Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

August 19, 2014

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

Re: **Request of Cellco Partnership d/b/a Verizon Wireless for an Order to Approve the Shared Use of an Existing Tower at 344 Firetown Road, Simsbury, Connecticut**

Dear Ms. Bachman:

Pursuant to Connecticut General Statutes ("C.G.S.") §16-50aa, as amended, Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby requests an order from the Connecticut Siting Council ("Council") to approve the shared use by Cellco of an existing telecommunications tower, owned by the Simsbury Fire Department ("SFD"), at 344 Firetown Road in Simsbury, Connecticut (the "Property"). Cellco requests that the Council find that the proposed shared use of the SFD tower satisfies the criteria of C.G.S § 16-50aa and issue an order approving the proposed shared use. A copy of this letter is being sent to Simsbury's First Selectwoman Mary Glassman and the SFD, the owner of the Property.

Background

The existing SFD facility consists of an 80-foot self-supporting monopole tower in the northerly portion of a 1.29 acre parcel. T-Mobile maintains antennas at the 77-foot level on the tower and the SFD antennas extend off the top of the tower. T-Mobile's equipment cabinet is located next to the tower on a concrete pad.

Cellco is licensed by the Federal Communications Commission ("FCC") to provide wireless services throughout the State of Connecticut. Cellco and the SFD have agreed to the

proposed shared use of the SFD tower pursuant to mutually acceptable terms and conditions, and the SFD has authorized Cellco to apply for all necessary permits and approvals that may be required to share the existing tower. (*See* Owner's authorization letter included in Attachment 1).

Cellco proposes to install twelve (12) antennas and nine (9) remote radio heads (RRHs) behind the antennas, on a low-profile antenna platform at a height of 67 feet above ground level. Equipment associated with Cellco's antennas and a natural gas-fueled generator will be located inside a new 12' x 30' shelter. Included in Attachment 2 are Cellco's project plans showing the location of all proposed site improvements.

C.G.S. § 16-50aa(c)(1) provides that, upon written request for approval of a proposed shared use, "if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the council shall issue an order approving such shared use." Cellco respectfully submits that the shared use of the tower satisfies these criteria.

A. Technical Feasibility. The existing SFD tower is structurally capable of supporting Cellco's antennas. The proposed shared use of this tower is, therefore, technically feasible. A Structural Analysis Report verifying the structural integrity of the tower, and its ability to support Cellco's antennas and related equipment is included in Attachment 3.

B. Legal Feasibility. Under C.G.S. § 16-50aa, the Council has been authorized to issue orders approving the shared use of an existing tower such as the SFD tower. This authority complements the Council's prior-existing authority under C.G.S. § 16-50p to issue orders approving the construction of new towers that are subject to the Council's jurisdiction. In addition, § 16-50x(a) directs the Council to "give such consideration to other state laws and municipal regulations as it shall deem appropriate" in ruling on requests for the shared use of existing tower facilities. Under the statutory authority vested in the Council, an order by the Council approving the requested shared use would permit the Applicant to obtain a building permit for the proposed installations.

C. Environmental Feasibility. The proposed shared use of the SFD tower would have a minimal environmental effect, for the following reasons:

1. The proposed installation of twelve (12) antennas and nine (9) remote radio heads behind the antennas at the 67-foot level on the existing 80-foot

tower would have an insignificant incremental visual impact on the area around the existing tower. Cellco's shelter would be installed on a concrete pad adjacent to the existing tower site. No trees larger than six inch diameter, above breast height, will need to be removed to accommodate Cellco's improvements. Cellco's shared use of this tower would therefore, not cause any significant change or alteration in the physical or environmental characteristics of the existing site.

2. Noise associated with the equipment shelter's air conditioning ("A/C") units was evaluated for compliance with State and/or local noise standards. According to the Noise Compliance Study included in Attachment 4 ("Study"), noise from the shelter's A/C units will not exceed State and/or local noise limits. Noise associated with Cellco's emergency back-up generator is exempt from State and local noise standards.

3. Operation of Cellco's antennas at this site would not exceed the RF emissions standards adopted by the Federal Communications Commission ("FCC"). Included in Attachment 5 of this filing are Radio Frequency ("RF") Far Field Approximations that demonstrate that the proposed Cellco antennas will operate well within the FCC RF emissions standards.

4. Under ordinary operating conditions, the proposed installation would not require the use of any water or sanitary facilities and would not generate air emissions or discharges to water bodies or sanitary facilities. After construction is complete the proposed installations would not generate any increased traffic to the SFD facility other than periodic (monthly) maintenance visits to the cell site.

5. Cellco's equipment shelter will be located approximately 24 feet from an existing wetland area to the west. Related construction activity extends to within 9 feet of Wetland Flag (WF) # 8. Cellco's proposed improvements will not result in any direct impacts to this wetland area. Provided certain sedimentation and erosion controls are designed, installed and maintained during construction, temporary wetland impact would be minimized. According to the Wetlands Investigation Report prepared by Dean Gustafson at All-Points Technology Corp., P.C., a wetlands protection plan will also be implemented to provide additional protections to the

nearby wetland area. A copy of the Wetlands Investigation Report dated August 15, 2014, is included in Attachment 6.

The proposed use of the SFD facility would, therefore, have a minimal environmental effect, and is environmentally feasible.

D. Economic Feasibility. As previously mentioned, the SFD and Cellco have entered into a lease for the shared use of the existing tower on mutually agreeable terms. The proposed tower sharing is, therefore, economically feasible. (*See* Attachment 1).

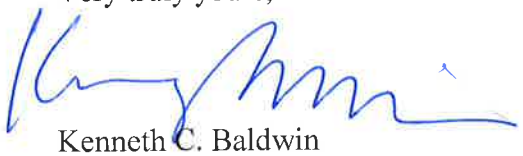
E. Public Safety Concerns. As discussed above, the tower is structurally capable of supporting Cellco's full array of twelve (12) antennas, remote radio heads and all related equipment. Cellco is not aware of any public safety concerns relative to the proposed sharing of the existing SFD tower. In fact, the provision of new and improved wireless service through shared use of the existing tower is expected to enhance the safety and welfare of area residents and members of the general public traveling through Simsbury.

Conclusion

For the reasons discussed above, the proposed shared use of the existing SFD tower at 344 Firetown Road satisfies the criteria stated in C.G.S. § 16-50aa and advances the General Assembly's and the Council's goal of preventing the unnecessary proliferation of towers in Connecticut. The Applicant, therefore, respectfully requests that the Council issue an order approving the proposed shared use.

Thank you for your consideration of this matter.

Very truly yours,



Kenneth C. Baldwin

Enclosures
Copy to:
Mary Glassman, First Selectwoman
Simsbury Fire District
Sandy M. Carter

ATTACHMENT 1

August 14, 2014

Sandy Carter
Verizon Wireless
99 East River Drive
East Hartford, CT 06108

RE: Cellco Partnership d/b/a Verizon Wireless
Co-location on Existing Wireless Telecommunications Tower
344 Firetown RD
Simsbury, Connecticut 06070

Dear Ms. Carter:

Simsbury Fire District, the owner of the above-referenced property, hereby authorizes Cellco Partnership d/b/a Verizon Wireless and/or its agents to apply for and obtain all necessary permits and approvals from the Connecticut Siting Council and all appropriate Town of Simsbury boards, commissions and agencies for its proposed wireless telecommunications facility modifications.

Please contact us should you have any questions.

Sincerely

The Simsbury Fire District

KEVIN A. NORTH
PRESIDENT

11645304-v1

ATTACHMENT 2

Cellco Partnership

d.b.a. verizon wireless

WIRELESS COMMUNICATIONS FACILITY

SIMSBURY NW

344 FIRETOWN ROAD

SIMSBURY, CT 06070

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT **TO:** 344 FIRETOWN ROAD, SIMSBURY, CT 06070

1.	HEAD NORTHEAST ON E RIVER DR TOWARD DARLIN ST	0.3 MI
2.	TURN LEFT TO STAY ON E RIVER DR	400 FT
3.	TAKE THE 1ST LEFT ONTO CONNECTICUT BLVD	0.2 MI
4.	TURN LEFT ONTO THE RT-84 W RAMP TO HARTFORD/RT-91	443 FT
5.	MERGE ONTO I-84	0.3 MI
6.	TAKE EXIT 51 TO MERGE ONTO I-91N TOWARD SPRINGFIELD	4.9 MI
7.	TAKE EXIT 36 FOR CT-178/PARK AVE TOWARD BLOOMFIELD	0.3 MI
8.	TURN LEFT ONTO CT-178W/PARK AVE	1.9 MI
9.	TURN RIGHT ONTO CT-187 N	4.8 MI
10.	TAKE THE CT-189N RAMP TO TARIFFVILLE/GRANBY	0.7 MI
11.	MERGE ONTO CT-189N	0.9 MI
12.	TURN LEFT ONTO ELM ST	0.5 MI
13.	ELM ST TURNS SLIGHTLY LEFT AND BECOMES CT-315 W/TARIFFVILLE RD	1.5 MI
14.	TURN RIGHT ONTO US-202 N/HOPMEADOW ST	0.1 MI
15.	TAKE THE 1ST LEFT ONTO HOSKINS RD	0.7 MI
16.	SLIGHT LEFT TOP STAY ON HOSKINS RD	1.2 MI
17.	TAKE THE 3RD LEFT ONTO FIRETOWN RD, DESTINATION WILL BE ON THE LEFT	121 FT

GENERAL NOTES

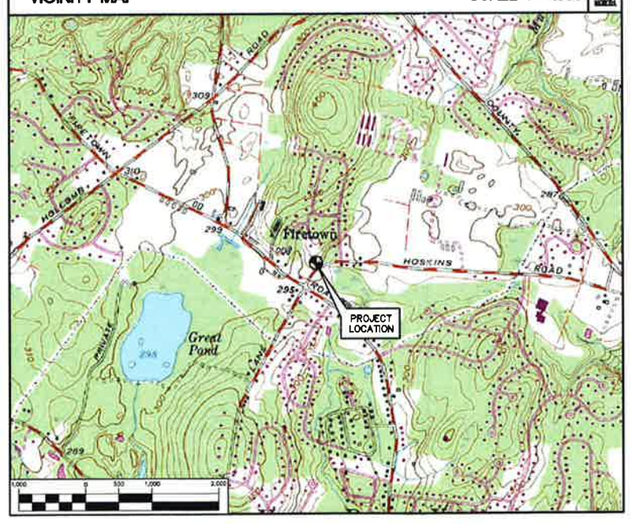
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE EXPANSION OF THE EXISTING FENCED COMPOUND IN ORDER TO ACCOMMODATE THE INSTALLATION OF A 12'x30'± PREFABRICATED WIRELESS EQUIPMENT SHELTER ON A CONCRETE FOUNDATION.
2. A TOTAL OF TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED ON AN EXISTING 80' TALL MONOPOLE TOWER AT A CENTERLINE ELEVATION OF 67' ABOVE FINISHED GRADE.
3. ELECTRIC AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND TO THE PROPOSED EQUIPMENT SHELTER FROM AN EXISTING UTILITY BACKBOARD LOCATED ADJACENT TO FENCED COMPOUND.
4. FINAL DESIGN FOR TOWER AND ANTENNA MOUNTS SHALL BE INCLUDED IN THE D&M PLANS.
5. THE PROPOSED WIRELESS FACILITY INSTALLATION WILL BE DESIGNED IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2009 CONNECTICUT SUPPLEMENT.
6. THERE WILL NOT BE ANY LIGHTING UNLESS REQUIRED BY THE FCC OR THE FAA.
7. THERE WILL NOT BE ANY SIGNS OR ADVERTISING ON THE ANTENNAS OR EQUIPMENT.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	SIMSBURY NW
SITE ADDRESS:	344 FIRETOWN ROAD SIMSBURY, CT 06070
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON:	SANDY CARTER CELLCO PARTNERSHIP (860) 803-8219
TOWER COORDINATES:	LATITUDE 41°-54'-11.51" LONGITUDE 72°-49'-18.95" GROUND ELEVATION: 310' ± A.M.S.L. COORDINATES & GROUND ELEVATION ARE BASED ON CONNECTICUT SITING COUNCIL DATABASE.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	0
C-1	SITE PLAN	0
C-2	COMPOUND PLAN AND ELEVATION	0
C-3	SITE CONSTRUCTION, S&E CONTROL NOTES AND DETAILS	0
C-4	SITE DETAILS	0
C-5	SHELTER FOUND. PLAN, DETAILS AND NOTES	0

PROFESSIONAL ENGINEER SEAL

REV.	DATE	DRAWN BY	CH'K'D BY	DESCRIPTION
0	06/11/14	HAR	DMD	ISSUED FOR CSC - CLIENT REVIEW

Cellco Partnership d.b.a. verizon wireless

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

Cellco Partnership d/b/a Verizon Wireless

WIRELESS COMMUNICATIONS FACILITY

SIMSBURY NW

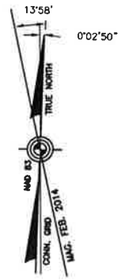
344 FIRETOWN ROAD
SIMSBURY, CT 06070

DATE: 06/06/14
SCALE: AS NOTED
JOB NO. 14014.000

TITLE SHEET

T-1

Sheet No. 1 of 6



PLANTING SCHEDULE		
QUANTITY	DESIGNATION	TYPE & HEIGHT
16	PS-1	WHITE PINE 8'-10'

NOTES: 1) SPACING OF PLANTS SHALL BE AS SHOWN.

TREE LEGEND

PS-1

SURVEY NOTES

THIS SURVEY AND MAP HAS BEEN PREPARED IN ACCORDANCE WITH SECTIONS 20-300B-1 THRU 20-300B-20 OF THE REGULATIONS OF CONNECTICUT STATE AGENCIES – "MINIMUM STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ENDORSED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPT. 26, 1996. IT IS A BOUNDARY MAP AND IS BASED UPON A DEPENDENT RESURVEY CONFORMING TO HORIZONTAL ACCURACY CLASS A-2 AND IS INTENDED TO BE USED TO DEPICT A PROPOSED TELECOMMUNICATION SITE. PLANIMETRIC FEATURES SUCH AS THE ROADWAY WERE COMPILED FROM OTHER PLANS. NOT ALL SITE IMPROVEMENTS SHOWN.

COORDINATES REFER TO NAD 83.

PARCEL OWNER OF RECORD: SIMSBURY FIRE DISTRICT
869 HOPMEADOW STREET
SIMSBURY, CT 06070

PARCELS KNOWN AS 344 FIRETOWN ROAD

PARCEL AREA= 1.29 ACRES:

PARCEL IS IN THE R-40 ZONING DISTRICT.

MAP F05, LOT NO. 1, SIMSBURY ASSESSORS MAP.

PARCEL IS NOT IN A FLOOD ZONE BASED ON THE FLOOD INSURANCE RATE MAP, HARTFORD COUNTY, CONNECTICUT, ALL JURISDICTIONS, PANEL 189 OF 875, COMMUNITY MAP NUMBER 09003C0189F, EFFECTIVE DATE SETEMBER 26, 2008.

NEAREST RESIDENCE IS 210'±

PARCEL IS SUBJECT TO A UTILITY EASEMENT IN FAVOR OF THE CONNECTICUT LIGHT & POWER COMPANY AS DESCRIBED IN VOL. 739 P. 958-958

WETLANDS FLAGS DEPICTED HEREON WERE FIELD LOCATED BY ALL POINTS TECHNOLOGY CORPORATION.

