEAR SITE	N/A

CONTACT INFORMATION

PROJECT DESCRIPTION:
STRUCTURAL UPGRADE

TOWER TYPE:
103' SELF SUPPORTING POLE STRUCTURE

AREA OF CONSTRUCTION:

PROJECT INFORMATION

CONNECTICUT
ONE CALL
CALL BEFORE YOU DIG
1-800-922-4455

ONE CALL

SHEET	DESCRIPTION	REV
T-1	TITLE SHEET	0
N-1	PROJECT NOTES	0
N-2	PROJECT NOTES	0
B-1	BILL OF MATERIALS	0
S-1	TOWER ELEVATION AND MODIFICATION SCHEDULE	0
S-2	CONSTRUCTION DETAILS	0
S-3	CONSTRUCTION DETAILS	0
S-4	CONSTRUCTION DETAILS	0
S-5	CONSTRUCTION DETAILS	0
S-6	FABRICATION DETAILS	0
S-7	FABRICATION DETAILS	0
S-8	FABRICATION DETAILS	0
S-9	FABRICATION DETAILS	0

INDEX OF SHEETS

PLANS PREPARED FOR:

URS

500 ENTERPRISE DR, STE 3B
ROCKY HILL, CT 06067
OFFICE (860) 990-6737

PROJECT INFORMATION:

STRATFORD, CT

VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

PLANS PREPARED BY:

vertical solutions

2002 PRODUCTION DRIVE
APEX, NC 27539
OFFICE: (888) 321-6167
www.verticalsolutions-inc.com

REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

DRAWN BY: JWM CHECKED BY: MER

SHEET TITLE:

TITLE SHEET

SHEET NUMBER: T-1

REVISION: 0

VSI #: 140008

SEAL:

January 27, 2014

GENERAL NOTES:

1. ALL REFERENCES TO TOWER OWNER IN THESE DOCUMENTS SHALL BE CONSIDERED AS URS OR ITS DESIGNATED REPRESENTATIVE.
2. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST HAVE CONSIDERABLE EXPERIENCE IN PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTANCE OF THIS ASSIGNMENT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICENT EXPERIENCE AND ABILITY, THAT HE IS KNOWLEDGEABLE OF THE WORK TO BE PERFORMED AND THAT HE IS PROPERLY LICENSED AND PROPERLY REGISTERED TO DO THIS WORK IN THE STATE OF CONNECTICUT.
3. THE STRUCTURE IS DESIGNED IN ACCORDANCE WITH ANSI/TIA-222-F-2005, FOR A 90 MPH FASTEST MILE BASIC WIND SPEED. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CONNECTICUT STATE BUILDING CODE, 2005 EDITION.
4. UNLESS SHOWN OR NOTED OTHERWISE ON THE CONTRACT DRAWINGS, OR IN THE SPECIFICATIONS, THE FOLLOWING NOTES SHALL APPLY TO THE MATERIALS LISTED HEREIN, AND TO THE PROCEDURES TO BE USED ON THIS PROJECT.
5. ALL PRODUCT MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED EXACTLY AND SHALL SUPERCEDE ANY CONFLICTING NOTES ENCLOSED HEREIN.
6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE MODIFICATION PROCEDURE AND SEQUENCE TO INSURE THE SAFETY OF THE STRUCTURE AND IT'S COMPONENT PARTS DURING ERECTION AND/OR FIELD MODIFICATIONS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF TEMPORARY BRACING, GUYS OR TIE-DOWNS THAT MAY BE NECESSARY, SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER THE COMPLETION OF THE PROJECT.
7. ALL DIMENSIONS, ELEVATIONS, AND EXISTING CONDITIONS SHOWN ON THE DRAWINGS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BEGINNING ANY MATERIALS ORDERING, FABRICATION OR CONSTRUCTION WORK ON THIS PROJECT. CONTRACTOR SHALL NOT SCALE CONTRACT DRAWINGS IN LIEU OF FIELD VERIFICATION. ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND THE OWNER'S ENGINEER. THE DISCREPANCIES MUST BE RESOLVED BEFORE THE CONTRACTOR IS TO PROCEED WITH THE WORK. THE CONTRACT DOCUMENTS DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE OWNER AND/OR THE ENGINEER SHALL NOT INCLUDE INSPECTION OF THE PROTECTIVE MEASURES AND PROCEDURES.
8. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN COMFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR INSURING THAT THIS PROJECT AND RELATED WORK COMPLIES WITH ALL APPLICABLE AND LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK.
10. ACCESS TO THE PROPOSED WORK SITE MAY BE RESTRICTED. THE CONTRACTOR SHALL COORDINATE INTENDED CONSTRUCTION ACTIVITY, INCLUDING WORK SCHEDULE AND MATERIALS ACCESS, WITH THE RESIDENT LEASING AGENT FOR APPROVAL.
11. BILL OF MATERIALS AND PART NUMBERS LISTED ON THE CONSTRUCTION DRAWINGS ARE INTENDED TO AID THE CONTRACTOR/OWNER. CONTRACTOR/OWNER SHALL VERIFY PARTS AND QUANTITIES WITH THE MANUFACTURER PRIOR TO BIDDING AND/OR ORDERING MATERIALS.
12. CONTRACTOR SHALL SECURE ALL NECESSARY PERMITS FOR THIS PROJECT FROM ALL APPLICABLE GOVERNING AGENCIES.
13. ALL PERMITS THAT MUST BE OBTAINED ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE RESPONSIBLE FOR ABIDING BY ALL CONDITIONS AND REQUIREMENTS OF THE PERMITS.
14. 24 HOURS BEFORE THE BEGINNING OF ANY CONSTRUCTION, THE CONTRACTOR MUST NOTIFY THE APPLICABLE JURISDICTIONAL (STATE, COUNTY OR CITY) ENGINEER.
15. THE CONTRACTOR SHALL REWORK (DRY, SCARIFY, ETC.) ALL MATERIAL NOT SUITABLE FOR SUBGRADE IN ITS PRESENT STATE. IF THE MATERIAL REMAINS UNSUITABLE AFTER REWORKING, THE CONTRACTOR SHALL UNDERCUT THIS MATERIAL AND REPLACE IT WITH APPROVED MATERIAL. IF PAVING IS TO BE DONE, ALL SUBGRADES SHALL BE PROOFROLLED WITH A FULLY LOADED TANDEM AXLE DUMP TRUCK PRIOR TO PAVING. ANY SOFT MATERIAL SHALL BE REWORKED OR REPLACED.
16. THE CONTRACTOR IS REQUIRED TO MAINTAIN ALL PIPES, DITCHES, AND OTHER DRAINAGE STRUCTURES FREE FROM OBSTRUCTION UNTIL WORK IS ACCEPTED BY THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGES CAUSED BY FAILURE TO MAINTAIN DRAINAGE STRUCTURE IN OPERABLE CONDITION.
17. ALL MATERIALS AND WORKMANSHIP SHALL BE WARRANTED FOR ONE YEAR FROM ACCEPTANCE DATE.
18. ALL DIMENSIONS SHALL BE VERIFIED WITH THE PLANS (LATEST REVISION) PRIOR TO COMMENCING CONSTRUCTION. THE OWNER SHALL HAVE A SET OF APPROVED PLANS AVAILABLE AT THE SITE AT ALL TIMES WHILE WORK IS BEING PERFORMED. A DESIGNATED RESPONSIBLE EMPLOYEE SHALL BE AVAILABLE FOR CONTACT BY GOVERNING AGENCY INSPECTORS.