MAP REFERENCE:

1) GRADING DRAINAGE & UTILITIES PLAN, PREPARED FOR: THE SIMSBURY FIRE DISTRICT, 196 HOSKINS ROAD, SIMSBURY, CONNECTICUT, SCALE: 1"=20', DATE: 7-16-2001, BY: RANDOLPH H. DUFOUR.

2) RE-SUBDIVISION, KELLY-GREEN MEADOWS SECTION I PROPERTY OF JOHN J. KELLY FIRETOWN ROAD SIMSBURY CONNECTICUT A-25 ZONE, SCALE: 1"=100', DATE: JUNE 1960, BY: HAROLD R. SANDERSON.

3) SURVEY-SIMSBURY FIRE DIST., FIRETOWN & HOSKINS ROADS, SIMSBURY, CONNECTICUT, SCALE: 1"=60', DATE: 4-5-63, BY: HAROLD R. SANDERSON.

4) PROPERTY OF RALPH E. HOLCOMBE, ET AL, HOSKINS ROAD & FIRETOWN ROAD, SIMSBURY, CONNECTICUT, SCALE: 1"=100', DATE: FEBRUARY, 1956, BY: HAROLD R. SANDERSON.

5) SUBDIVISION PLAN KELLY FARM PREPARED FOR DON BARRETT SIMSBURY, CONNECTICUT, SCALE: 1"=100', DATE: JUNE 15, 1961, REVISED THRU: 1-18-82, BY: EDWARD F. LALLY, JR.

6) PREPARED FOR C.G.R. DEVELOPMENT CORP., SUBDIVISION, GRADING, EROSION AND SEDIMENTATION CONTROL PLAN, 351 FIRETOWN ROAD, SIMSBURY, CONNECTICUT, SCALE: 1"=40', DATE: MAY 10, 1994, REVISED THRU: 8-24-94, BY: WILSON M. ALFORD, JR.

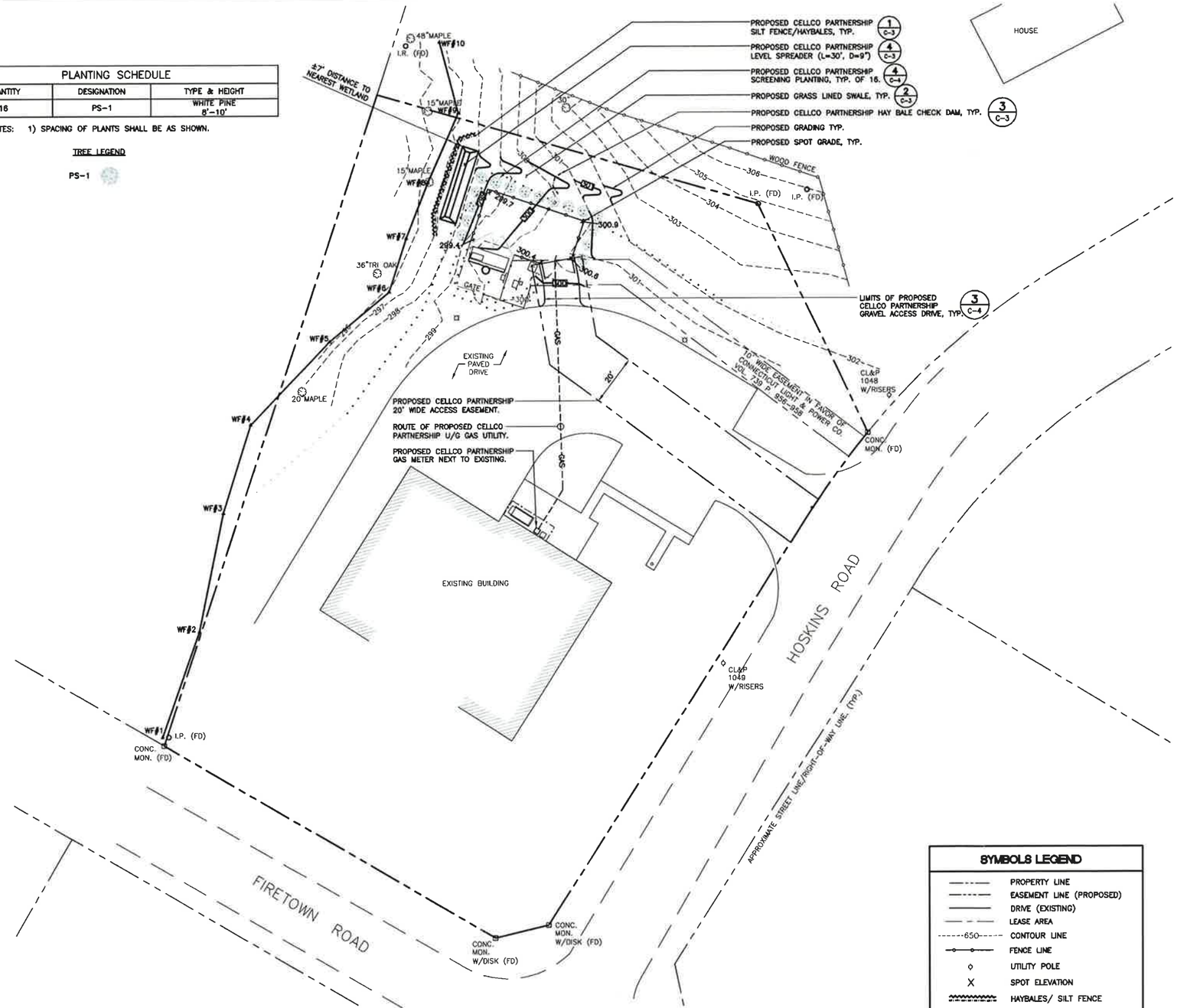
7) FIRETOWN FIRE HOUSE PROPERTY OF THE SIMSBURY FIRE DISTRICT, FIRETOWN ROAD & 196 HOSKINS ROAD, SIMSBURY, CONNECTICUT, SCALE: 1"=40', DATE: JANUARY 1987, BY: CLIFFORD A. WASHBURN, JR.

8) "COMPILATION PLAN MAP SHOWING EASEMENT AREA TO BE GRANTED TO THE CONNECTICUT LIGHT AND POWER COMPANY ACROSS THE PROPERTY OF SIMSBURY FIRE DISTRICT FIRETOWN ROAD, SIMSBURY, CT, CL&P FILE NO. E8259, SCALE: 1"=40', DATE: DECEMBER 15, 2006, BY: WILLIAM S. LUCARELLI.

TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON

THIS MAP IS NOT VALID WITHOUT A LIVE SIGNATURE AND SEAL

A. RAFAEL MARTINEZ LLS #18833 DATE



1 C-1 **SITE PLAN - PROPOSED**
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 60
(IN FEET)
1 inch = 20 ft

SYMBOLS LEGEND

- PROPERTY LINE
- EASEMENT LINE (PROPOSED)
- DRIVE (EXISTING)
- LEASE AREA
- 650 CONTOUR LINE
- FENCE LINE
- UTILITY POLE
- SPOT ELEVATION
- HAYBALES/ SILT FENCE
- TREE LINE
- SIGN
- SILTATION FENCE
- CT WETLAND BOUNDARY

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	05/11/14	HMR	DMD	ISSUED FOR CSC – CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d/b/a verizonwireless

CENTEK engineering
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(203) 488-0580
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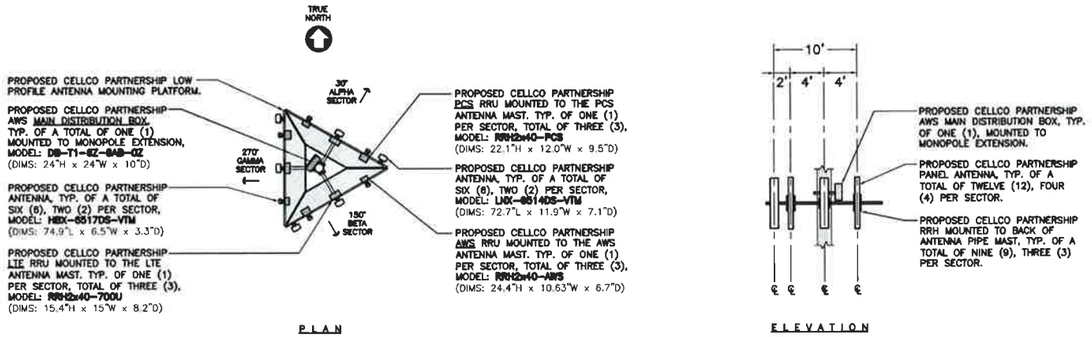
Cellco Partnership d/b/a Verizon Wireless
WIRELESS COMMUNICATIONS FACILITY
SIMSBURY NW
344 FIRETOWN ROAD
SIMSBURY, CT 06070

DATE: 08/08/14
SCALE: AS NOTED
JOB NO. 14014.000

SITE PLAN

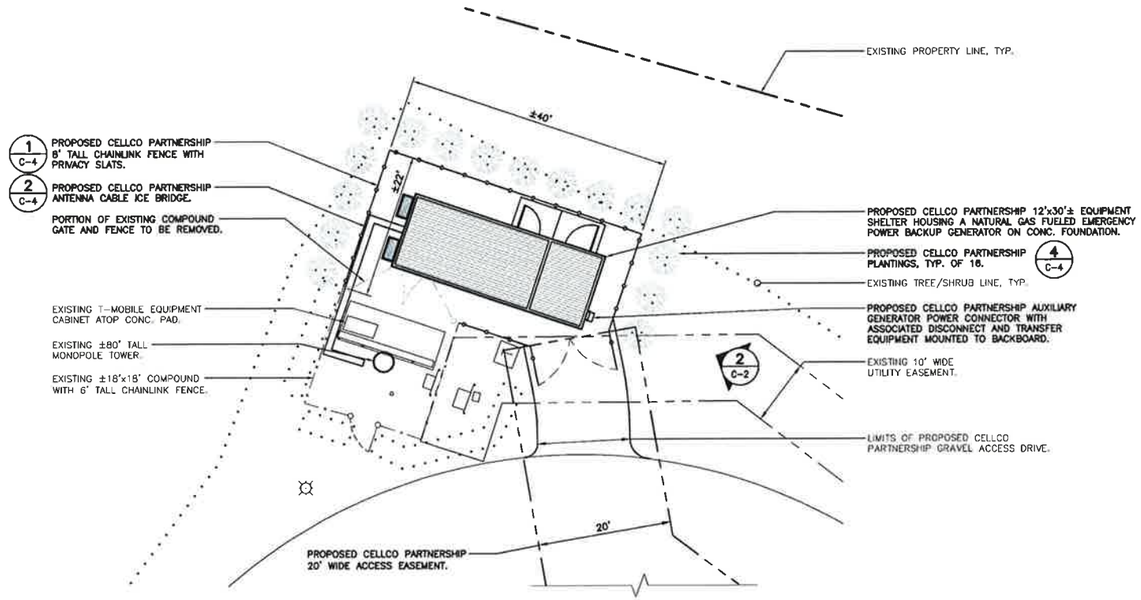
C-1

Sheet No. 2 of 8



3 / C-2 ANTENNA MOUNTING CONFIGURATION

NOT TO SCALE



1 / C-2 COMPOUND PLAN - PROPOSED

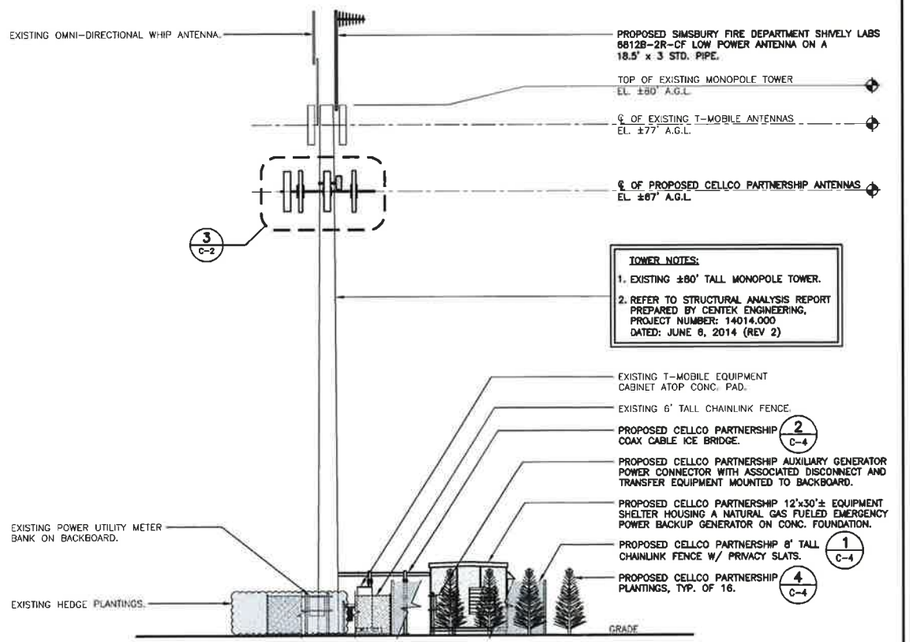
SCALE: 1" = 10'

APPROXIMATE NORTH

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 inch = 10 ft.



2 / C-2 SOUTHEAST ELEVATION - PROPOSED

SCALE: 1" = 10'

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 inch = 10 ft.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	08/11/14	MAR	DMD	ISSUED FOR CSC - CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. verizonwireless

CENTEK engineering
Centered on Solutions®
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(203) 488-8587 Fax
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SIMSBURY NW

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DATE:	08/06/14
SCALE:	AS NOTED
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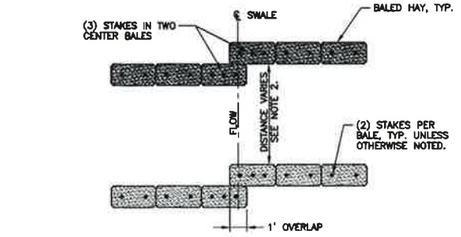
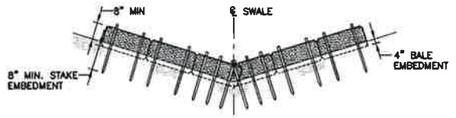
COMPOUND PLAN AND ELEVATION

C-2

Sheet No. 3 of 5



PLAN



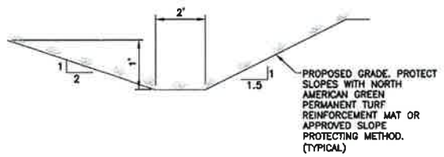
SECTION

NOTES:

1. CHECKDAM SHALL BE INSTALLED IN LOCATIONS INDICATED ON SITE PLAN (SHEET C-1A) IN DRAINAGE SWALE WITH BED WIDTHS OF 2 FEET OR LESS.
2. THE DISTANCE BETWEEN HAYBALE CHECKDAMS SHALL BE DETERMINED BY THE SLOPE OF THE SWALE. CHECKDAMS SHALL BE SET AT EVERY 2 FEET DROP IN SWALE ELEVATION.
3. BALES SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. INTALL 3 STAKES PER BALE WITHIN SWALE BED AREAS.
5. HAYBALES CAN BE SUBSTITUTED WITH EITHER STRAW WATTLE OR COMPOST SOCK/FILTER (E.G., SILTSOXX™ OR APPROVED EQUIVALENT).

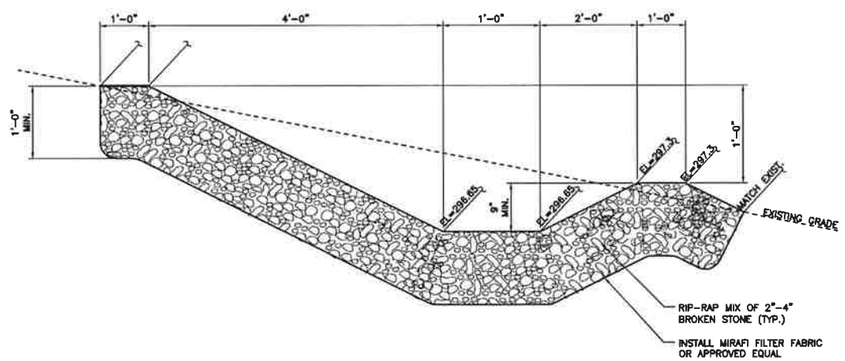
3 / C-3 TYP. HAYBALE CHECKDAM

NOT TO SCALE



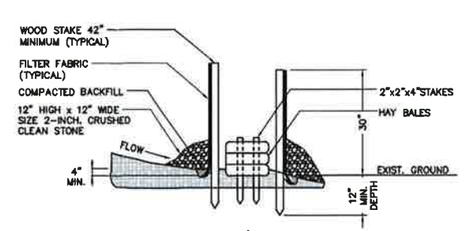
2 / C-3 TYPICAL SWALE SECTION

NOT TO SCALE



4 / C-3 LEVEL SPREADER SECTION

NOT TO SCALE



1 / C-3 SILTATION FENCE/HAY BALE SILTATION FENCE "SANDWICH" EROSION CONTROL

NOT TO SCALE

GENERAL CONSTRUCTION / PRE-CONSTRUCTION NOTES

1. PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES, A MANDITORY ON-SITE PRE-CONSTRUCTION MEETING SHALL BE CONDUCTED WITH THE VERIZON WIRELESS CONSTRUCTION MANAGER, CONTRACTOR'S CONSTRUCTION MANAGER, THE PROJECT EROSION AND SEDIMENTATION CONTROL/ENVIRONMENTAL MONITOR AND THE ENGINEER OF RECORD.

GENERAL CONSTRUCTION SEQUENCE

THIS IS A GENERAL CONSTRUCTION SEQUENCE OUTLINE SOME ITEMS OF WHICH MAY NOT APPLY TO PARTICULAR SITES.

1. CUT AND STUMP AREAS OF PROPOSED CONSTRUCTION.
2. INSTALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES AS REQUIRED.
3. REMOVE AND STOCKPILE TOPSOIL. STOCKPILE SHALL BE SEEDED TO PREVENT EROSION.
4. CONSTRUCT CLOSED DRAINAGE SYSTEM. PRECEPT CULVERT INLETS AND CATCH BASINS WITH SEDIMENTATION BARRIERS.
5. CONSTRUCT ROADWAYS AND PERFORM SITE GRADING, PLACING HAY BALES AND SILITATION FENCES AS REQUIRED TO CONTROL SOIL EROSION.
6. INSTALL UNDERGROUND UTILITIES.
7. BEGIN TEMPORARY AND PERMANENT SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED OR MULCHED IMMEDIATELY AFTER THEIR CONSTRUCTION. NO AREA SHALL BE LEFT UNSTABILIZED FOR A TIME PERIOD OF MORE THAN 30 DAYS.
8. DAILY, OR AS REQUIRED, CONSTRUCT, INSPECT, AND IF NECESSARY, RECONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, SILT FENCES AND SEDIMENT TRAPS INCLUDING MULCHING AND SEEDING.
9. BEGIN EXCAVATION FOR AND CONSTRUCTION OF TOWERS AND PLATFORMS.
10. FINISH PAVING ALL ROADWAYS, DRIVES, AND PARKING AREAS.
11. COMPLETE PERMANENT SEEDING AND LANDSCAPING.
12. NO FLOW SHALL BE DIVERTED TO ANY WETLANDS UNTIL A HEALTHY STAND OF GRASS HAS BEEN ESTABLISHED IN REGARDED AREAS.
13. AFTER GRASS HAS BEEN FULLY GERMINATED IN ALL SEEDED AREAS, REMOVE ALL TEMPORARY EROSION CONTROL MEASURES.

SOIL EROSION AND SEDIMENT CONTROL SEQUENCE

1. ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES, SUCH AS CONSTRUCTION ENTRANCE / ANTI TRACKING PAD, SILTATION FENCE, AND SILTATION FENCE / HAY BALE SHALL BE IN PLACE PRIOR TO ANY GRADING ACTIVITY, INSTALLATION OF PROPOSED STRUCTURES OR UTILITIES. MEASURES SHALL BE LEFT IN PLACE AND MAINTAINED UNTIL CONSTRUCTION IS COMPLETED AND/OR AREA IS STABILIZED.
2. THE ENTRANCE TO THE PROJECT SITE IS TO BE PROTECTED BY STONE ANTI TRACKING PAD OF ASTM C-33, SIZE NO. 2 OR 3, OR D.O.T. 2" CRUSHED GRAVEL. THE STONE ANTI TRACKING PAD IS TO BE MAINTAINED AT ALL TIMES DURING THE CONSTRUCTION PERIOD.
3. LAND DISTURBANCE WILL BE KEPT TO A MINIMUM AND RESTABILIZATIONS WILL BE SCHEDULED AS SOON AS PRACTICAL.
4. ALL SOIL EROSION AND SEDIMENT CONTROL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CONNECTICUT GUIDELINES FOR EROSION AND SEDIMENT CONTROL INCLUDING THE LATEST DATE FROM THE COUNCIL ON SOIL AND WATER CONSERVATION.
5. ANY ADDITIONAL EROSION/SEDIMENTATION CONTROL DEEMED NECESSARY BY TOWN STAFF DURING CONSTRUCTION, SHALL BE INSTALLED BY THE DEVELOPER. IN ADDITION, THE DEVELOPER SHALL BE RESPONSIBLE FOR THE REPAIR/REPLACEMENT/MAINTENANCE OF ALL EROSION CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED TO THE SATISFACTION OF THE TOWN STAFF.
6. IN ALL AREAS, REMOVAL OF TREES, BUSHES AND OTHER VEGETATION AS WELL AS DISTURBANCE OF THE SOIL IS TO BE KEPT TO AN ABSOLUTE MINIMUM WHILE ALLOWING PROPER DEVELOPMENT OF THE SITE. DURING CONSTRUCTION, EXPOSE AS SMALL AN AREA OF SOIL AS POSSIBLE FOR AS SHORT A TIME AS POSSIBLE.
7. SILTATION FENCE SHALL BE PLACED AS INDICATED BEFORE A CUT SLOPE HAS BEEN CREATED. SEDIMENT DEPOSITS SHOULD BE PERIODICALLY REMOVED FROM THE UPSTREAM SIDES OF SILTATION FENCE. THIS MATERIAL IS TO BE SPREAD AND STABILIZED IN AREAS NOT SUBJECT TO EROSION, OR TO BE USED IN AREAS WHICH ARE NOT TO BE PAVED OR BUILT ON. SILTATION FENCE IS TO BE REPLACED AS NECESSARY TO PROVIDE PROPER FILTERING ACTION. THE FENCE IS TO REMAIN IN PLACE AND BE MAINTAINED TO INSURE EFFICIENT SILTATION CONTROL UNTIL ALL AREAS ABOVE THE EROSION CHECKS ARE STABILIZED AND VEGETATION HAS BEEN ESTABLISHED.
8. SWALE DISCHARGE AREA WILL BE PROTECTED WITH RIP RAP SPLASH PAD/ ENERGY DISSIPATER.
9. ALL FILL AREAS SHALL BE COMPACTED SUFFICIENTLY FOR THEIR INTENDED PURPOSE AND AS REQUIRED TO REDUCE SLIPPING, EROSION OR EXCESS SATURATION.
10. THE SOIL SHALL NOT BE PLACED WHILE IN A FROZEN OR MUDDY CONDITION, WHEN THE SUBGRADE IS EXCESSIVELY WET, OR IN A CONDITION THAT MAY OTHERWISE BE DETRIMENTAL TO PROPER GRADING OR PROPOSED SODDING OR SEEDING.
11. AFTER CONSTRUCTION IS COMPLETE AND GROUND IS STABLE, REMOVE SILTS IN THE RIP RAP ENERGY DISSIPATERS. REMOVE OTHER EROSION AND SEDIMENT DEVICES.

CONSTRUCTION SPECIFICATIONS - SILT FENCE

1. THE GEOTEXTILE FABRIC SHALL MEET THE DESIGN CRITERIA FOR SILT FENCES.
2. THE FABRIC SHALL BE EMBEDDED A MINIMUM OF 8 INCHES INTO THE GROUND AND THE SOIL COMPACTED OVER THE EMBEDDED FABRIC.
3. WOVEN WIRE FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES OR STAPLES.
4. FILTER CLOTH SHALL BE FASTENED SECURELY TO THE WOVEN WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP, MID-SECTION AND BOTTOM.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6 INCHES, FOLDED, AND STAPLED.
6. FENCE POSTS SHALL BE A MINIMUM OF 36 INCHES LONG AND DRIVEN A MINIMUM OF 16 INCHES INTO THE GROUND. WOOD POSTS SHALL BE OF SOUND QUALITY HARDWOOD AND SHALL HAVE A MINIMUM CROSS SECTIONAL AREA OF 3.0 SQUARE INCHES.
7. MAINTENANCE SHALL BE PERFORMED AS NEEDED TO PREVENT BUILD UP IN THE SILT FENCE DUE TO DEPOSITION OF SEDIMENT.

MAINTENANCE - SILT FENCE

1. SILT FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REPAIRS THAT ARE REQUIRED SHALL BE MADE IMMEDIATELY.
2. IF THE FABRIC ON A SILT FENCE SHOULD DECOMPOSE OR BECOME INEFFECTIVE DURING THE EXPECTED LIFE OF THE FENCE, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SEDIMENT SHOULD BE INSPECTED AFTER EVERY STORM EVENT. THE DEPOSITS SHOULD BE REMOVED WHEN THEY REACHED APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
4. SEDIMENT DEPOSITS THAT ARE REMOVED OR LEFT IN PLACE AFTER THE FABRIC HAS BEEN REMOVED SHALL BE GRADED TO CONFORM WITH THE EXISTING TOPOGRAPHY AND VEGETATED.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	06/11/14	HMR	DMD	ISSUED FOR CSC - CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. Verizon Wireless

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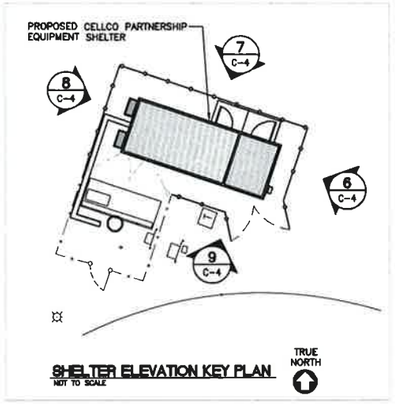
WIRELESS COMMUNICATIONS FACILITY
SIMSBURY NW
344 FIRETOWN ROAD
SIMSBURY, CT 06070

DATE: 06/06/14
SCALE: AS NOTED
JOB NO. 14014.000

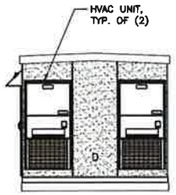
SITE CONSTRUCTION, S&E CONTROL, NOTES AND DETAILS

C-3

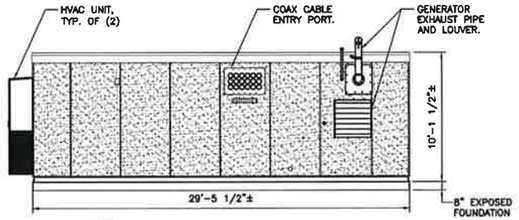
Sheet No. 4 of 6



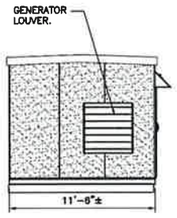
SHELTER ELEVATION KEY PLAN
NOT TO SCALE



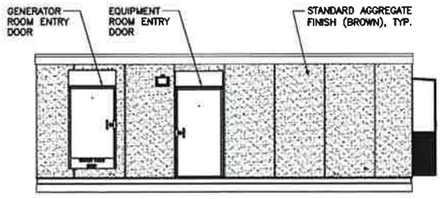
8 C-4 **WESTERN SHELTER ELEVATION**
SCALE: 3/16" = 1'-0"



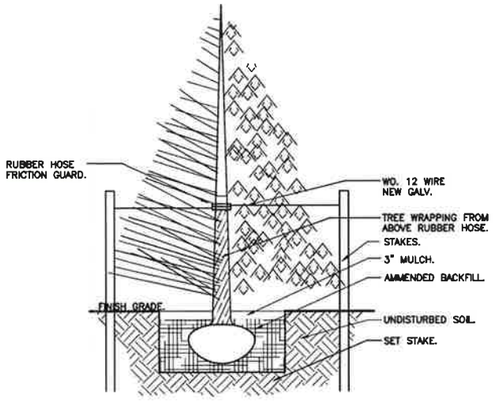
9 C-4 **SOUTHERN SHELTER ELEVATION**
SCALE: 3/16" = 1'-0"



6 C-4 **EASTERN SHELTER ELEVATION**
SCALE: 3/16" = 1'-0"



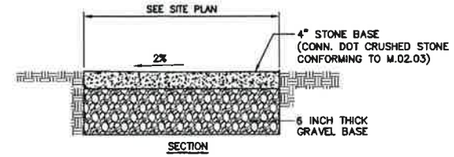
7 C-4 **NORTHERN SHELTER ELEVATION**
SCALE: 3/16" = 1'-0"



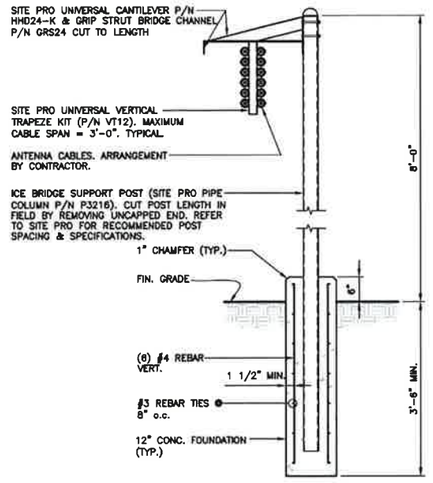
TREE & SHRUB PLANTING SPECIFICATIONS:

1. GUY WIRES (WO.12 NEW GALV.) SHALL BE REQUIRED FOR ALL TREES 3 CAL. AND LARGER.
2. SOIL MIX SHALL CONSIST OF: 3 PARTS TOP SOIL, 3 PART PEAT MOSS, 10 ONE PART COMPOSTED COW MANURE, AND 1 OZ. SOIL MOIST PER EVERY 12 IN. OF LINEAR DIM. OF ROOT BALL. COVER WITH LANDSCAPE FABRIC, AND A MINIMUM OF 3" CEDAR MULCH.
3. TREES 6' AND OVER SHALL BE STAKED WITH 2 OAK STAKES 2" X 2" X 6' AND GUY WIRE TO STAKES.
4. ALL TREES AND SHRUBS MUST MEET OR EXCEED STANDARDS SET BY THE NATIONAL ASSOCIATION OF NURSERYMEN, YEAR OF LATEST REVISION.