STRUCTURAL STEEL NOTES:

1. THE FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC SPECIFICATION FOR THE MANUAL OF STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN, 13TH EDITION.
2. UNLESS OTHERWISE NOTED, ALL STRUCTURAL ELEMENTS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
   A. ALL SHAPES SHALL BE ASTM A572-50, PLATES A572-65, TUBES A500-C, PIPES A500-C
   B. ALL BOLTS SHALL BE GALVANIZED A325 HIGH STRENGTH BOLTS.
   C. ALL NUTS SHALL BE CARBON AND ALLOY STEEL NUTS.
   D. ALL WASHERS SHALL BE ASTM F436 HARDENED STEEL WASHERS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE FABRICATOR IN ACCORDANCE WITH AISC SPECIFICATION FOR MANUAL OF STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN, 13TH EDITION.
4. HOLES SHALL NOT BE FLAME CUT THRU STEEL UNLESS APPROVED BY THE ENGINEER.
5. HOT-DIP GALVANIZE ALL ITEMS UNLESS OTHERWISE NOTED, AFTER FABRICATION WHERE PRACTICABLE. GALVANIZING: ASTM A123, ASTM A153/153M OR ASTM A653/653M, G90, AS APPLICABLE.
6. REPAIR DAMAGED SURFACES WITH GALVANIZING REPAIR METHOD AND PAINT CONFORMING TO ASTM OR BY APPLICATION OF STICK OR THICK PASTE MATERIAL SPECIFICALLY DESIGNED FOR REPAIR OF GALVANIZING. CLEAN AREAS TO BE REPAIRED AND REMOVE SLAG FROM WELDS. HEAT SURFACES TO WHICH STICK OR PASTE MATERIAL IS APPLIED, WITH A TORCH, TO A TEMPERATURE SUFFICIENT TO MELT THE METALLICS IN STICK OR PASTE; SPREAD MOLTEN MATERIAL UNIFORMLY OVER SURFACES TO BE COATED AND WIPE OFF EXCESS MATERIAL.
7. A NUT LOCKING DEVICE SHALL BE INSTALLED ON ALL PROPOSED AND/OR REPLACED BOLTS.
8. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXCLUDE THE THREADS FROM THE SHEAR PLANE.
9. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH SUCH THAT THE END OF THE BOLT BE AT LEAST FLUSH WITH THE FACE OF THE NUT. IT IS NOT PERMITTED FOR THE BOLT END TO BE BELOW THE FACE OF THE NUT AFTER TIGHTENING IS COMPLETED.
10. DO NOT OVER TORQUE ASSEMBLY BOLTS. GALVANIZING ON BOLT NUTS AND STEEL PARTS MAY ACT AS A LUBRICANT, THUS OVER TIGHTENING MAY OCCUR AND MAY CAUSE BOLTS TO CRACK AND SNAP OFF.

BOLT TIGHTENING PROCEDURE:

1. TIGHTEN FLANGE BOLTS BY AISC- "TURN OF THE NUT" METHOD, USING THE CHART BELOW:

BOLT LENGTHS UP TO AND INCLUDING FOUR DIA.

3/4"	BOLTS UP TO AND INCLUDING 4.0 LENGTH	+1/3 TURN BEYOND SNUG TIGHT
7/8"	BOLTS UP TO AND INCLUDING 3.5 LENGTH	+1/3 TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 LENGTH	+1/3 TURN BEYOND SNUG TIGHT
1-1/8"	BOLTS UP TO AND INCLUDING 4.5 LENGTH	+1/3 TURN BEYOND SNUG TIGHT
1-1/4"	BOLTS UP TO AND INCLUDING 5.0 LENGTH	+1/3 TURN BEYOND SNUG TIGHT
1-1/2"	BOLTS UP TO AND INCLUDING 6.0 LENGTH	+1/3 TURN BEYOND SNUG TIGHT

BOLT LENGTH OVER FOUR DIA. BUT NOT EXCEEDING 8 DIA.

3/4"	BOLTS 4.25 TO 6.0 INCH LENGTH	+1/2 TURN BEYOND SNUG TIGHT
7/8"	BOLTS 3.75 TO 7.0 INCH LENGTH	+1/2 TURN BEYOND SNUG TIGHT
1"	BOLTS 4.25 TO 8.0 INCH LENGTH	+1/2 TURN BEYOND SNUG TIGHT
1-1/8"	BOLTS 4.75 TO 9.0 INCH LENGTH	+1/2 TURN BEYOND SNUG TIGHT
1-1/4"	BOLTS 5.25 TO 10.0 INCH LENGTH	+1/2 TURN BEYOND SNUG TIGHT
1-1/2"	BOLTS 6.25 TO 12.0 INCH LENGTH	+1/2 TURN BEYOND SNUG TIGHT

2. SPLICE BOLTS SUBJECT TO DIRECT TENSION SHALL BE INSTALLED AND TIGHTENED AS PER SECTION 8(d)(1) OF THE AISC MANUAL OF STEEL CONSTRUCTION. THE INSTALLATION PROCEDURE IS PARAPHRASED AS FOLLOWS:

"FASTENERS SHALL BE INSTALLED IN PROPERLY ALIGNED HOLES AND BE TIGHTENED BY ONE OF THE METHODS DESCRIBED IN SUBSECTION 8(d)(1) THROUGH 8(d)(4).

8(d)(1) TURN-OF-THE-NUT TIGHTENING.
BOLTS SHALL BE INSTALLED IN ALL HOLES OF THE CONNECTION AND BROUGHT TO A SNUG TIGHT CONDITION. SNUG TIGHT IS DEFINED AS THE TIGHTNESS THAT EXISTS WHEN THE PLIES OF A JOINT ARE IN FIRM CONTACT. THIS MAY BE OBTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A MAN USING AN ORDINARY SPUD WRENCH. SNUG TIGHTENING SHALL PROGRESS SYSTEMATICALLY...UNTIL ALL THE BOLTS ARE SIMULTANEOUSLY SNUG TIGHT AND THE CONNECTION IS FULLY COMPACTED. FOLLOWING THIS INITIAL OPERATION ALL BOLTS IN THE CONNECTION SHALL BE TIGHTENED FURTHER BY THE APPLICABLE AMOUNT OF ROTATION SPECIFIED ABOVE. DURING THE TIGHTENING OPERATION THERE SHALL BE NO ROTATION OF THE PART NOT TURNED BY THE WRENCH. TIGHTENING SHALL PROGRESS SYSTEMATICALLY.

BEFORE 1/3 TURN

AFTER 1/3 TURN

PLANS PREPARED FOR:

URS

500 ENTERPRISE DR, STE 3B
ROCKY HILL, CT 06067
OFFICE: (860) 990-8737

PROJECT INFORMATION:

STRATFORD, CT

VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

PLANS PREPARED BY:

vertical solutions

2002 PRODUCTION DRIVE
APEX, NC 27539
OFFICE (888) 321-6167
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REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

DRAWN BY: JWM | CHECKED BY: MER

SHEET TITLE:

PROJECT NOTES

SHEET NUMBER: **N-1** | REVISION: **0**

VSI #: 140008

SEAL:

January 27, 2014

APPLICABLE CODES AND STANDARDS

1. ANSI/TIA/EIA STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES, 222-F.
2. 2005 CONNECTICUT STATE BUILDING CODE.
3. ACI 318: AMERICAN CONCRETE INSTITUTE, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, 318-89.
4. CRSI: CONCRETE REINFORCING STEEL INSTITUTE, MANUAL OF STANDARD PRACTICE, LATEST EDITION.
5. AISC: AMERICAN INSTITUTE OF STEEL CONSTRUCTION, MANUAL OF STEEL CONSTRUCTION, LATEST EDITION.
6. AWS: AMERICAN WELDING SOCIETY D1.1, STRUCTURAL WELDING CODE, LATEST EDITION.

STRUCTURAL STEEL

1. ALL DETAILING, FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC SPECIFICATIONS, LATEST EDITION.
2. ALL EXPOSED STRUCTURAL STEEL MEMBERS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION PER ASTM A123. EXPOSED STEEL HARDWARE AND ANCHOR BOLTS SHALL BE GALVANIZED PER ASTM A153 OR B695.
3. ALL U-BOLTS SHALL BE ASTM A307 OR EQUIVALENT, WITH LOCKING DEVICE, UNLESS NOTED OTHERWISE.

WELDING

1. ALL WELDING SHALL BE PERFORMED BY WELDERS CURRENTLY STATE OR AWS CERTIFIED TO THE AWS D1.1 STRUCTURAL WELDING CODE, LATEST EDITION.
2. ALL FIELD WELDING SHALL UTILIZE LOW HYDROGEN ELECTRODES.
3. PRIOR TO FIELD WELDING, GRIND OFF GALVANIZING TO 1/2" BEYOND ALL FIELD WELD SURFACES.
4. ALL FIELD CUT, FIELD WELDED, OR DAMAGED GALVANIZING SURFACES SHALL BE REPAIRED WITH ZINC RICH PAINT (95% ZINC CONTENT) PER ASTM A780.
5. PRIOR TO FIELD WELDING, CONTRACTOR SHALL CLEAR THE INTERIOR OF MONOPOLE OF FLAMMABLE DEBRIS. COAXIAL CABLE SHALL BE SHIFTED AWAY FROM PROXIMITY OF THE WELD AND/OR COVERED WITH A HEAT RESISTANT BLANKET.