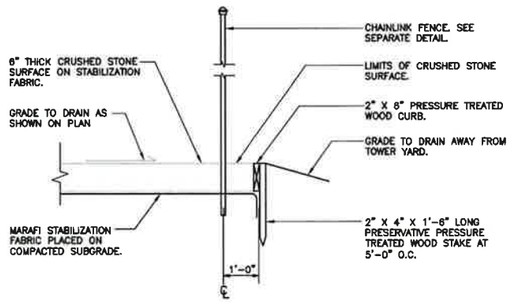
4 C-4 **TYPICAL TREE PLANTING DETAIL**
NOT TO SCALE



3 C-4 **GRAVEL SURFACE ACCESS DRIVE**
NOT TO SCALE



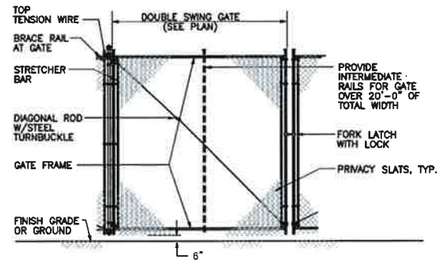
2 C-4 **ICE BRIDGE DETAIL**
NOT TO SCALE



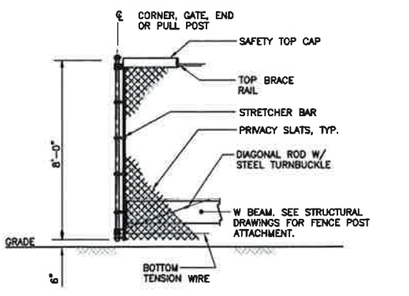
5 C-4 **COMPOUND SURFACING DETAIL**
NOT TO SCALE

WOVEN WIRE FENCE NOTES

1. GATE POST, CORNER, TERMINAL OR PULL POST 2 1/2" ø SCHEDULE 40 FOR GATE WIDTHS UP THRU 6 FEET OR 12 FEET FOR DOUBLE SWING GATE PER ASTM-F1083.
2. LINE POST: 2" ø SCHEDULE 40 PIPE PER ASTM-F1083.
3. GATE FRAME: 1 1/2" ø SCHEDULE 40 PIPE PER ASTM-F1083.
4. TOP RAIL & BRACE RAIL: 1 1/2" ø SCHEDULE 40 PIPE PER ASTM-F1083.
5. FABRIC: 12 GA. CORE WIRE SIZE 2" MESH, CONFORMING TO ASTM-A392.
6. TIE WIRE: MINIMUM 11 GA. GALVANIZED STEEL AT POSTS AND RAILS A SINGLE WRAP OF FABRIC TIE AND AT TENSION WIRE BY HOG RINGS SPACED MAX 24" INTERVALS.
7. TENSION WIRE: 7 GA. GALVANIZED STEEL.
8. BARBED WIRE: DOUBLE STRAND 12-1/2" O.O. TWISTED WIRE TO MATCH W/FABRIC 14 GA., 4 PT. BARBS SPACED ON APPROXIMATELY 5" CENTERS.
9. GATE LATCH: DROP DOWN LOCKABLE FORK LATCH AND LOCK, KEYED ALIKE FOR ALL SITES IN A GIVEN MTA.
10. LOCAL ORDINANCE OF BARBED WIRE PERMIT REQUIREMENT SHALL BE COMPLIED WITH IF REQUIRED.
11. HEIGHT = 8' VERTICAL VERTICAL DIMENSION.



1A C-4 **TYP. WOVEN WIRE SWING GATE-DOUBLE**
NOT TO SCALE



1 C-4 **TYPICAL WOVEN WIRE SCREENING DETAIL**
NOT TO SCALE

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0	06/11/14	HMR	DMD	ISSUED FOR CSC - CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d/b/a Verizon Wireless

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DATE: 06/06/14
SCALE: AS NOTED
JOB NO. 14014.000

SITE DETAILS

C-4

Sheet No. 5 of 6

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

80-ft Existing Summit Monopole

Proposed Verizon Wireless
Antenna Installation

Verizon Site Ref: Simsbury NW

344 Firetown Road
Simsbury, CT

Centek Project No. 14014.000

Date: March 6, 2014

Prepared for:

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

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Table of Contents

CENTEK Engineering, Inc.
Structural Analysis - 80-ft Summit Monopole
Verizon Wireless Antenna Upgrade – Simsbury NW
Simsbury, CT
March 6, 2014

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by Verizon Wireless on the existing monopole (tower) located in Simsbury, CT.

The host tower is a 80-ft tall, two-section, eighteen sided, tapered monopole, originally designed by Paul J. Ford and Company and manufactured by PennSummit Tubular, LLC job no; 29204-0034 dated February 16, 2004. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned PennSummit design documents.

Antenna and appurtenance information were obtained from visual verification from grade conducted by Centek personnel on January 24, 2014 and a Verizon RF data sheet.

The tower consists of two (2) tapered vertical sections consisting of A607-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 22.00-in at the top and 33.47-in at the base.

Verizon proposes the installation of twelve (12) panel antennas, nine (9) remote radio heads and one (1) main distribution box mounted on a low profile platform to the exiting monopole. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- UNKNOWN (EXISTING):
  Antennas: One (1) 8-ft Omni-directional whip pipe mounted to the top of the tower.
  Coax Cables: One (1) 7/8" ∅ coax cable running on the inside of the existing tower.
- T-MOBILE (EXISTING):
  Antennas: Three (3) RFS APX16DWV-16DWVS-E-A20 panel antennas and three (3) 10"x8"x3" TMA's flush mounted with a RAD center elevation of 77-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **VERIZON (PROPOSED):**
  Antennas: Six (6) Andrew LNX-6514DS panel antennas, six (6) Andrew HBX-6517DS panel antennas, three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads, three (3) Alcatel-Lucent RRH2x40-PCS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a Site Pro low profile platform p/n RMQP-472 with a RAD center elevation of 67-ft above grade.
  Cables: Two (2) 1-5/8" dia. Hybriflex Fiber feeder cables banded to the exterior of the tower.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed as indicated in this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Simsbury; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **48.6%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L2)	0.00'-41.5'	48.6%	**PASS**

Foundation and Anchors

The existing foundation consists of a 5.0-ft square x 3.5-ft long reinforced concrete pier on a 17.0-ft square x 3.0-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned PJF/Summit design documents. The base of the tower is connected to the foundation by means of (8) 2.25"Ø, ASTM A615-75 anchor bolts embedded approximately 6-ft into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	8 kips
	Compression	9 kips
	Moment	449 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad and Pier	OTM[2]	2.0	5.00	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Compression and Bending	35.6%	**PASS**
Base Plate	Bending	43.8%	**PASS**

Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed antenna configuration.

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16884
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

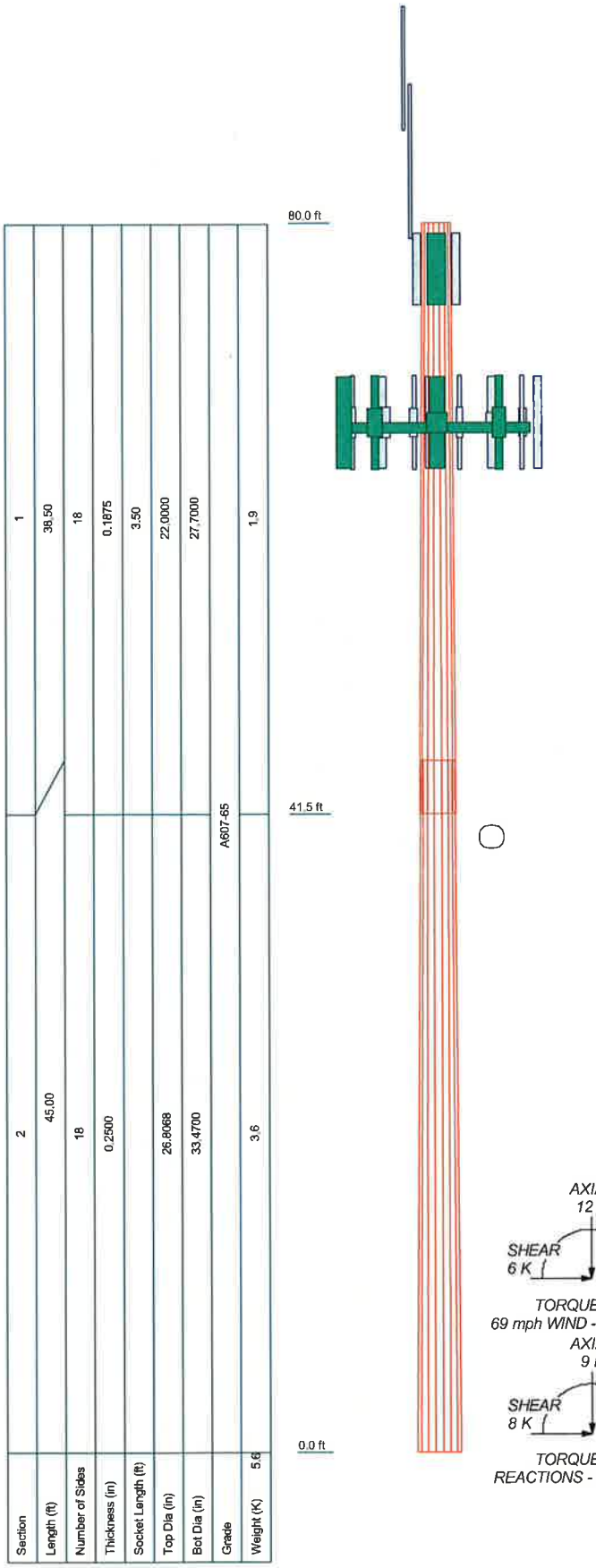
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of CENTEK engineering, Inc. or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

General Description of Structural Analysis Program

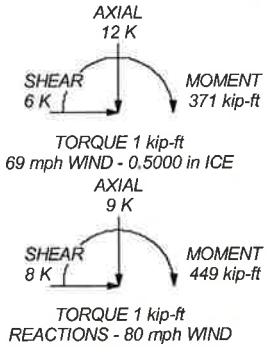
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.



Section	1	2
Length (ft)	38.50	45.00
Number of Sides	18	18
Thickness (in)	0.1875	0.2500
Socket Length (ft)	3.50	
Top Dia (in)	22.0000	26.8068
Bot Dia (in)	27.7000	33.4700
Grade	A607-65	
Weight (K)	1.9	3.6
		5.6



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
8' x 3" Dia Omni	90	LNX-6514DS-VTM (Verizon - Proposed)	67
10'x2.5" Pipe Mount	84	HBX-6517DS-VTM (Verizon - Proposed)	67
APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	77	LNX-6514DS-VTM (Verizon - Proposed)	67
APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	77	HBX-6517DS-VTM (Verizon - Proposed)	67
APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	77	LNX-6514DS-VTM (Verizon - Proposed)	67
TMA 10"x8"x3" (T-Mobile - Existing)	77	HBX-6517DS-VTM (Verizon - Proposed)	67
TMA 10"x8"x3" (T-Mobile - Existing)	77	RRH2x40-07-U (Verizon - Proposed)	67
TMA 10"x8"x3" (T-Mobile - Existing)	77	RRH2x40-07-U (Verizon - Proposed)	67
Valmont Uni-Tri Bracket (T-Mobile - Existing)	77	RRH2x40-07-U (Verizon - Proposed)	67
LNX-6514DS-VTM (Verizon - Proposed)	67	RRH2x40-AWS (Verizon - Proposed)	67
HBX-6517DS-VTM (Verizon - Proposed)	67	RRH2x40-AWS (Verizon - Proposed)	67
LNX-6514DS-VTM (Verizon - Proposed)	67	RRH2x40-AWS (Verizon - Proposed)	67
HBX-6517DS-VTM (Verizon - Proposed)	67	RRH2x40-PCS (Verizon - Proposed)	67
LNX-6514DS-VTM (Verizon - Proposed)	67	RRH2x40-PCS (Verizon - Proposed)	67
HBX-6517DS-VTM (Verizon - Proposed)	67	RRH2x40-PCS (Verizon - Proposed)	67
		DB-T1-6Z-8AB-0Z (Verizon - Proposed)	67
		Valmont 13' Low Profile Platform (Verizon - Proposed)	67

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 48.6%

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 14014.000 - Simsbury NW			
Project: 80' PennSummit Monopole - 344 Firetown Rd., Simsbury, CT			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 03/06/14	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	14014.000 - Simsbury NW	1 of 20
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 80' PennSummit Monopole - 344 Firetown Rd., Simsbury, CT	**Date** 10:39:29 03/06/14
	Client Verizon Wireless	**Designed by** TJL

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 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56.0 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
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, feedline supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	√ Assume Rigid Index Plate	Calculate Redundant Bracing Forces
Use Moment Magnification	Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
√ Use Code Stress Ratios	Use Clear Spans For KL/r	SR Leg Bolts Resist Compression
Use Code Safety Factors - Guys	Retension Guys To Initial Tension	All Leg Panels Have Same Allowable
Escalate Ice	√ Bypass Mast Stability Checks	Offset Girt At Foundation
Always Use Max Kz	Use Azimuth Dish Coefficients	√ Consider Feedline Torque
Use Special Wind Profile	√ Project Wind Area of Appurt.	Include Angle Block Shear Check
Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Poles
Leg Bolts Are At Top Of Section	SR Members Have Cut Ends	√ Include Shear-Torsion Interaction
Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination		

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	80.00-41.50	38.50	3.50	18	22.0000	27.7000	0.1875	0.7500	A607-65 (65 ksi)
L2	41.50-0.00	45.00		18	26.8068	33.4700	0.2500	1.0000	A607-65 (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	22.3394	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	28.1273	16.3734	1565.7983	9.7669	14.0716	111.2736	3133.6569	8.1882	4.5452	24.241
L2	27.7466	21.0728	1877.6407	9.4277	13.6179	137.8807	3757.7521	10.5384	4.2780	17.112
	33.9863	26.3601	3675.2194	11.7931	17.0028	216.1543	7355.2747	13.1825	5.4507	21.803

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 80.00-41.50				1	1	1		
L2 41.50-0.00				1	1	1		

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
1 5/8	C	No	Inside Pole	77.00 - 0.00	12	No Ice	0.00	1.04
(T-Mobile - Existing)						1/2" Ice	0.00	1.04
7/8	C	No	Inside Pole	80.00 - 0.00	1	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
HYBRIFLEX 1-5/8"	C	No	Inside Pole	67.00 - 0.00	2	No Ice	0.00	1.90
(Verizon - Proposed)						1/2" Ice	0.00	1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	80.00-41.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.56
L2	41.50-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.70

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	80.00-41.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.56
L2	41.50-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.70