PAINT

1. CLEAN AND PAINT PROPOSED STEEL ACCORDING TO FAA ADVISORY CIRCULAR AC 70/7460-1K.

REINFORCEMENT STEEL

1. ALL REINFORCEMENT BARS ARE ASTM A572 GRADE 50, Fy = 50 ksi, Fu = 65 ksi.

FIELD WELDS

1. ALL FIELD WELDS SHALL BE MADE WITH E70XX WELD RODS.

GENERAL NOTES:

1. ALL METHODS, MATERIAL AND WORKMANSHIP SHALL FOLLOW THE DICTATES OF GOOD CONSTRUCTION PRACTICES.
2. ALL WORK INDICATED ON THESE DRAWINGS SHALL BE PERFORMED BY QUALIFIED CONTRACTORS EXPERIENCED IN TOWER AND FOUNDATION CONSTRUCTION.
3. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF RECORD IMMEDIATELY OF ANY INSTALLATION INTERFERENCES. ALL NEW WORK SHALL ACCOMMODATE EXISTING CONDITIONS. DETAILS NOT SPECIFICALLY SHOWN ON THE DRAWINGS SHALL FOLLOW SIMILAR DETAILS FOR THIS JOB.
4. ANY SUBSTITUTIONS MUST CONFORM TO THE REQUIREMENTS OF THE NOTES AND SPECIFICATIONS AND SHOULD BE SIMILAR TO THOSE SHOWN. ALL SUBSTITUTIONS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.
5. ANY MANUFACTURED DESIGN ELEMENTS MUST CONFORM TO THE REQUIREMENTS OF THESE NOTES AND SPECIFICATIONS AND SHOULD BE SIMILAR TO THOSE SHOWN. THESE DESIGN ELEMENTS MUST BE STAMPED BY AN ENGINEER PROFESSIONALLY REGISTERED IN THE STATE OF THE PROJECT, AND SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO FABRICATION.
6. ALL WORK SHALL BE DONE IN ACCORDANCE WITH LOCAL CODES AND OSHA SAFETY REGULATIONS.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND EXECUTION OF ALL MISCELLANEOUS SHORING, BRACING, TEMPORARY SUPPORTS, ETC. NECESSARY TO PROVIDE A COMPLETE AND STABLE STRUCTURE AS SHOWN ON THESE DRAWINGS.
8. ANY STEEL WHICH HAS BEEN FIELD CUT OR WELDED SHALL BE COLD GALVANIZED WITH 95% ZINC RICH PAINT PER ASTM A780.
9. CONTRACTOR'S PROPOSED INSTALLATION SHALL NOT INTERFERE, NOR DENY ACCESS TO, ANY EXISTING OPERATIONAL AND SAFETY EQUIPMENT.

SPECIAL INSPECTION

1. A QUALIFIED INDEPENDENT TESTING LABORATORY, EMPLOYED BY THE OWNER, SHALL PERFORM INSPECTION AND TESTING IN ACCORDANCE WITH IBC 2003, SECTION 1704 AS REQUIRED BY PROJECT SPECIFICATIONS FOR THE FOLLOWING CONSTRUCTION WORK:
   a) STRUCTURAL WELDING
   b) HIGH STRENGTH BOLTS
2. THE INSPECTION AGENCY SHALL SUBMIT INSPECTION AND TEST REPORTS TO THE BUILDING DEPARTMENT, THE ENGINEER OF RECORD, AND THE OWNER IN ACCORDANCE WITH IBC 2003, SECTION 1704. UNLESS THE FABRICATOR IS APPROVED BY THE BUILDING OFFICIAL TO PERFORM SUCH WORK WITHOUT THE SPECIAL INSPECTIONS.

FIELD BOLTS

1. ALL STITCH, SPLICE & TERMINATION BOLTS ARE 20 mm ONESIDE BOLTS BY AJAX.
   a) BOLTS SHALL MEET AS 1252, PROPERTRY CLASS 8.8 (SIMILAR TO ASTM A325M)
   b) Fu = 120 ksi
2. EACH BOLT SHALL INCLUDE A 30 mm O.D. BY 20 mm I.D. SLEEVE (Fu=120 ksi)
3. BOLT HOLES SHALL BE 31 mm MAXIMUM.

PHOTO CHECKLIST

1. CONTRACTOR SHALL SUBMIT THE FOLLOWING PHOTOS TO VERTICAL SOLUTIONS. IF PHOTOS DON'T MEET THE SATISFACTION OF OWNER OR ENGINEER OF RECORD, CONTRACTOR SHALL RETURN TO SITE AT HIS OWN EXPENSE TO OBTAIN ADDITIONAL PHOTOS. AS AN ALTERNATE, CONTRACTOR MAY RETAIN VERTICAL SOLUTIONS TO EXECUTE AN INSPECTION FOR A FEE. URS MAY ALSO ELECT TO RETAIN VERTICAL SOLUTIONS IF CONTRACTOR SCHEDULE DOES NOT MEET PROJECT TIMELINES. CONTACT inspections@verticalsolutions-inc.com FOR FEE AMOUNT AND / OR SCHEDULE.

BAR REINFORCEMENT - SELF SUPPORTING POLE STRUCTURE

COMPLETE (Y/N)	PHOTOGRAPH(S) DESCRIPTION
	LABEL AND PHOTO EACH STIFFENER PLATE OF EACH SIDE AFTER WELDING AND PRIOR TO COLD GALVANIZING.
	LABEL AND PHOTO EACH STIFFENER PLATE OF EACH SIDE AFTER COLD GALVANIZING.
	BOTTOM OF B#1 TO B#4, INCLUDING ALL TERMINATION BOLTS . MAKE SURE RB'S ARE LABELED PER FIGURE BELOW.
	BOTTOM OF B#1 TO B#4, INCLUDING ALL TERMINATION BOLTS . MAKE SURE RB'S ARE LABELED PER FIGURE BELOW.
	ALL SPLICE CONNECTIONS OF B#1 TO B#4, INCLUDING ALL BOLTS AND WELDS, MAKE SURE RB'S ARE LABELED PER FIGURE BELOW.
	FULL ELEVATION OF B#1 TO B#4, INCLUDING FULL LENGTH OF BAR.
	LABEL AND PHOTO EACH BPL AFTER WELDING AND PRIOR TO COLD GALVANIZING.

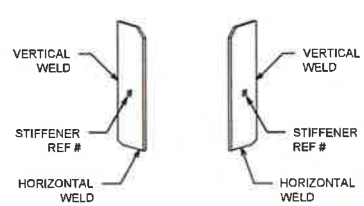

FIGURE 1

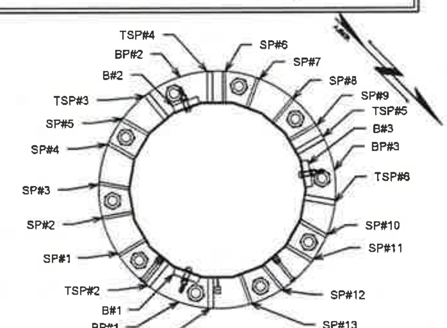

FIGURE 2

PLANS PREPARED FOR:

URS

500 ENTERPRISE DR. STE 3B
ROCKY HILL, CT 06067
OFFICE: (860) 990-6737

PROJECT INFORMATION:

STRATFORD, CT

VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

PLANS PREPARED BY:

vertical solutions

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APEX, NC 27539
OFFICE: (866) 321-6167
www.verticalsolutions-inc.com

REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

DRAWN BY: JWM | CHECKED BY: MER

SHEET TITLE:

PROJECT NOTES

SHEET NUMBER: **N-2** | REVISION: **0**

VSI #: 140008

SEAL:

January 27, 2014

BILL OF MATERIAL - MONOPOLE REINFORCEMENT-OPTION-01

MARK NO.	DESCRIPTION	SIZE	QTY
RB-01	REINFORCING BAR 01	A572-50 ℞ 1 1/2" x 6" x 31'-9"	3
RB-02	REINFORCING BAR 02	A572-50 ℞ 1 1/2" x 5 1/4" x 28'-11"	3
RB-F	REINFORCING BAR FLANGE	A572-50 ℞ 1 1/2" x 6" x 2'-10"	3
RB-VP	REINFORCING BAR VERTICAL PLATE	A572-50 ℞ 1" x 4 1/8" x 2'-9"	12
SPL	SPLICE PLATE	A572-50 ℞ 1" x 4 1/8" x 5'-6 1/4"	6
TSP	TRANSITION STIFFENER PLATE	A572-50 ℞ 1 3/8"	6
SP	STIFFENER PLATE	A572-50 ℞ 3/4"	13
BP	BASE PLATE	A572-50 ℞ 3/8"	3
HSB-01	HIGH STRENGTH BOLT DACROMET COATED	ASTM A490* 1"Ø x 4" (1) FLAT WASHER (1) SPLIT WASHER	24
HSB-02	HIGH STRENGTH BOLT W/ ASTM F436 WASHER	ASTM A325 3/4"Ø x 2 1/4" (1) FLAT WASHER (1) SPLIT WASHER	132
SB	STITCH BOLT (AJAX)**	20-mmØ - STANDARD LENGTH ONESIDE W/ 30-mmØ SLEEVE	189
-	WELD ELECTRODE	E70XX	TBD

NOTES:
1. LABEL BARS WITH BAR #.
2. BARS ARE TO BE ASTM A572 GRADE 50 STEEL
   & HOT-DIP GALVANIZED.
3. HOLES IN BARS ARE 31mmØ & DIMENSIONED TO CENTERS U.N.O.
4. BOTTOM OF BARS ON LEFT AS SHOWN.
5. SEE SLEEVE CHART FOR AJAX SLEEVE SIZE AND QUANTITY.

*=ASTM 490 HSB TO BE COATED WITH ZINC/ALUMINUM CORROSIVE PROTECTIVE COASTING PER ASTM F1136 GRADE 3(DACROMENT)

** = A325 1 1/8"Ø MAY BE USED.

AJAX SLEEVE

SLEEVE SIZE	QTY
30-mmØ O.D. x 20-mmØ I.D. x 1.625"	42
30-mmØ O.D. x 20-mmØ I.D. x 1.9375"	6
30-mmØ O.D. x 20-mmØ I.D. x 1.6875"	144

NOTE:
1. 29'-6"± TOTAL NEEDED.

BILL OF MATERIAL - MONOPOLE REINFORCEMENT-OPTION-02

MARK NO.	DESCRIPTION	SIZE	QTY
RB-01	REINFORCING BAR 01	A572-50 ℞ 1 1/2" x 6" x 31'-9"	3
RB-02	REINFORCING BAR 02	A572-50 ℞ 1 1/2" x 5 1/4" x 31'-9"	3
TSP	TRANSITION STIFFENER PLATE	A572-50 ℞ 1 3/8"	6
SP	STIFFENER PLATE	A572-50 ℞ 3/4"	13
BP	BASE PLATE	A572-50 ℞ 3/8"	3
HSB-01	HIGH STRENGTH BOLT DACROMET COATED	ASTM A490* 1"Ø x 4" (1) FLAT WASHER (1) SPLIT WASHER	24
SB	STITCH BOLT (AJAX)**	20-mmØ - STANDARD LENGTH ONESIDE W/ 30-mmØ SLEEVE	141
-	WELD ELECTRODE	E70XX	TBD

NOTES:
1. LABEL BARS WITH BAR #.
2. BARS ARE TO BE ASTM A572 GRADE 50 STEEL
   & HOT-DIP GALVANIZED.
3. HOLES IN BARS ARE 31mmØ & DIMENSIONED TO CENTERS U.N.O.
4. BOTTOM OF BARS ON LEFT AS SHOWN.
5. SEE SLEEVE CHART FOR AJAX SLEEVE SIZE AND QUANTITY.

*=ASTM 490 HSB TO BE COATED WITH ZINC/ALUMINUM CORROSIVE PROTECTIVE COASTING PER ASTM F1136 GRADE 3(DACROMENT)

** = A325 1 1/8"Ø MAY BE USED.

AJAX SLEEVE

SLEEVE SIZE	QTY
30-mmØ O.D. x 20-mmØ I.D. x 1.625"	45
30-mmØ O.D. x 20-mmØ I.D. x 1.9375"	6
30-mmØ O.D. x 20-mmØ I.D. x 1.6875"	90

NOTE:
1. 22'-0"± TOTAL NEEDED.

PLANS PREPARED FOR:

URS

500 ENTERPRISE DR, STE 3B
ROCKY HILL, CT 06067
OFFICE: (860) 990-6737

PROJECT INFORMATION:

STRATFORD, CT

VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

PLANS PREPARED BY:

vertical solutions

2002 PRODUCTION DRIVE
APEX, NC 27539
OFFICE: (888) 321-6167
www.verticalsolutions-inc.com

REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

DRAWN BY: JWM CHECKED BY: MER

SHEET TITLE:

BILL OF MATERIALS

SHEET NUMBER: B-1

REVISION: 0

VSI #: 140008

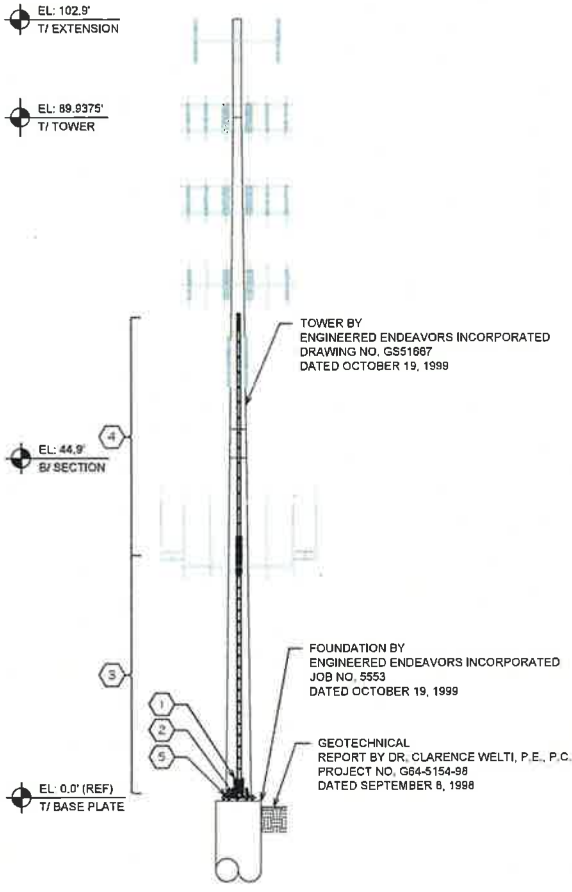
SEAL:

STATE OF CONNECTICUT
MICHAEL L. LA...
No. 25064
LICENSED
PROFESSIONAL ENGINEER

January 27, 2014

STRUCTURE

SECTION	01		02	03
LENGTH	48.78		45.01	12.92
# SIDES	18			
THICK. (IN.)	0.3125		0.2500	0.2500
LAP SPLICE (FT)		3.85		
TOP DIA (IN)	25.1130		13.0000	13.0000
BOT DIA (IN)	40.0000		26.7025	13.0000
SHAFT GRADE	A572 GR 65			
ANCHOR BOLT	(10) 2.25" x 6'-0" A615 GR 75			
BASE PLATE	1.75" x 54.0"Ø			



TOWER ELEVATION
SCALE: 1" = 20'-0"

MODIFICATION DESIGN PROVISIONS

THIS MODIFICATION DESIGN IS BASED ON VERTICAL SOLUTIONS STRUCTURAL ANALYSIS REPORT, VSI JOB # 140008 DATED JANUARY 27, 2014. THIS REPORT IS BASED ON A SPECIFIC ANTENNA AND COAX CONFIGURATION. SEE THE REPORT FOR ANTENNA AND COAX LOADING. ANY OTHER ANTENNA CONFIGURATION REQUIRES REVIEW BY VERTICAL SOLUTIONS.

CONSTRUCTION INTERFERENCES

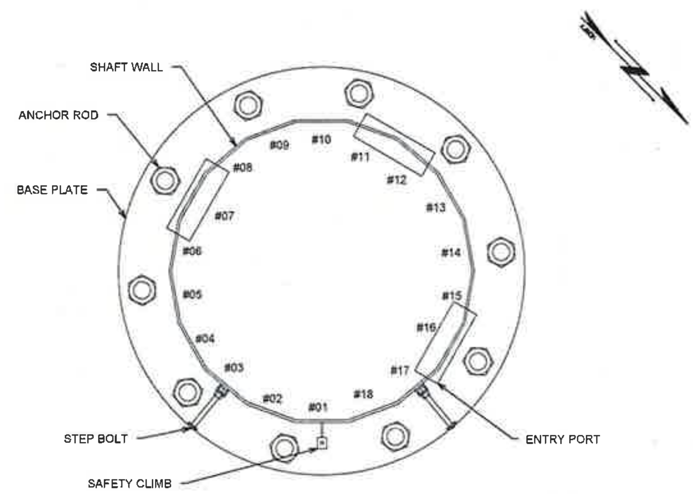
EXISTING AND PROPOSED ANTENNAS, MOUNTS, COAX, AND HAND-HOLE RIMS ARE NOT SHOWN FOR CLARITY. CONTRACTOR SHALL COORDINATE WITH THE TOWER OWNER WITH RESPECT TO INTERFERENCES TO REINFORCEMENT. CONTRACTOR SHALL FIELD VERIFY TOWER DIMENSION PRIOR TO FABRICATION.