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	80.00-41.50	0.0000	0.0000	0.0000	0.0000
L2	41.50-0.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
8' x 3" Dia Omni	A	From Face	1.50 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.40 3.19	2.40 3.19	0.03 0.04
10'x2.5" Pipe Mount	A	From Face	1.00 0.00 0.00	0.0000	84.00	No Ice 1/2" Ice	2.88 3.91	2.88 3.91	0.06 0.08
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	A	From Face	0.50 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	B	From Face	0.50 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	C	From Face	0.50 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	1.00 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.02
TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	1.00 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.02
TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	1.00 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.02
Valmont Uni-Tri Bracket (T-Mobile - Existing)	C	None		0.0000	77.00	No Ice 1/2" Ice	1.75 1.94	1.75 1.94	0.29 0.31
LNX-6514DS-VTM (Verizon - Proposed)	A	From Face	3.00 6.00 0.00	0.0000	67.00	No Ice 1/2" Ice	8.41 8.96	5.41 5.86	0.04 0.09
HBX-6517DS-VTM (Verizon - Proposed)	A	From Face	3.00 4.00 0.00	0.0000	67.00	No Ice 1/2" Ice	5.24 5.71	3.30 3.75	0.01 0.04
LNX-6514DS-VTM (Verizon - Proposed)	A	From Face	3.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice	8.41 8.96	5.41 5.86	0.04 0.09
HBX-6517DS-VTM (Verizon - Proposed)	A	From Face	3.00 -4.00 0.00	0.0000	67.00	No Ice 1/2" Ice	5.24 5.71	3.30 3.75	0.01 0.04
LNX-6514DS-VTM (Verizon - Proposed)	B	From Face	3.00 6.00	0.0000	67.00	No Ice 1/2" Ice	8.41 8.96	5.41 5.86	0.04 0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
HBX-6517DS-VTM	B	From Face	3.00	0.0000	67.00	No Ice	5.24	3.30	0.01
(Verizon - Proposed)			4.00			1/2" Ice	5.71	3.75	0.04
			0.00						
LNX-6514DS-VTM	B	From Face	3.00	0.0000	67.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBX-6517DS-VTM	B	From Face	3.00	0.0000	67.00	No Ice	5.24	3.30	0.01
(Verizon - Proposed)			-4.00			1/2" Ice	5.71	3.75	0.04
			0.00						
LNX-6514DS-VTM	C	From Face	3.00	0.0000	67.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			6.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBX-6517DS-VTM	C	From Face	3.00	0.0000	67.00	No Ice	5.24	3.30	0.01
(Verizon - Proposed)			4.00			1/2" Ice	5.71	3.75	0.04
			0.00						
LNX-6514DS-VTM	C	From Face	3.00	0.0000	67.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBX-6517DS-VTM	C	From Face	3.00	0.0000	67.00	No Ice	5.24	3.30	0.01
(Verizon - Proposed)			-4.00			1/2" Ice	5.71	3.75	0.04
			0.00						
RRH2x40-07-U	A	From Face	3.00	0.0000	67.00	No Ice	2.25	1.23	0.05
(Verizon - Proposed)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	B	From Face	3.00	0.0000	67.00	No Ice	2.25	1.23	0.05
(Verizon - Proposed)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	C	From Face	3.00	0.0000	67.00	No Ice	2.25	1.23	0.05
(Verizon - Proposed)			0.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-AWS	A	From Face	3.00	0.0000	67.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Face	3.00	0.0000	67.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	C	From Face	3.00	0.0000	67.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-PCS	A	From Face	3.00	0.0000	67.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.80	2.24	0.08
			0.00						
RRH2x40-PCS	B	From Face	3.00	0.0000	67.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.80	2.24	0.08
			0.00						
RRH2x40-PCS	C	From Face	3.00	0.0000	67.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.80	2.24	0.08
			0.00						
DB-T1-6Z-8AB-0Z	A	From Face	3.00	0.0000	67.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
Valmont 13' Low Profile Platform	C	None		0.0000	67.00	No Ice	15.70	15.70	1.30
(Verizon - Proposed)						1/2" Ice	20.10	20.10	1.76

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 80.00-41.50	60.45	1.189	19.39	79.727	A	0.000	79.727	79.727	100.00	0.000	0.000
					B	0.000	79.727		100.00	0.000	0.000
					C	0.000	79.727		100.00	0.000	0.000
L2 41.50-0.00	20.05	1	16.38	105.125	A	0.000	105.125	105.125	100.00	0.000	0.000
					B	0.000	105.125		100.00	0.000	0.000
					C	0.000	105.125		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 80.00-41.50	60.45	1.189	14.54	0.5000	82.935	A	0.000	82.935	82.935	100.00	0.000	0.000
						B	0.000	82.935		100.00	0.000	0.000
						C	0.000	82.935		100.00	0.000	0.000
L2 41.50-0.00	20.05	1	12.29	0.5000	108.583	A	0.000	108.583	108.583	100.00	0.000	0.000
						B	0.000	108.583		100.00	0.000	0.000
						C	0.000	108.583		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 80.00-41.50	60.45	1.189	7.57	79.727	A	0.000	79.727	79.727	100.00	0.000	0.000
					B	0.000	79.727		100.00	0.000	0.000
					C	0.000	79.727		100.00	0.000	0.000
L2 41.50-0.00	20.05	1	6.40	105.125	A	0.000	105.125	105.125	100.00	0.000	0.000
					B	0.000	105.125		100.00	0.000	0.000
					C	0.000	105.125		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.56	1.92	A	1	0.65	1	1	1	79.727	1.70	44.10	C
80.00-41.50			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L2 41.50-0.00	0.70	3.63	A	1	0.65	1	1	1	105.125	1.89	45.59	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.26	5.55						OTM	140.58 kip-ft	3.59		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.56	1.92	A	1	0.65	1	1	1	79.727	1.70	44.10	C
80.00-41.50			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L2 41.50-0.00	0.70	3.63	A	1	0.65	1	1	1	105.125	1.89	45.59	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.26	5.55						OTM	140.58 kip-ft	3.59		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.56	1.92	A	1	0.65	1	1	1	79.727	1.70	44.10	C
80.00-41.50			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L2 41.50-0.00	0.70	3.63	A	1	0.65	1	1	1	105.125	1.89	45.59	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.26	5.55						OTM	140.58 kip-ft	3.59		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.56	2.53	A	1	0.65	1	1	1	82.935	1.32	34.41	C
80.00-41.50			B	1	0.65	1	1	1	82.935			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	82.935			
L2 41.50-0.00	0.70	4.42	A	1	0.65	1	1	1	108.583	1.47	35.32	C
			B	1	0.65	1	1	1	108.583			
			C	1	0.65	1	1	1	108.583			
Sum Weight:	1.26	6.95						OTM	109.47 kip-ft	2.79		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.56	2.53	A	1	0.65	1	1	1	82.935	1.32	34.41	C
80.00-41.50			B	1	0.65	1	1	1	82.935			
			C	1	0.65	1	1	1	82.935			
L2 41.50-0.00	0.70	4.42	A	1	0.65	1	1	1	108.583	1.47	35.32	C
			B	1	0.65	1	1	1	108.583			
			C	1	0.65	1	1	1	108.583			
Sum Weight:	1.26	6.95						OTM	109.47 kip-ft	2.79		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.56	2.53	A	1	0.65	1	1	1	82.935	1.32	34.41	C
80.00-41.50			B	1	0.65	1	1	1	82.935			
			C	1	0.65	1	1	1	82.935			
L2 41.50-0.00	0.70	4.42	A	1	0.65	1	1	1	108.583	1.47	35.32	C
			B	1	0.65	1	1	1	108.583			
			C	1	0.65	1	1	1	108.583			
Sum Weight:	1.26	6.95						OTM	109.47 kip-ft	2.79		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	0.56	1.92	A	1	0.65	1	1	1	79.727	0.66	17.23	C
80.00-41.50			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L2 41.50-0.00	0.70	3.63	A	1	0.65	1	1	1	105.125	0.74	17.81	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.26	5.55						OTM	54.91 kip-ft	1.40		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.56	1.92	A	1	0.65	1	1	1	79.727	0.66	17.23	C
80.00-41.50			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L2 41.50-0.00	0.70	3.63	A	1	0.65	1	1	1	105.125	0.74	17.81	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.26	5.55						OTM	54.91 kip-ft	1.40		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.56	1.92	A	1	0.65	1	1	1	79.727	0.66	17.23	C
80.00-41.50			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L2 41.50-0.00	0.70	3.63	A	1	0.65	1	1	1	105.125	0.74	17.81	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.26	5.55						OTM	54.91 kip-ft	1.40		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	5.55					
Bracing Weight	0.00					
Total Member Self-Weight	5.55			-0.23	0.40	
Total Weight	9.46			-0.23	0.40	
Wind 0 deg - No Ice		-0.05	-7.86	-436.51	3.61	-0.63
Wind 30 deg - No Ice		3.92	-6.79	-376.46	-216.81	-0.73

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 60 deg - No Ice		6.83	-3.89	-215.59	-379.04	-0.63
Wind 90 deg - No Ice		7.92	0.05	2.98	-439.59	-0.36
Wind 120 deg - No Ice		6.88	3.97	220.69	-382.25	0.00
Wind 150 deg - No Ice		4.00	6.83	379.21	-222.38	0.36
Wind 180 deg - No Ice		0.05	7.86	436.05	-2.81	0.63
Wind 210 deg - No Ice		-3.92	6.79	375.99	217.61	0.73
Wind 240 deg - No Ice		-6.83	3.89	215.13	379.84	0.63
Wind 270 deg - No Ice		-7.92	-0.05	-3.44	440.39	0.36
Wind 300 deg - No Ice		-6.88	-3.97	-221.15	383.05	0.00
Wind 330 deg - No Ice		-4.00	-6.83	-379.67	223.18	-0.36
Member Ice	1.39					
Total Weight Ice	12.18			-0.35	0.60	
Wind 0 deg - Ice		-0.04	-6.39	-359.61	3.07	-0.59
Wind 30 deg - Ice		3.19	-5.52	-310.24	-178.32	-0.68
Wind 60 deg - Ice		5.56	-3.17	-177.83	-311.77	-0.59
Wind 90 deg - Ice		6.44	0.04	2.13	-361.52	-0.34
Wind 120 deg - Ice		5.59	3.23	181.43	-314.25	0.00
Wind 150 deg - Ice		3.25	5.56	312.02	-182.61	0.34
Wind 180 deg - Ice		0.04	6.39	358.92	-1.88	0.59
Wind 210 deg - Ice		-3.19	5.52	309.55	179.51	0.68
Wind 240 deg - Ice		-5.56	3.17	177.14	312.97	0.59
Wind 270 deg - Ice		-6.44	-0.04	-2.82	362.72	0.34
Wind 300 deg - Ice		-5.59	-3.23	-182.12	315.44	0.00
Wind 330 deg - Ice		-3.25	-5.56	-312.71	183.80	-0.34
Total Weight	9.46			-0.23	0.40	
Wind 0 deg - Service		-0.02	-3.07	-170.65	1.66	-0.25
Wind 30 deg - Service		1.53	-2.65	-147.19	-84.45	-0.28
Wind 60 deg - Service		2.67	-1.52	-84.36	-147.82	-0.25
Wind 90 deg - Service		3.09	0.02	1.02	-171.47	-0.14
Wind 120 deg - Service		2.69	1.55	86.07	-149.07	0.00
Wind 150 deg - Service		1.56	2.67	147.99	-86.62	0.14
Wind 180 deg - Service		0.02	3.07	170.19	-0.85	0.25
Wind 210 deg - Service		-1.53	2.65	146.73	85.25	0.28
Wind 240 deg - Service		-2.67	1.52	83.89	148.62	0.25
Wind 270 deg - Service		-3.09	-0.02	-1.49	172.27	0.14
Wind 300 deg - Service		-2.69	-1.55	-86.53	149.87	0.00
Wind 330 deg - Service		-1.56	-2.67	-148.45	87.42	-0.14

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

Comb. No.	Description
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	80 - 41.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-6.76	0.60	0.35
			Max. Mx	11	-4.76	134.10	1.31
			Max. My	2	-4.76	1.48	132.69
			Max. Vy	11	-5.98	134.10	1.31
			Max. Vx	2	-5.92	1.48	132.69
			Max. Torque	9			-0.74
L2	41.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-12.18	0.60	0.35
			Max. Mx	11	-9.46	446.58	3.50
			Max. My	2	-9.46	3.67	442.64
			Max. Vy	11	-7.93	446.58	3.50
			Max. Vx	2	-7.87	3.67	442.64
			Max. Torque	9			-0.74

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	25	12.18	5.59	3.23
	Max. H_x	11	9.46	7.92	0.05
	Max. H_z	2	9.46	0.05	7.86
	Max. M_x	2	442.64	0.05	7.86
	Max. M_z	5	445.75	-7.92	-0.05

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. Torsion	3	0.74	-3.92	6.79
	Min. Vert	1	9.46	0.00	0.00
	Min. H_x	5	9.46	-7.92	-0.05
	Min. H_z	8	9.46	-0.05	-7.86
	Min. M_x	8	-442.16	-0.05	-7.86
	Min. M_z	11	-446.58	7.92	0.05
	Min. Torsion	9	-0.74	3.92	-6.79