FIELD VERIFICATION

THE CONTRACTOR SHALL FIELD VERIFY THE STRUCTURE DIMENSIONS, PROPOSED MATERIAL SIZES AND QUANTITIES PRIOR TO PURCHASING, FABRICATION AND ERECTION.

MODIFICATION SCHEDULE

NO.	MODIFICATION DESCRIPTION
1	INSTALL (6) TRANSITION STIFFENERS. SEE SHEETS S-2 & S-3.
2	INSTALL (3) ADDITIONAL BASE PLATES. SEE SHEETS S-3 & S-3.
3	INSTALL (3) REINFORCING BARS. SEE SHEETS S-2 & S-3.
4	INSTALL (3) REINFORCING BARS. SEE SHEETS S-2 & S-3.
5	INSTALL (13) STIFFENER PLATES. SEE SHEETS S-4.
6	CONTRACTOR SHALL PROVIDE CONSTRUCTION PROGRESS PHOTOS, AS WELL AS PROJECT COMPLETION PHOTOS, ALONG WITH STEEL & CONCRETE CERTIFICATION FOR VERTICAL SOLUTIONS, INC. TO COMPLETE A POST MODIFICATION LETTER. SEE SHEET N-2



SECTION @ BASE 8.0'
SCALE: 3/4" = 1'-0"

PLANS PREPARED FOR:

URS

500 ENTERPRISE DR, STE 3B
ROCKY HILL, CT 06067
OFFICE: (860) 990-6737

PROJECT INFORMATION:

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VZ5-156

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PLANS PREPARED BY:

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REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

DRAWN BY: JWM | CHECKED BY: MER

SHEET TITLE:
TOWER ELEVATION AND MODIFICATION SCHEDULE

SHEET NUMBER: **S-1**

REVISION: **0**

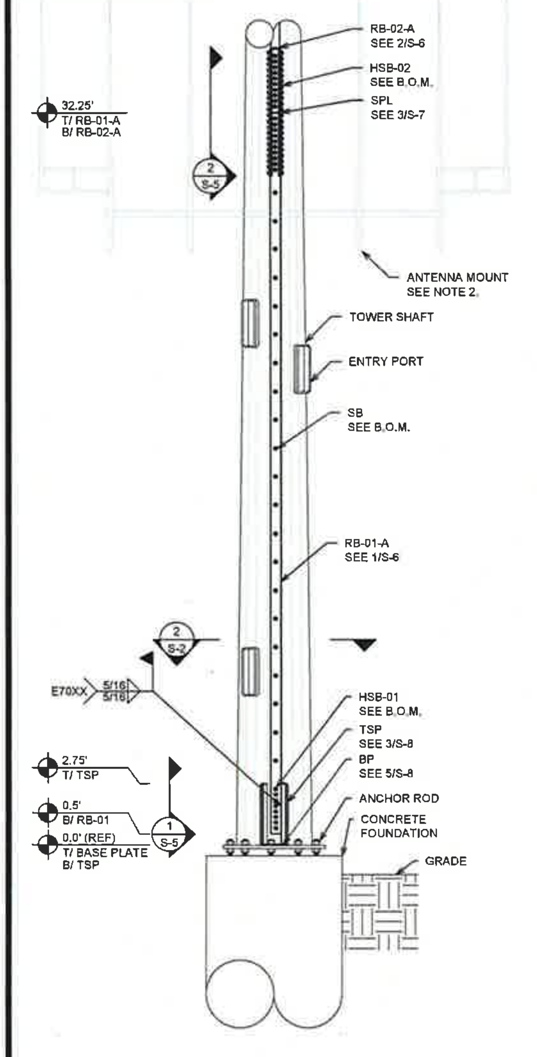
VSI #: 140008

SEAL:

STATE OF CONNECTICUT · MICHAEL L. LASSITER · No. 25064 · LICENSED · PROFESSIONAL ENGINEER

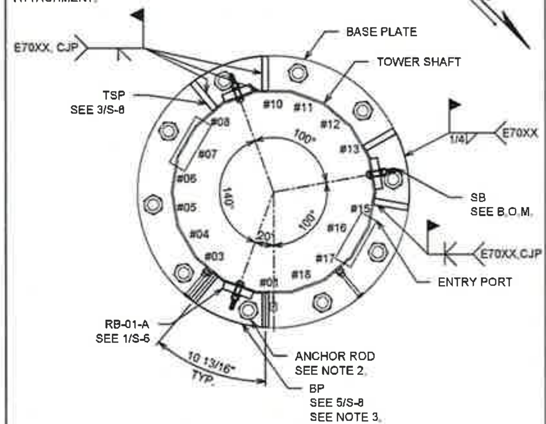
January 27, 2014

NOTE:
1. SHOWN FACING FLAT #14 FOR CLARITY.
2. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.



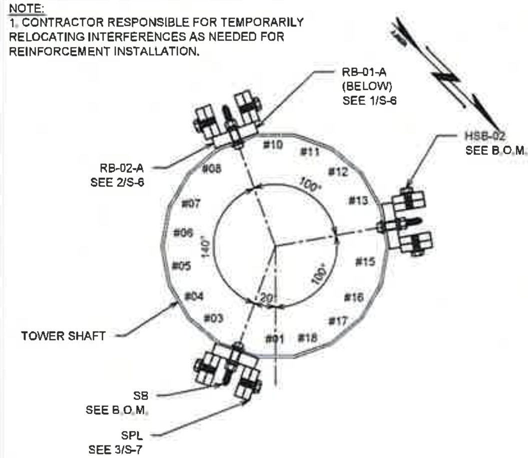
1 S-2 SECTION ELEVATION-OPTION-01
SCALE: 3/16" = 1'-0"

NOTE:
1. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.
2. REMOVE ANCHOR NUT AS REQUIRED TO INSTALL BP-0X.
3. FIELD LOCATED AND DRILL 2 3/8"Ø HOLE IN BP FOR ANCHOR ROD ATTACHMENT.



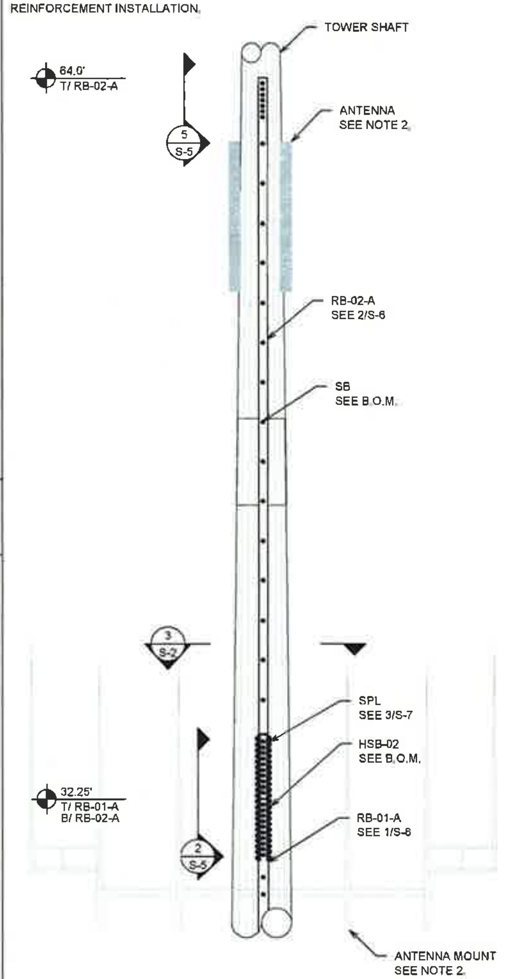
2 S-2 SECTION PLAN-OPTION-01
SCALE: 1/2" = 1'-0"

NOTE:
1. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.



3 S-2 SECTION PLAN-OPTION-01
SCALE: 3/4" = 1'-0"

NOTE:
1. SHOWN FACING FLAT #14 FOR CLARITY.
2. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.



4 S-2 SECTION ELEVATION-OPTION-01
SCALE: 3/16" = 1'-0"

PLANS PREPARED FOR:

URS
500 ENTERPRISE DR, STE 3B
ROCKY HILL, CT 06067
OFFICE: (860) 990-6737

PROJECT INFORMATION:

STRATFORD, CT

VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

PLANS PREPARED BY:

vertical solutions
2002 PRODUCTION DRIVE
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www.verticalsolutions-inc.com

REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

DRAWN BY: JWM | CHECKED BY: MER

SHEET TITLE:

CONSTRUCTION DETAILS

SHEET NUMBER: **S-2**

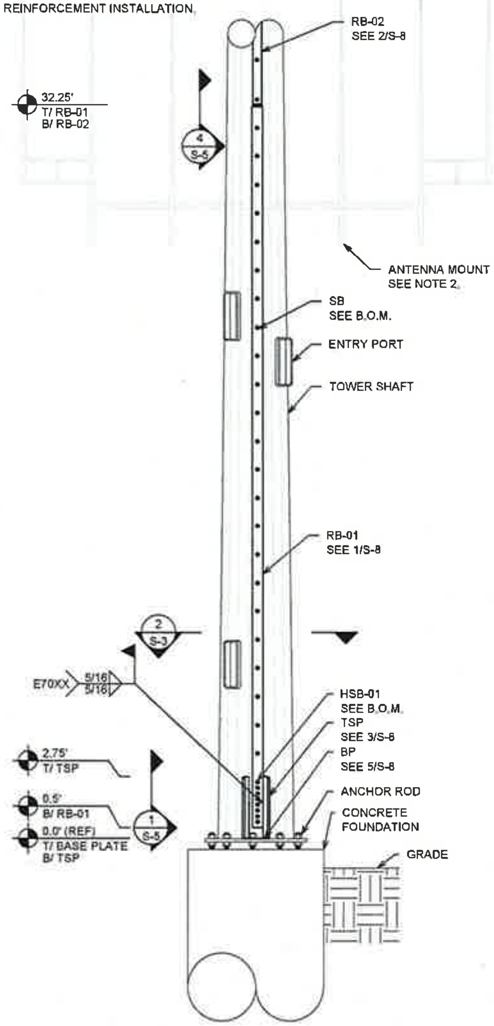
REVISION: **0**

VSI #: 140008

SEAL:

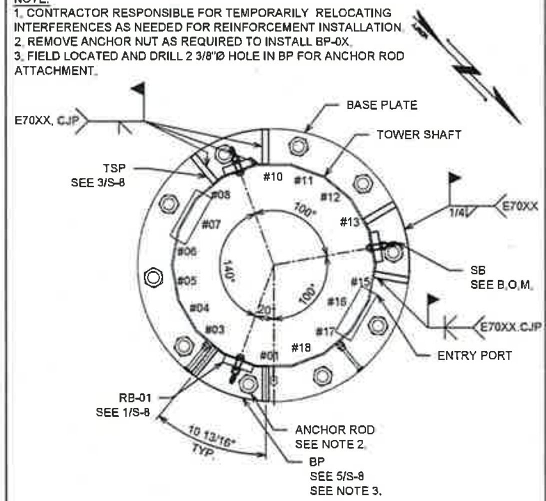
January 27, 2014

NOTE:
1. SHOWN FACING FLAT #14 FOR CLARITY.
2. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.



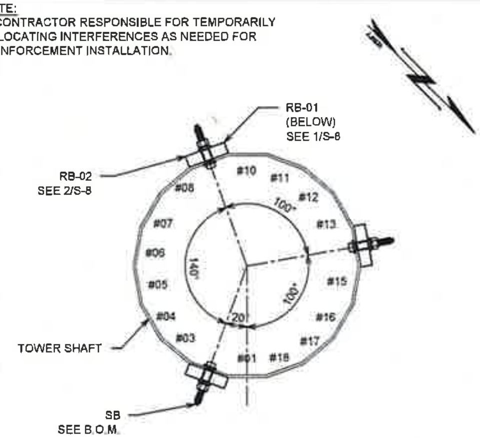
1 S-3 SECTION ELEVATION-OPTION-02
SCALE: 3/16" = 1'-0"

NOTE:
1. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.
2. REMOVE ANCHOR NUT AS REQUIRED TO INSTALL BP-0X.
3. FIELD LOCATED AND DRILL 2 3/8"Ø HOLE IN BP FOR ANCHOR ROD ATTACHMENT.



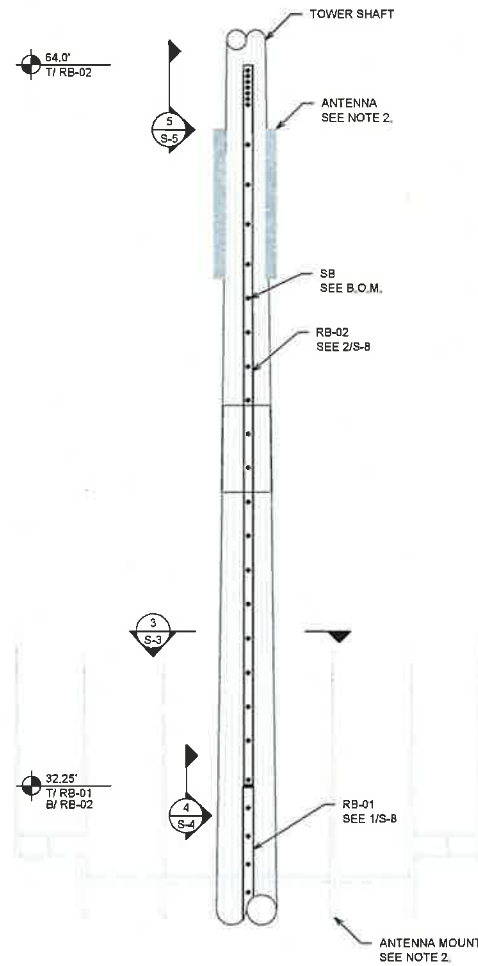
2 S-3 SECTION PLAN-OPTION-02
SCALE: 1/2" = 1'-0"

NOTE:
1. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.



3 S-3 SECTION PLAN-OPTION-02
SCALE: 3/4" = 1'-0"

NOTE:
1. SHOWN FACING FLAT #14 FOR CLARITY.
2. CONTRACTOR RESPONSIBLE FOR TEMPORARILY RELOCATING INTERFERENCES AS NEEDED FOR REINFORCEMENT INSTALLATION.



4 S-3 SECTION ELEVATION-OPTION-02
SCALE: 3/16" = 1'-0"

PLANS PREPARED FOR:

URS
500 ENTERPRISE DR, STE 3B
ROCKY HILL, CT 06067
OFFICE: (860) 990-6737

PROJECT INFORMATION:

STRATFORD, CT

VZ5-156

627 HONEYSPOT ROAD
STRATFORD, CT 06615
(FAIRFIELD COUNTY)

PLANS PREPARED BY:

vertical solutions
2002 PRODUCTION DRIVE
APEX, NC 27539
OFFICE: (888) 321-6167
www.verticalsolutions-inc.com