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	9.46	0.00	0.00	-0.23	0.40	0.00
Dead+Wind 0 deg - No Ice	9.46	-0.05	-7.86	-442.64	3.67	-0.64
Dead+Wind 30 deg - No Ice	9.46	3.92	-6.79	-381.74	-219.85	-0.74
Dead+Wind 60 deg - No Ice	9.46	6.83	-3.89	-218.61	-384.35	-0.64
Dead+Wind 90 deg - No Ice	9.46	7.92	0.05	3.02	-445.75	-0.37
Dead+Wind 120 deg - No Ice	9.46	6.88	3.97	223.79	-387.61	0.00
Dead+Wind 150 deg - No Ice	9.46	4.00	6.83	384.52	-225.49	0.37
Dead+Wind 180 deg - No Ice	9.46	0.05	7.86	442.16	-2.85	0.64
Dead+Wind 210 deg - No Ice	9.46	-3.92	6.79	381.26	220.67	0.74
Dead+Wind 240 deg - No Ice	9.46	-6.83	3.89	218.14	385.17	0.64
Dead+Wind 270 deg - No Ice	9.46	-7.92	-0.05	-3.50	446.58	0.37
Dead+Wind 300 deg - No Ice	9.46	-6.88	-3.97	-224.26	388.43	0.00
Dead+Wind 330 deg - No Ice	9.46	-4.00	-6.83	-385.00	226.32	-0.37
Dead+Ice+Temp	12.18	0.00	0.00	-0.35	0.60	0.00
Dead+Wind 0 deg+Ice+Temp	12.18	-0.04	-6.39	-366.56	3.14	-0.59
Dead+Wind 30 deg+Ice+Temp	12.18	3.19	-5.52	-316.24	-181.76	-0.69
Dead+Wind 60 deg+Ice+Temp	12.18	5.56	-3.17	-181.27	-317.79	-0.59
Dead+Wind 90 deg+Ice+Temp	12.18	6.44	0.04	2.17	-368.51	-0.34
Dead+Wind 120 deg+Ice+Temp	12.18	5.59	3.23	184.93	-320.32	0.00
Dead+Wind 150 deg+Ice+Temp	12.18	3.25	5.56	318.05	-186.13	0.34
Dead+Wind 180 deg+Ice+Temp	12.18	0.04	6.39	365.85	-1.91	0.59
Dead+Wind 210 deg+Ice+Temp	12.18	-3.19	5.52	315.53	182.99	0.69
Dead+Wind 240 deg+Ice+Temp	12.18	-5.56	3.17	180.56	319.03	0.59
Dead+Wind 270 deg+Ice+Temp	12.18	-6.44	-0.04	-2.88	369.74	0.34
Dead+Wind 300 deg+Ice+Temp	12.18	-5.59	-3.23	-185.65	321.55	0.00
Dead+Wind 330 deg+Ice+Temp	12.18	-3.25	-5.56	-318.76	187.37	-0.34
Dead+Wind 0 deg - Service	9.46	-0.02	-3.07	-173.07	1.68	-0.25
Dead+Wind 30 deg - Service	9.46	1.53	-2.65	-149.28	-85.64	-0.29
Dead+Wind 60 deg - Service	9.46	2.67	-1.52	-85.55	-149.91	-0.25
Dead+Wind 90 deg - Service	9.46	3.09	0.02	1.04	-173.90	-0.14
Dead+Wind 120 deg - Service	9.46	2.69	1.55	87.28	-151.18	0.00
Dead+Wind 150 deg - Service	9.46	1.56	2.67	150.08	-87.85	0.14
Dead+Wind 180 deg - Service	9.46	0.02	3.07	172.60	-0.86	0.25
Dead+Wind 210 deg - Service	9.46	-1.53	2.65	148.81	86.46	0.29
Dead+Wind 240 deg - Service	9.46	-2.67	1.52	85.08	150.73	0.25
Dead+Wind 270 deg - Service	9.46	-3.09	-0.02	-1.51	174.72	0.14
Dead+Wind 300 deg - Service	9.46	-2.69	-1.55	-87.76	152.00	0.00
Dead+Wind 330 deg - Service	9.46	-1.56	-2.67	-150.56	88.67	-0.14

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-9.46	0.00	0.00	9.46	0.00	0.000%
2	-0.05	-9.46	-7.86	0.05	9.46	7.86	0.000%
3	3.92	-9.46	-6.79	-3.92	9.46	6.79	0.000%
4	6.83	-9.46	-3.89	-6.83	9.46	3.89	0.000%
5	7.92	-9.46	0.05	-7.92	9.46	-0.05	0.000%
6	6.88	-9.46	3.97	-6.88	9.46	-3.97	0.000%
7	4.00	-9.46	6.83	-4.00	9.46	-6.83	0.000%
8	0.05	-9.46	7.86	-0.05	9.46	-7.86	0.000%
9	-3.92	-9.46	6.79	3.92	9.46	-6.79	0.000%
10	-6.83	-9.46	3.89	6.83	9.46	-3.89	0.000%
11	-7.92	-9.46	-0.05	7.92	9.46	0.05	0.000%
12	-6.88	-9.46	-3.97	6.88	9.46	3.97	0.000%
13	-4.00	-9.46	-6.83	4.00	9.46	6.83	0.000%
14	0.00	-12.18	0.00	0.00	12.18	0.00	0.000%
15	-0.04	-12.18	-6.39	0.04	12.18	6.39	0.000%
16	3.19	-12.18	-5.52	-3.19	12.18	5.52	0.000%
17	5.56	-12.18	-3.17	-5.56	12.18	3.17	0.000%
18	6.44	-12.18	0.04	-6.44	12.18	-0.04	0.000%
19	5.59	-12.18	3.23	-5.59	12.18	-3.23	0.000%
20	3.25	-12.18	5.56	-3.25	12.18	-5.56	0.000%
21	0.04	-12.18	6.39	-0.04	12.18	-6.39	0.000%
22	-3.19	-12.18	5.52	3.19	12.18	-5.52	0.000%
23	-5.56	-12.18	3.17	5.56	12.18	-3.17	0.000%
24	-6.44	-12.18	-0.04	6.44	12.18	0.04	0.000%
25	-5.59	-12.18	-3.23	5.59	12.18	3.23	0.000%
26	-3.25	-12.18	-5.56	3.25	12.18	5.56	0.000%
27	-0.02	-9.46	-3.07	0.02	9.46	3.07	0.000%
28	1.53	-9.46	-2.65	-1.53	9.46	2.65	0.000%
29	2.67	-9.46	-1.52	-2.67	9.46	1.52	0.000%
30	3.09	-9.46	0.02	-3.09	9.46	-0.02	0.000%
31	2.69	-9.46	1.55	-2.69	9.46	-1.55	0.000%
32	1.56	-9.46	2.67	-1.56	9.46	-2.67	0.000%
33	0.02	-9.46	3.07	-0.02	9.46	-3.07	0.000%
34	-1.53	-9.46	2.65	1.53	9.46	-2.65	0.000%
35	-2.67	-9.46	1.52	2.67	9.46	-1.52	0.000%
36	-3.09	-9.46	-0.02	3.09	9.46	0.02	0.000%
37	-2.69	-9.46	-1.55	2.69	9.46	1.55	0.000%
38	-1.56	-9.46	-2.67	1.56	9.46	2.67	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00006968
3	Yes	4	0.00000001	0.00014378
4	Yes	4	0.00000001	0.00020741
5	Yes	4	0.00000001	0.00003578
6	Yes	4	0.00000001	0.00017136
7	Yes	4	0.00000001	0.00015618
8	Yes	4	0.00000001	0.00006370
9	Yes	4	0.00000001	0.00021442
10	Yes	4	0.00000001	0.00014427
11	Yes	4	0.00000001	0.00004181
12	Yes	4	0.00000001	0.00017368
13	Yes	4	0.00000001	0.00019495

14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00030860
16	Yes	4	0.00000001	0.00042197
17	Yes	4	0.00000001	0.00045238
18	Yes	4	0.00000001	0.00029951
19	Yes	4	0.00000001	0.00043610
20	Yes	4	0.00000001	0.00042955
21	Yes	4	0.00000001	0.00030603
22	Yes	4	0.00000001	0.00045781
23	Yes	4	0.00000001	0.00042302
24	Yes	4	0.00000001	0.00030224
25	Yes	4	0.00000001	0.00044173
26	Yes	4	0.00000001	0.00045276
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00002388
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00002561
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00002008

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	80 - 41.5	7.061	37	0.6498	0.0045
L2	45 - 0	2.605	37	0.5001	0.0017

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
90.00	8' x 3" Dia Omni	37	7.061	0.6498	0.0045	32269
84.00	10'x2.5" Pipe Mount	37	7.061	0.6498	0.0045	32269
77.00	APX16DWV-16DWVS-E-A20	37	6.634	0.6414	0.0042	32269
67.00	LNX-6514DS-VTM	37	5.236	0.6109	0.0034	12411

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	80 - 41.5	18.008	12	1.6540	0.0115
L2	45 - 0	6.651	12	1.2765	0.0044

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
90.00	8' x 3" Dia Omni	12	18.008	1.6540	0.0115	12696
84.00	10'x2.5" Pipe Mount	12	18.008	1.6540	0.0115	12696
77.00	APX16DWV-16DWVS-E-A20	12	16.920	1.6331	0.0108	12696
67.00	LNX-6514DS-VTM	12	13.357	1.5569	0.0086	4883

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	80 - 78.1579	TP27.7x22x0.1875	38.50	0.00	0.0	39.000	13.1435	-0.25	512.60	0.000
	78.1579 - 76.3158					39.000	13.3058	-0.96	518.92	0.002
	76.3158 - 74.4737					39.000	13.4681	-0.86	525.26	0.002
	74.4737 - 72.6316					39.000	13.6304	-0.97	531.59	0.002
	72.6316 - 70.7895					39.000	13.7927	-1.08	537.91	0.002
	70.7895 - 68.9474					39.000	13.9550	-1.19	544.25	0.002
	68.9474 - 67.1053					39.000	14.1173	-1.30	550.58	0.002
	67.1053 - 65.2632					39.000	14.2796	-3.41	556.90	0.006
	65.2632 - 63.4211					39.000	14.4419	-3.52	563.24	0.006
	63.4211 - 61.5789					39.000	14.6042	-3.64	569.57	0.006
	61.5789 - 59.7368					39.000	14.7665	-3.76	575.89	0.007
	59.7368 - 57.8947					39.000	14.9288	-3.88	582.23	0.007
	57.8947 - 56.0526					39.000	15.0912	-4.00	588.55	0.007
	56.0526 - 54.2105					39.000	15.2535	-4.12	594.88	0.007
	54.2105 - 52.3684					39.000	15.4158	-4.24	601.22	0.007
	52.3684 - 50.5263					39.000	15.5781	-4.37	607.54	0.007
	50.5263 -					39.000	15.7404	-4.50	613.88	0.007

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 $\frac{P}{P_a}$
	48.6842									
	48.6842 - 46.8421					39.000	15.9027	-4.62	620.21	0.007
	46.8421 - 45					39.000	16.0650	-4.75	626.53	0.008
	45 - 41.5					39.000	16.3734	-2.29	638.56	0.004
L2	45 - 41.5	TP33.47x26.8068x0.25	45.00	0.00	0.0	39.000	21.4841	-2.97	837.88	0.004
	41.5 - 39.3158					39.000	21.7407	-5.45	847.89	0.006
	39.3158 - 37.1316					39.000	21.9973	-5.66	857.90	0.007
	37.1316 - 34.9474					39.000	22.2540	-5.86	867.90	0.007
	34.9474 - 32.7632					39.000	22.5106	-6.07	877.91	0.007
	32.7632 - 30.5789					39.000	22.7672	-6.28	887.92	0.007
	30.5789 - 28.3947					39.000	23.0239	-6.49	897.93	0.007
	28.3947 - 26.2105					39.000	23.2805	-6.71	907.94	0.007
	26.2105 - 24.0263					39.000	23.5371	-6.92	917.95	0.008
	24.0263 - 21.8421					39.000	23.7938	-7.14	927.96	0.008
	21.8421 - 19.6579					39.000	24.0504	-7.36	937.97	0.008
	19.6579 - 17.4737					39.000	24.3070	-7.59	947.97	0.008
	17.4737 - 15.2895					39.000	24.5636	-7.81	957.98	0.008
	15.2895 - 13.1053					39.000	24.8203	-8.04	967.99	0.008
	13.1053 - 10.9211					39.000	25.0769	-8.27	978.00	0.008
	10.9211 - 8.73684					39.000	25.3335	-8.50	988.01	0.009
	8.73684 - 6.55263					39.000	25.5902	-8.74	998.02	0.009
	6.55263 - 4.36842					39.000	25.8468	-8.98	1008.03	0.009
	4.36842 - 2.18421					39.000	26.1034	-9.22	1018.03	0.009
	2.18421 - 0					39.000	26.3601	-9.46	1028.04	0.009

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 $\frac{f_{bv}}{F_{by}}$
L1	80 - 78.1579	TP27.7x22x0.1875	1.98	0.332	39.000	0.009	0.00	0.000	39.000	0.000
	78.1579 - 76.3158		2.95	0.483	39.000	0.012	0.00	0.000	39.000	0.000
	76.3158 - 74.4737		4.77	0.762	39.000	0.020	0.00	0.000	39.000	0.000
	74.4737 - 72.6316		6.69	1.043	39.000	0.027	0.00	0.000	39.000	0.000
	72.6316 -		8.76	1.334	39.000	0.034	0.00	0.000	39.000	0.000

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 $\frac{f_{by}}{F_{by}}$
	70.7895									
	70.7895 - 68.9474		10.99	1.633	39.000	0.042	0.00	0.000	39.000	0.000
	68.9474 - 67.1053		13.36	1.940	39.000	0.050	0.00	0.000	39.000	0.000
	67.1053 - 65.2632		22.43	3.183	39.000	0.082	0.00	0.000	39.000	0.000
	65.2632 - 63.4211		31.88	4.423	39.000	0.113	0.00	0.000	39.000	0.000
	63.4211 - 61.5789		41.48	5.627	39.000	0.144	0.00	0.000	39.000	0.000
	61.5789 - 59.7368		51.23	6.798	39.000	0.174	0.00	0.000	39.000	0.000
	59.7368 - 57.8947		61.14	7.936	39.000	0.203	0.00	0.000	39.000	0.000
	57.8947 - 56.0526		71.20	9.044	39.000	0.232	0.00	0.000	39.000	0.000
	56.0526 - 54.2105		81.41	10.121	39.000	0.260	0.00	0.000	39.000	0.000
	54.2105 - 52.3684		91.78	11.171	39.000	0.286	0.00	0.000	39.000	0.000
	52.3684 - 50.5263		102.30	12.192	39.000	0.313	0.00	0.000	39.000	0.000
	50.5263 - 48.6842		112.97	13.187	39.000	0.338	0.00	0.000	39.000	0.000
	48.6842 - 46.8421		123.80	14.156	39.000	0.363	0.00	0.000	39.000	0.000
	46.8421 - 45		134.78	15.101	39.000	0.387	0.00	0.000	39.000	0.000
	45 - 41.5		68.78	7.417	39.000	0.190	0.00	0.000	39.000	0.000
L2	45 - 41.5	TP33.47x26.8068x0.25	87.30	7.309	39.000	0.187	0.00	0.000	39.000	0.000
	41.5 - 39.3158		169.66	13.868	39.000	0.356	0.00	0.000	39.000	0.000
	39.3158 - 37.1316		183.43	14.645	39.000	0.376	0.00	0.000	39.000	0.000
	37.1316 - 34.9474		197.40	15.397	39.000	0.395	0.00	0.000	39.000	0.000
	34.9474 - 32.7632		211.57	16.126	39.000	0.413	0.00	0.000	39.000	0.000
	32.7632 - 30.5789		225.93	16.834	39.000	0.432	0.00	0.000	39.000	0.000
	30.5789 - 28.3947		240.50	17.520	39.000	0.449	0.00	0.000	39.000	0.000
	28.3947 - 26.2105		255.27	18.186	39.000	0.466	0.00	0.000	39.000	0.000
	26.2105 - 24.0263		270.24	18.834	39.000	0.483	0.00	0.000	39.000	0.000
	24.0263 - 21.8421		285.41	19.463	39.000	0.499	0.00	0.000	39.000	0.000
	21.8421 - 19.6579		300.79	20.074	39.000	0.515	0.00	0.000	39.000	0.000
	19.6579 - 17.4737		316.37	20.669	39.000	0.530	0.00	0.000	39.000	0.000
	17.4737 - 15.2895		332.16	21.248	39.000	0.545	0.00	0.000	39.000	0.000
	15.2895 - 13.1053		348.16	21.811	39.000	0.559	0.00	0.000	39.000	0.000
	13.1053 - 10.9211		364.36	22.359	39.000	0.573	0.00	0.000	39.000	0.000
	10.9211 - 8.73684		380.77	22.894	39.000	0.587	0.00	0.000	39.000	0.000
	8.73684 -		397.39	23.414	39.000	0.600	0.00	0.000	39.000	0.000