REV	DATE	ISSUED FOR:
0	01-27-14	CONSTRUCTION

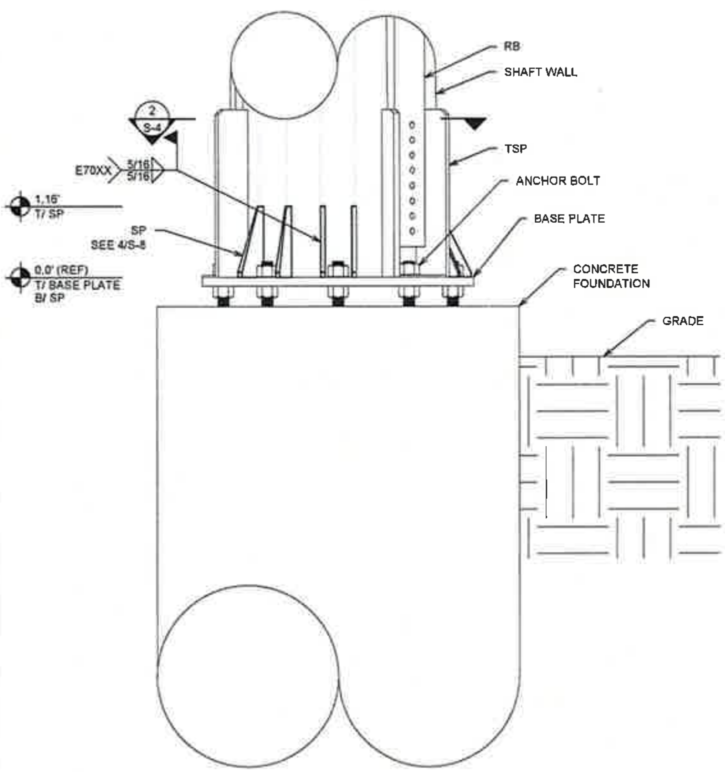
DRAWN BY: JWM | CHECKED BY: MER

SHEET TITLE:
CONSTRUCTION DETAILS

SHEET NUMBER: **S-3**
REVISION: **0**
VSI #: 140008

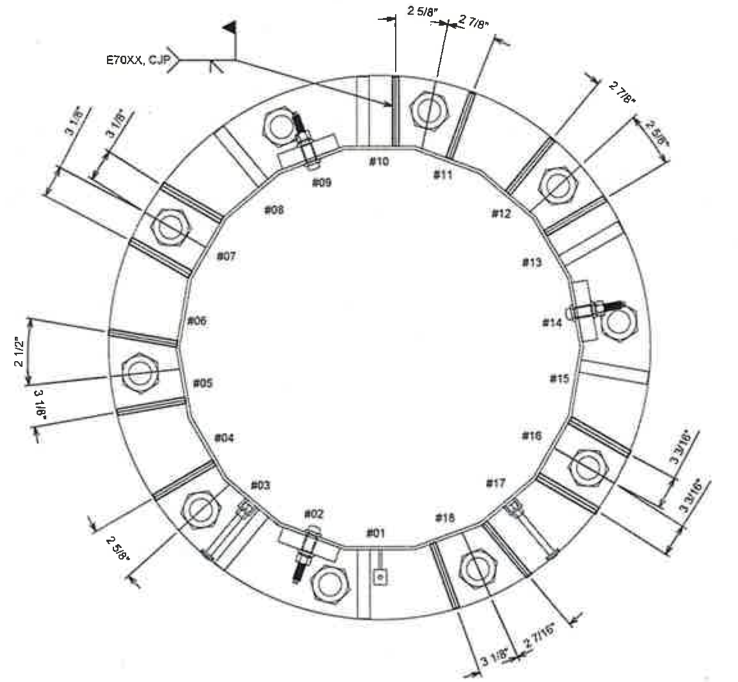
SEAL:
STATE OF CONNECTICUT · MICHAEL L. LASSITER · No. 25064 · LICENSED PROFESSIONAL ENGINEER
January 27, 2014

NOTE:
1. SHOWN ON FLAT #16 FOR CLARITY.



1 S-4 **SECTION ELEVATION**
SCALE: 3/16" = 1'-0"

NOTE:
1. ALL DIMENSIONS ARE ALONG TOWER BASE.



2 S-4 **SECTION PLAN**
SCALE: 1" = 1'-0"

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SHEET NUMBER: **S-4**
REVISION: **0**
VSI #: 140008

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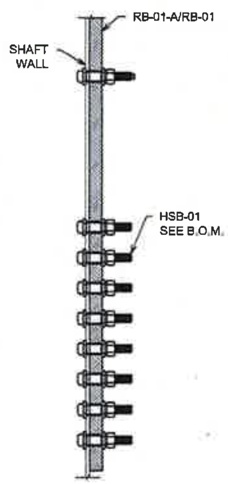
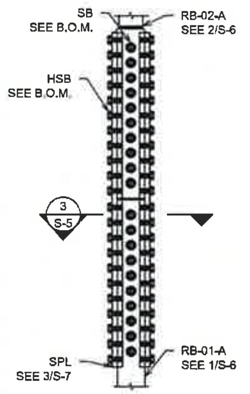
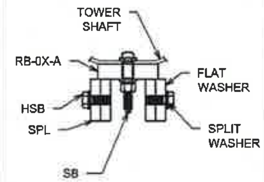
January 27, 2014



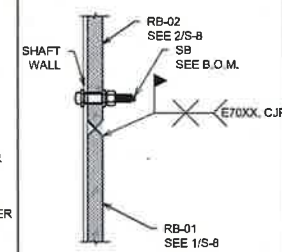
1 / S-5 **RB-01 BOT TERM**
SCALE: 1" = 1'-0"



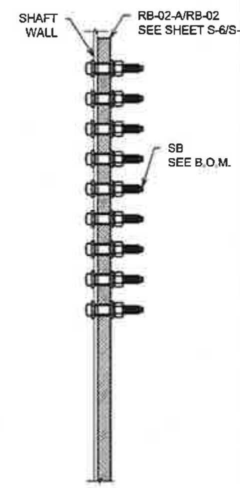
2 / S-5 **SPLICE-01-OPTION-01**
SCALE: 1/2" = 1'-0"



3 / S-5 **SPLICE-01-PLAN OPTION-01**
SCALE: 1" = 1'-0"



4 / S-5 **SPLICE-01-OPTION-02**
SCALE: 1" = 1'-0"



5 / S-5 **RB-02-A/RB-02 TOP TERM**
SCALE: 1/2" = 1'-0"

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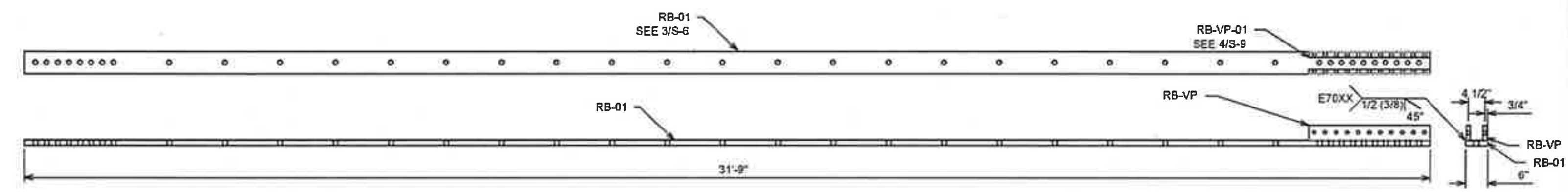
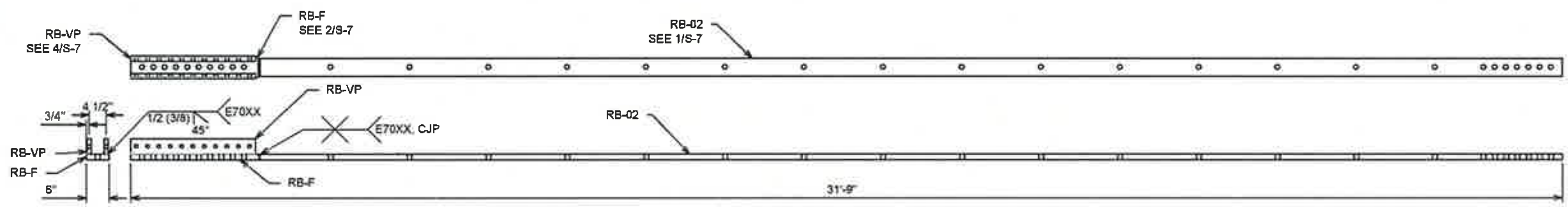


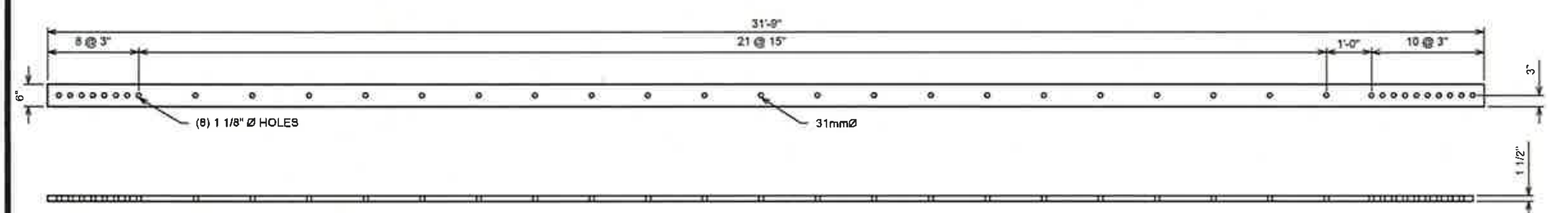
1 / S-6 RB-01 ASSEMBLY-OPTION-01

SCALE: 3/8" = 1'-0"