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 $\frac{f_{bv}}{F_{by}}$
	6.55263									
	6.55263 - 4.36842		414.22	23.922	39.000	0.613	0.00	0.000	39.000	0.000
	4.36842 - 2.18421		431.27	24.417	39.000	0.626	0.00	0.000	39.000	0.000
	2.18421 - 0		448.52	24.900	39.000	0.638	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	80 - 78.1579	TP27.7x22x0.1875	0.26	0.020	26.000	0.002	0.00	0.000	26.000	0.000
	78.1579 - 76.3158		0.79	0.059	26.000	0.005	0.00	0.000	26.000	0.000
	76.3158 - 74.4737		1.00	0.074	26.000	0.006	0.00	0.000	26.000	0.000
	74.4737 - 72.6316		1.08	0.079	26.000	0.006	0.00	0.000	26.000	0.000
	72.6316 - 70.7895		1.17	0.084	26.000	0.006	0.00	0.000	26.000	0.000
	70.7895 - 68.9474		1.25	0.089	26.000	0.007	0.00	0.000	26.000	0.000
	68.9474 - 67.1053		1.33	0.094	26.000	0.007	0.00	0.000	26.000	0.000
	67.1053 - 65.2632		5.09	0.356	26.000	0.027	0.00	0.000	26.000	0.000
	65.2632 - 63.4211		5.17	0.358	26.000	0.028	0.00	0.000	26.000	0.000
	63.4211 - 61.5789		5.25	0.360	26.000	0.028	0.00	0.000	26.000	0.000
	61.5789 - 59.7368		5.34	0.361	26.000	0.028	0.00	0.000	26.000	0.000
	59.7368 - 57.8947		5.42	0.363	26.000	0.028	0.00	0.000	26.000	0.000
	57.8947 - 56.0526		5.50	0.365	26.000	0.028	0.00	0.000	26.000	0.000
	56.0526 - 54.2105		5.59	0.366	26.000	0.028	0.00	0.000	26.000	0.000
	54.2105 - 52.3684		5.67	0.368	26.000	0.028	0.00	0.000	26.000	0.000
	52.3684 - 50.5263		5.75	0.369	26.000	0.028	0.00	0.000	26.000	0.000
	50.5263 - 48.6842		5.84	0.371	26.000	0.029	0.00	0.000	26.000	0.000
	48.6842 - 46.8421		5.92	0.372	26.000	0.029	0.00	0.000	26.000	0.000
	46.8421 - 45		6.00	0.374	26.000	0.029	0.00	0.000	26.000	0.000
	45 - 41.5		2.76	0.169	26.000	0.013	0.00	0.000	26.000	0.000
L2	45 - 41.5	TP33.47x26.8068x0.25	3.41	0.159	26.000	0.012	0.00	0.000	26.000	0.000
	41.5 - 39.3158		6.26	0.288	26.000	0.022	0.00	0.000	26.000	0.000
	39.3158 - 37.1316		6.35	0.289	26.000	0.022	0.00	0.000	26.000	0.000
	37.1316 - 34.9474		6.44	0.290	26.000	0.022	0.00	0.000	26.000	0.000
	34.9474 -		6.53	0.290	26.000	0.022	0.00	0.000	26.000	0.000

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 $\frac{f_{vt}}{F_{vt}}$
	32.7632									
	32.7632 - 30.5789		6.63	0.291	26.000	0.022	0.00	0.000	26.000	0.000
	30.5789 - 28.3947		6.72	0.292	26.000	0.022	0.00	0.000	26.000	0.000
	28.3947 - 26.2105		6.81	0.293	26.000	0.023	0.00	0.000	26.000	0.000
	26.2105 - 24.0263		6.90	0.293	26.000	0.023	0.00	0.000	26.000	0.000
	24.0263 - 21.8421		7.00	0.294	26.000	0.023	0.00	0.000	26.000	0.000
	21.8421 - 19.6579		7.09	0.295	26.000	0.023	0.00	0.000	26.000	0.000
	19.6579 - 17.4737		7.19	0.296	26.000	0.023	0.00	0.000	26.000	0.000
	17.4737 - 15.2895		7.28	0.296	26.000	0.023	0.00	0.000	26.000	0.000
	15.2895 - 13.1053		7.38	0.297	26.000	0.023	0.00	0.000	26.000	0.000
	13.1053 - 10.9211		7.47	0.298	26.000	0.023	0.00	0.000	26.000	0.000
	10.9211 - 8.73684		7.57	0.299	26.000	0.023	0.00	0.000	26.000	0.000
	8.73684 - 6.55263		7.66	0.299	26.000	0.023	0.00	0.000	26.000	0.000
	6.55263 - 4.36842		7.76	0.300	26.000	0.023	0.00	0.000	26.000	0.000
	4.36842 - 2.18421		7.86	0.301	26.000	0.023	0.00	0.000	26.000	0.000
	2.18421 - 0		7.95	0.302	26.000	0.023	0.00	0.000	26.000	0.000

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	80 - 78.1579	0.000	0.009	0.000	0.002	0.000	0.009 ✔	1.333	H1-3+VT ✔
	78.1579 - 76.3158	0.002	0.012	0.000	0.005	0.000	0.014 ✔	1.333	H1-3+VT ✔
	76.3158 - 74.4737	0.002	0.020	0.000	0.006	0.000	0.021 ✔	1.333	H1-3+VT ✔
	74.4737 - 72.6316	0.002	0.027	0.000	0.006	0.000	0.029 ✔	1.333	H1-3+VT ✔
	72.6316 - 70.7895	0.002	0.034	0.000	0.006	0.000	0.036 ✔	1.333	H1-3+VT ✔
	70.7895 - 68.9474	0.002	0.042	0.000	0.007	0.000	0.044 ✔	1.333	H1-3+VT ✔
	68.9474 - 67.1053	0.002	0.050	0.000	0.007	0.000	0.052 ✔	1.333	H1-3+VT ✔
	67.1053 - 65.2632	0.006	0.082	0.000	0.027	0.000	0.088 ✔	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
	65.2632 - 63.4211	0.006	0.113	0.000	0.028	0.000	0.120 ✔	1.333	H1-3+VT ✔
	63.4211 - 61.5789	0.006	0.144	0.000	0.028	0.000	0.151 ✔	1.333	H1-3+VT ✔
	61.5789 - 59.7368	0.007	0.174	0.000	0.028	0.000	0.181 ✔	1.333	H1-3+VT ✔
	59.7368 - 57.8947	0.007	0.203	0.000	0.028	0.000	0.210 ✔	1.333	H1-3+VT ✔
	57.8947 - 56.0526	0.007	0.232	0.000	0.028	0.000	0.239 ✔	1.333	H1-3+VT ✔
	56.0526 - 54.2105	0.007	0.260	0.000	0.028	0.000	0.267 ✔	1.333	H1-3+VT ✔
	54.2105 - 52.3684	0.007	0.286	0.000	0.028	0.000	0.294 ✔	1.333	H1-3+VT ✔
	52.3684 - 50.5263	0.007	0.313	0.000	0.028	0.000	0.320 ✔	1.333	H1-3+VT ✔
	50.5263 - 48.6842	0.007	0.338	0.000	0.029	0.000	0.346 ✔	1.333	H1-3+VT ✔
	48.6842 - 46.8421	0.007	0.363	0.000	0.029	0.000	0.371 ✔	1.333	H1-3+VT ✔
	46.8421 - 45	0.008	0.387	0.000	0.029	0.000	0.395 ✔	1.333	H1-3+VT ✔
	45 - 41.5	0.004	0.190	0.000	0.013	0.000	0.194 ✔	1.333	H1-3+VT ✔
L2	45 - 41.5	0.004	0.187	0.000	0.012	0.000	0.191 ✔	1.333	H1-3+VT ✔
	41.5 - 39.3158	0.006	0.356	0.000	0.022	0.000	0.362 ✔	1.333	H1-3+VT ✔
	39.3158 - 37.1316	0.007	0.376	0.000	0.022	0.000	0.382 ✔	1.333	H1-3+VT ✔
	37.1316 - 34.9474	0.007	0.395	0.000	0.022	0.000	0.402 ✔	1.333	H1-3+VT ✔
	34.9474 - 32.7632	0.007	0.413	0.000	0.022	0.000	0.421 ✔	1.333	H1-3+VT ✔
	32.7632 - 30.5789	0.007	0.432	0.000	0.022	0.000	0.439 ✔	1.333	H1-3+VT ✔
	30.5789 - 28.3947	0.007	0.449	0.000	0.022	0.000	0.457 ✔	1.333	H1-3+VT ✔
	28.3947 - 26.2105	0.007	0.466	0.000	0.023	0.000	0.474 ✔	1.333	H1-3+VT ✔
	26.2105 - 24.0263	0.008	0.483	0.000	0.023	0.000	0.491 ✔	1.333	H1-3+VT ✔
	24.0263 - 21.8421	0.008	0.499	0.000	0.023	0.000	0.507 ✔	1.333	H1-3+VT ✔
	21.8421 - 19.6579	0.008	0.515	0.000	0.023	0.000	0.523 ✔	1.333	H1-3+VT ✔
	19.6579 - 17.4737	0.008	0.530	0.000	0.023	0.000	0.538 ✔	1.333	H1-3+VT ✔
	17.4737 - 15.2895	0.008	0.545	0.000	0.023	0.000	0.553 ✔	1.333	H1-3+VT ✔
	15.2895 - 13.1053	0.008	0.559	0.000	0.023	0.000	0.568 ✔	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
	13.1053 - 10.9211	0.008	0.573	0.000	0.023	0.000	0.582 ✔	1.333	H1-3+VT ✔
	10.9211 - 8.73684	0.009	0.587	0.000	0.023	0.000	0.596 ✔	1.333	H1-3+VT ✔
	8.73684 - 6.55263	0.009	0.600	0.000	0.023	0.000	0.609 ✔	1.333	H1-3+VT ✔
	6.55263 - 4.36842	0.009	0.613	0.000	0.023	0.000	0.622 ✔	1.333	H1-3+VT ✔
	4.36842 - 2.18421	0.009	0.626	0.000	0.023	0.000	0.635 ✔	1.333	H1-3+VT ✔
	2.18421 - 0	0.009	0.638	0.000	0.023	0.000	0.648 ✔	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	80 - 41.5	Pole	TP27.7x22x0.1875	1	-4.75	835.17	29.6	Pass
L2	41.5 - 0	Pole	TP33.47x26.8068x0.25	2	-9.46	1370.38	48.6	Pass
							Summary	
						Pole (L2)	48.6	Pass
						RATING =	**48.6**	**Pass**

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		80-ft Summit Monopole Simsbury, CT
Rev. 0: 3/6/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14014.000

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 449·ft·kips	(User Input from tnxTower)
Shear Force =	Shear := 8·kip	(User Input from tnxTower)
Axial Force =	Axial := 9·kip	(User Input from tnxTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 8	(User Input)
Diameter of Bolt Circle =	D_{bc} := 39.00·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 100·ksi	(User Input)
Bolt Yield Strength =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.00·in	(User Input)
Base Plate Diameter =	D_{bp} := 38.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 33.47·in	(User Input)

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	80-ft Summit Monopole Simsbury, CT
Rev. 0: 3/6/14	Prepared by: T.J.L. Checked by: C.F.C. Job No. 14014.000

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

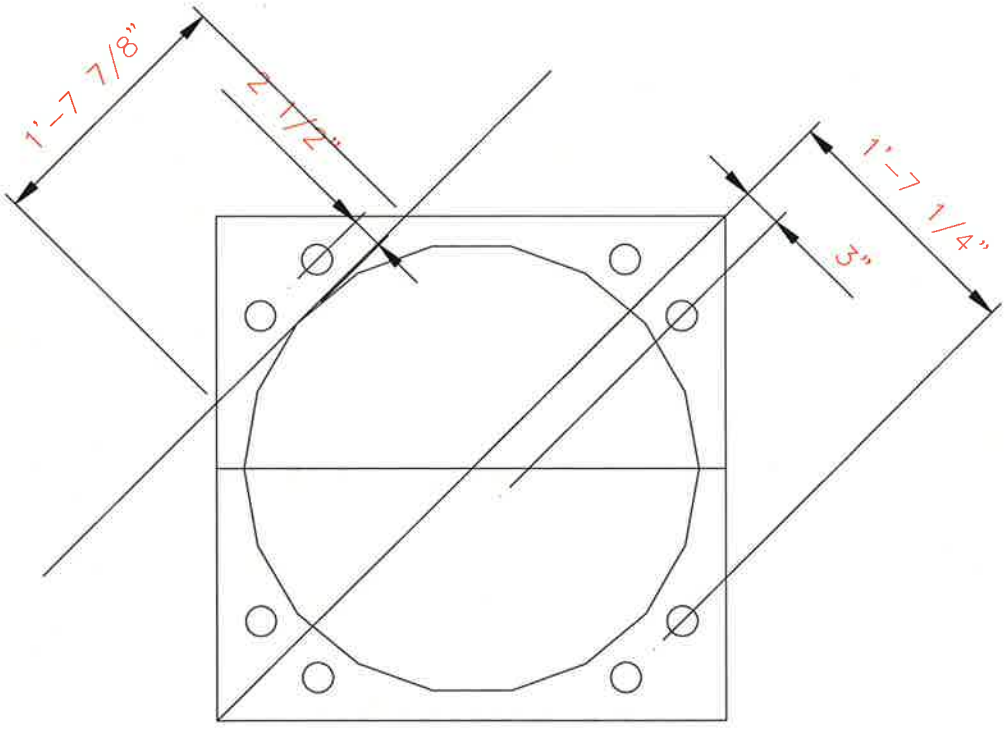
$d_1 := 19.25in$ (User Input)

$d_2 := 3in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.5in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 19.875in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[\left(d_1\right)^2 \cdot 4 + \left(d_2\right)^2 \cdot 4\right] = 1.518 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 67.2 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 174.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.333 \cdot \left(0.60 \cdot A_n \cdot F_y\right) = 194.812 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 34.5$ Bolts are "upset bolts". Use net area per AISC

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, "OK", "Overstressed"\right)$

Condition1 = "OK" Note Shear stress is negligible

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.25 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 3.6 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Anchor Bolt Compression/Combined Stress:

Applied Compressive Force =

$$C_{Max} := OM \cdot \frac{d_1}{l_p} + \frac{Axial}{N} = 69.4 \cdot kips$$

Applied Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 21.4 \cdot ksi$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} = 45 \cdot ksi$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 35.6$$

Condition 2 =

$$Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts =

$$C_1 := \frac{OM \cdot d_1}{I_p} + \frac{Axial}{N} = 69.44 \cdot kips$$

$$C_2 := \frac{OM \cdot d_2}{I_p} + \frac{Axial}{N} = 11.771 \cdot kips$$

Applied Bending Stress in Plate =

$$f_{bp} := \frac{6 \cdot \left(2C_1 \cdot ma_1\right)}{B_{eff} \cdot t_{bp}^2} = 26.2 \cdot ksi$$

Allowable Bending Stress in Plate =

$$F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} \cdot 100 = 43.8$$

Condition3 =

$$Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$$

Condition3 = "Ok"

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Subject:		Foundation Analysis
Location:		80-ft Summit Monopole Simsbury, CT
Rev. 0: 3/6/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14014.000