2 / S-6 RB-02 ASSEMBLY-OPTION-01

SCALE: 3/8" = 1'-0"



3 / S-6 RB-01 DETAIL-OPTION-01

SCALE: 3/8" = 1'-0"

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SHEET NUMBER: **S-6** | REVISION: **0**

VSI #: 140008

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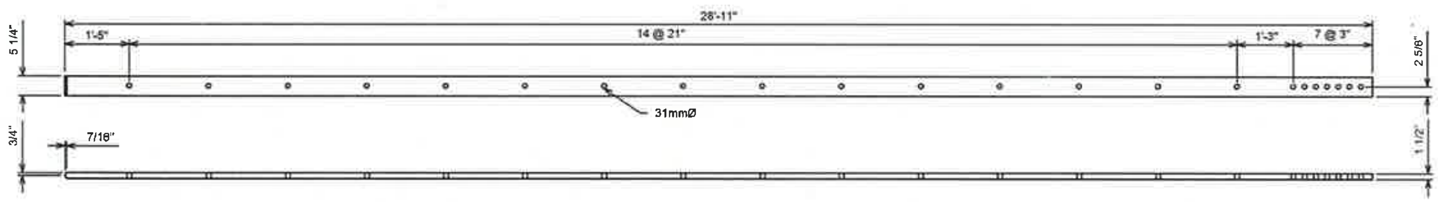
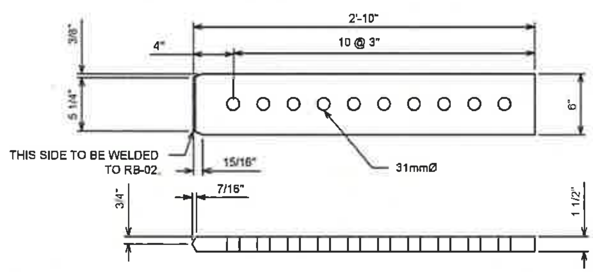
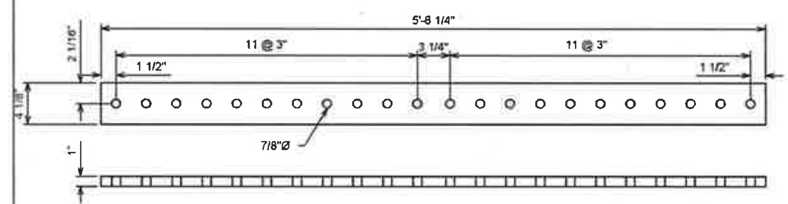
January 27, 2014



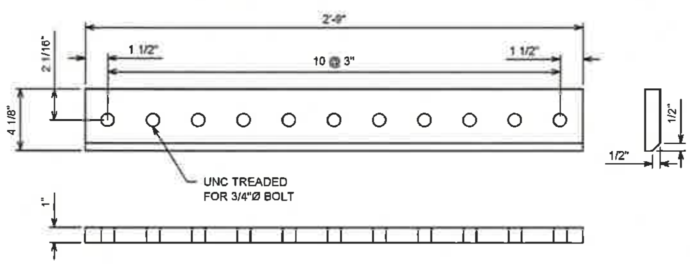
1 / S-7 RB-02 DETAIL-OPTION-01
SCALE: 3/8" = 1'-0"



2 / S-7 RB-F DETAIL-OPTION-01
SCALE: 1" = 1'-0"



3 / S-7 SPL DETAIL-OPTION-01
SCALE: 1" = 1'-0"



4 / S-7 RB-VP DETAIL-OPTION-01
SCALE: 1 1/2" = 1'-0"

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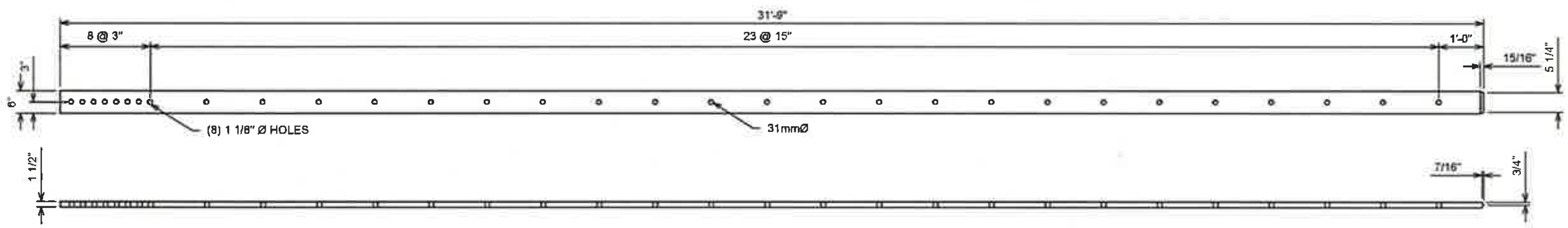
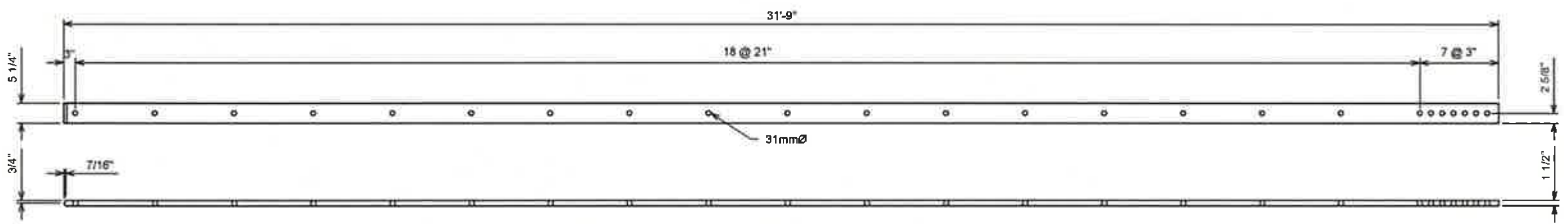
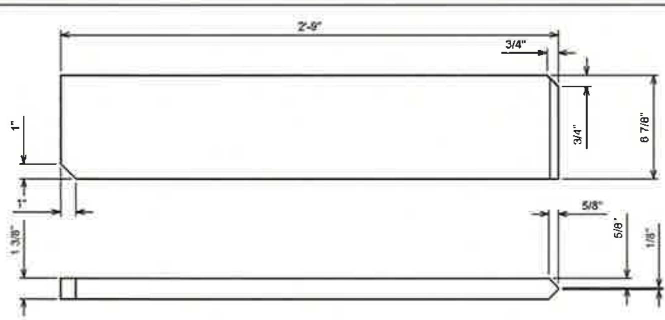


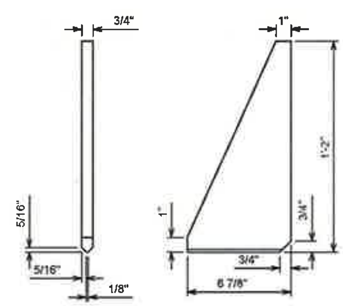
1 / S-8 **RB-01 DETAIL-OPTION-02**
SCALE: 3/8" = 1'-0"



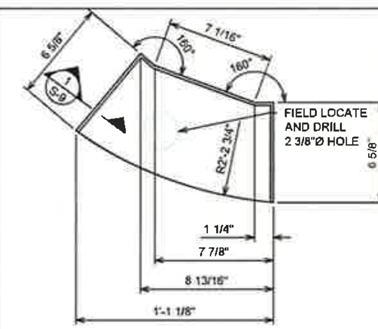
2 / S-8 **RB-02 DETAIL-OPTION-02**
SCALE: 3/8" = 1'-0"



3 / S-8 **TSP DETAIL**
SCALE: 1 1/2" = 1'-0"



4 / S-8 **SP DETAIL**
SCALE: 1 1/2" = 1'-0"



5 / S-8 **BP-01 DETAIL**
SCALE: 1 1/2" = 1'-0"

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SHEET NUMBER: **S-8**
REVISION: **0**
VSI #: 140008

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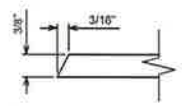
STATE OF CONNECTICUT
MICHAEL L. LASKE
No. 25064
LICENSED PROFESSIONAL ENGINEER

January 27, 2014



1 / S-9 **BP-01 DETAIL**
SCALE: 6" = 1'-0"

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