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 449 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$Shear := 8 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$Axial := 9 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 80 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 6.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 3.5 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 5.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 3.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 17.0 \cdot ft$	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts =	$L_{st} := 84 \cdot in$	(User Input)	
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12.0 \cdot in$	(User Input)	
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)	
Base Plate Bolt Circle =	$MP := 39.0 \cdot in$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 3000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 11$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.41 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 12$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 0.5 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 8$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.0 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 17$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.0 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 17$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =

$$A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 1.561 \cdot in^2$$

Pad Top Reinforcement Bar Area =

$$A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.785 \cdot in^2$$

Pad Bottom Reinforcement Bar Area =

$$A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785 \cdot in^2$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}\left(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}\right) = 150\cdot\text{pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}\left(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}\right) = 100\cdot\text{pcf}$$

Passive Pressure =

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

$$P_{pt} := K_p\cdot\gamma_s\cdot\left(D_f - T_f\right) + c\cdot 2\cdot\sqrt{K_p} = 0.9\cdot\text{ksf}$$

$$P_{top} := \text{if}\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0.9\cdot\text{ksf}$$

$$P_{bot} := K_p\cdot\gamma_s\cdot D_f + c\cdot 2\cdot\sqrt{K_p} = 1.8\cdot\text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.35\cdot\text{ksf}$$

$$T_p := \text{if}\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 3$$

$$A_p := W_f\cdot T_p = 51$$

Ultimate Shear =

$$S_u := P_{ave}\cdot A_p = 68.85\cdot\text{kip}$$

Weight of Concrete Pad =

$$WT_c := \left[\left(W_f^2\cdot T_f\right) + d_p^2\cdot L_p\right]\cdot\gamma_c = 143.175\cdot\text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left(W_f^2 - d_p^2\right)\cdot\begin{cases}\left(L_p - L_{pag} - n\right) & \text{if } \left(L_p - L_{pag} - n\right) \geq 0 \\ 0 & \text{if } \left(L_p - L_{pag} - n\right) \leq 0\end{cases}\right]\cdot\gamma_s = 79.2\cdot\text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left(\frac{D_f^2\cdot\tan\left(\Phi_s\right)}{2}\cdot W_f\right)\cdot\gamma_s = 17.667\cdot\text{kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2\cdot\left[\left(D_f\right)^3\cdot\frac{\tan\left(\Phi_s\right)}{3}\right]\cdot\gamma_s = 8.314\cdot\text{kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 231.375\cdot\text{kip}$$

Resisting Moment =

$$M_r := \left(WT_{tot}\right)\cdot\frac{W_f}{2} + S_u\cdot\frac{T_f}{3} + \left[\left(WT_{s2} + WT_{s3}\right)\cdot\left(W_f + \frac{D_f\tan\left(\Phi_s\right)}{3}\right)\right] = 2507\cdot\text{kip}\cdot\text{ft}$$

Overturning Moment =

$$M_{ot} := \text{OM} + \text{Shear}\cdot\left(L_p + T_f\right) = 501\cdot\text{kip}\cdot\text{ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 5$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$\text{OverTurning\_Moment\_Check} := \text{if}\left(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"}\right)$$

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{\mu \cdot WT_{tot}}{FS_{req}} = 52.059 \cdot kips$

$Shear\_Check := if(S_p > Shear, "Okay", "No Good")$

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 289$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 818.83 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.412 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < q_s, "Okay", "No Good")$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = 0.189 \cdot ksf$

$Min\_Pressure\_Check := if[(P_{min} \geq 0) \cdot (P_{min} < q_s), "Okay", "No Good"]$

Min_Pressure_Check = "Okay"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 6.541$

Distance to Kern = $X_k := \frac{W_f}{6} = 2.833$

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

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 2.165$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e\right)} = 1.432 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 1.412 \cdot ksf$

$Pressure\_Check := if(q_{adj} < q_s, "Okay", "No Good")$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 6.249 \times 10^3 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > LF \cdot Axial, "Okay", "No Good")$

Bearing_Check = "Okay"

Shear Strength of Concrete:

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

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 32 \cdot in$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$

$d_2 := d_1 - d$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := (d_p + d) \cdot \pi = 24.1$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 46.2$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 242.8$

Guess Value = $v_u := 1ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := \text{Find}(v_u) = 3.6 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 163.3 \cdot kips$

Required Shear Strength = $V_{req} := LF \cdot V_u = 217.7 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1988.8 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 0.981 \cdot ksf$

Maximum Bending at Face of Pier = $M_u := LF \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 517.4 \cdot kip \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$R_n := \frac{M_u}{\phi_m \cdot W_f \cdot d^2} = 33 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0006$

$\rho_{min} := \rho = 0.00055$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases}$$ (ACI -2008 7.12.2.1)

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 5.875 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 13.4 \cdot in^2$$

$$Pad\_Reinforcement\_Bot := if\left(As_{prov} > As, "Okay", "No Good"\right)$$

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 5.9 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 13.4 \cdot in^2$$

$$Pad\_Reinforcement\_Top := if\left(As_{prov} > As, "Okay", "No Good"\right)$$

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 11.31 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0$$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 23.7 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in$$ (ACI-2008 12.2.1)

$$L_{dbtCheck} := if\left(L_{dbt} \geq L_{dbmin}, "Use\ L.dbt", "Use\ L.dbmin"\right)$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 69 \cdot in$$

$$Lpad\_Check := if\left(L_{Pad} > L_{dbt}, "Okay", "No Good"\right)$$

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier =

$$A_p := \frac{\pi \cdot d_p^2}{4} = 2827.43 \cdot in^2$$

$$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 14.14 \cdot in^2 \qquad \text{(ACI-2008 10.8.4 \& 10.9.1)}$$

$$A_{sprov} := NB_{pier} \cdot A_{bpier} = 18.74 \cdot in^2$$

$$Steel\_Area\_Check := if\left(A_{sprov} > A_{smin}, "Okay", "No Good"\right)$$

Steel_Area_Check = "Okay"

Bar Spacing In Pier =

$$B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 14.298 \cdot in$$

Diameter of Reinforcement Cage =

$$Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 54 \cdot in$$

Maximum Moment in Pier =

$$M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF = 7694.1 \cdot in \cdot kips$$

Pier Check evaluated from outside program and results are listed below;

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{Axial \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$$

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) = \left(60 \;\; 12 \;\; 11 \;\; 11.997 \;\; 7.694 \times 10^3\right)$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := \phi P'_n\left(D, N, n, P_u, M_{xu}\right)^T$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = \left(39.063 \;\; 2.505 \times 10^4 \;\; -60 \;\; 6.621 \times 10^{-3}\right)$$

$$Axial\_Load\_Check := if\left(\phi P_n \geq P_u, "Okay", "No Good"\right)$$

Axial_Load_Check = "Okay"

$$Bending\_Check := if\left(\phi M_{xn} \geq M_{xu}, "Okay", "No Good"\right)$$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 39 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 33 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 47.15 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 18.727 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right)$

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 26.753 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 25.38 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 26.753 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

Tie Size and Spacing in Column:

Minimum Tie Size =

$Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 4$

Used #4 Ties

Seismic Factor =

$z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 22.56 \cdot in$

$s_{lim2} := 48 \cdot d_{Tie} \cdot z = 24 \cdot in$

$s_{lim3} := D_f \cdot z = 72 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing =

$$s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 18 \cdot in$$

Number of Ties Required =

$$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 3$$

Check Anchor Steel Embedment:

Depth Available =

$D_{ab} := L_{st} - A_{BP} = 6 \cdot ft$

Length of Anchor Bolt =

$$L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 10.87 \cdot ft$$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

Site Name	SIMSBURY NW, CT	Site #	8-0040
Latitude	41-54-11.51 N	Longitude	72-49-16.95 W
Firetown Rd, fire department tower		GEL (Feet)	314

700 MHz LTE Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH	
ANTENNA TYPE	LNX-6514DS-VTM		LNX-6514DS-VTM		LNX-6514DS-VTM	
QUANTITY PER FACE	1		1		1	
ORIENTATION	30		150		270	
DOWN TILT (DEG.)	0° Mech + 2° Elec		0° Mech + 2° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	67		67		67	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						
850 MHz Cellular Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	N/A		N/A		N/A	
ANTENNA TYPE	LNX-6514DS-VTM		LNX-6514DS-VTM		LNX-6514DS-VTM	
QUANTITY PER FACE	1		1		1	
ORIENTATION	30		150		270	
DOWN TILT (DEG.)	0° Mech + 2° Elec		0° Mech + 2° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	67		67		67	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
1900 MHz PCS Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 1900 MHz RRH		ALU 1900 MHz RRH		ALU 1900 MHz RRH	
ANTENNA TYPE	HBX-6517DS-VTM		HBX-6517DS-VTM		HBX-6517DS-VTM	
QUANTITY PER FACE	1		1		1	
ORIENTATION	30		150		270	
DOWN TILT (DEG.)	0° Mech + 0° Elec		0° Mech + 0° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	67		67		67	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-PCS	1	ALU RRH_2X40-PCS	1	ALU RRH_2X40-PCS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						
2100 MHz LTE Site Info	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	HBX-6517DS-VTM		HBX-6517DS-VTM		HBX-6517DS-VTM	
QUANTITY PER FACE	1		1		1	
ORIENTATION	30		150		270	
DOWN TILT (DEG.)	0° Mech + 0° Elec		0° Mech + 0° Elec		0° Mech + 0° Elec	
RAD CTR (FT AGL)	67		67		67	
TOWER MOUNTED AMPS (QTY)	N/A		N/A		N/A	
DIPLEXER - QTY/MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

Coax Cable Ordering					
MAINLINE SIZE	1 5/8"	TOTAL # OF MAIN LINES	0	COAX LINE MODEL #	
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS	12	TOP JUMPER MODEL #	
Fiber Cable Ordering					
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES	2	FIBER LINE MODEL #	HB158-1-08U8-S8J18
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS	12	TOP JUMPER MODEL #	HB058-1-08U1-S1J

TX / RX FREQUENCIES		
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - Block
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-2155	TX - 746-757
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-1755	RX - 776-787

TX POWER OUTPUT	
Cellular (Watts)	20
PCS (Watts)	16
700 MHz / 2100 MHz (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/ WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/ WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/ BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/ BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	RF INITIALS	DATE
Prepared By: Mark Brauer	Robert Hesselbach	MB	1/8/2014

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBX-6517DS-VTM

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

- Superior azimuth tracking and pattern symmetry to minimize any sector overlap
- Rugged, reliable design with excellent passive intermodulation suppression
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.9
Gain by all Beam Tilts Tolerance, dB	±0.2	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.3 3 ° | 18.6 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.6	0 ° | 18.8 3 ° | 19.1 6 ° | 18.7
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Horizontal Tolerance, degrees	±1.8	±0.9	±2.8
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.2	±0.2	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	19	19	18
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	11	11	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports	2

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity, total	2
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board

Product Specifications

HBX-6517DS-VTM

Radome Material	PVC, UV resistant
Wind Loading, maximum	393.0 N @ 150 km/h 88.3 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	83.0 mm | 3.3 in
Length	1902.0 mm | 74.9 in
Width	166.0 mm | 6.5 in
Net Weight	6.2 kg | 13.7 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBX-6517DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBX-6517DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

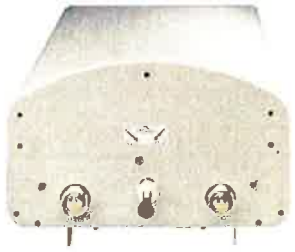
DB390 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Use for narrow panel antennas. Includes two pipe mounts.

DB5098E — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.



LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity, total	2
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Product Specifications

LNX-6514DS-VTM

Dimensions

Depth	181.0 mm | 7.1 in
Length	1847.0 mm | 72.7 in
Width	301.0 mm | 11.9 in
Net Weight	17.6 kg | 38.8 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	LNX-6514DS-R2M
Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

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

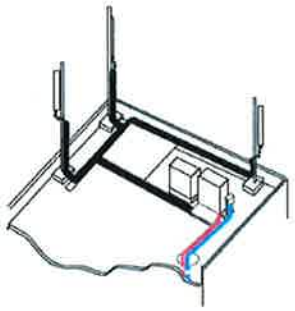
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

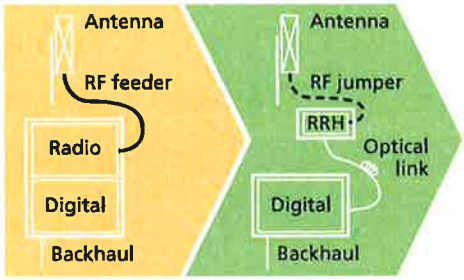
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

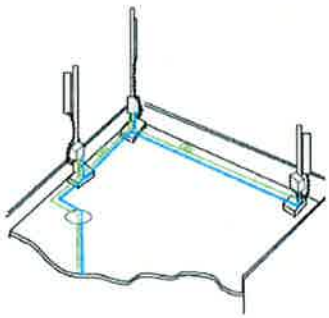
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

Alcatel·Lucent

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

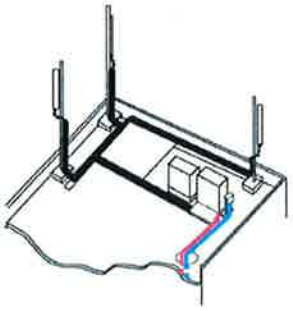
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and 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

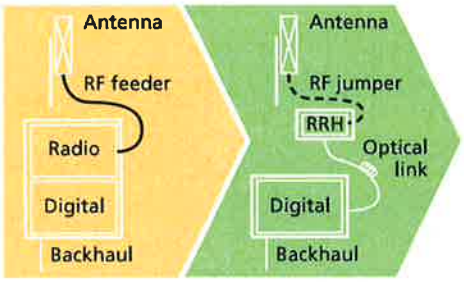
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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

Benefits

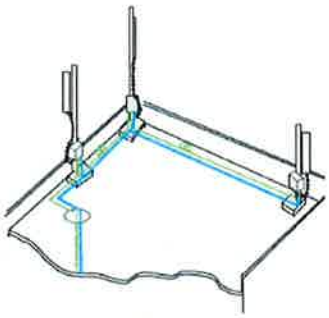
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

The RFS Distribution Box design comes with the option for pluggable over voltage protection (OVP) for up to 6 remote radios and the connection for 6 pairs of optical fiber with LC optical fiber cable management. There is a hybrid cable input with a jumper configuration for power and optical fiber to the remote radio heads (RRHs). A custom wall, a 2-inch pole, and an H-Frame mounting bracket are included. Both the compact and standard design are available with lightening protection.

Features/Benefits

- Designed to accommodate varying diameters of HYBRIFLEX™ (combined power and fiber optic) cables – up to 2 inches
- Supports Single- and Multi-Mode Optical fiber
- NEMA 4x rated enclosure – allows **flexibility for indoor or outdoor installation** on a roof or tower top
- Weatherproof enclosure and ports – **improves system reliability**
- Modular design – makes replacement or addition of OVP easy without removal of other components within the box
- Strikesorb OVP technology – protects equipment from damaging surges up to 60 kA on an 8/20 waveform and up to 5 kA on a 10/350 waveform (certain models only)
- Low residual voltage and high impedance – **ideally suited for RRH technology** – won't shut down the RRH the way spark gap technology does (certain models only)

Technical Specifications

Mechanical Specifications

Model Number	DB-B1-6C-8AB-0Z	DB-T1-6Z-8AB-0Z
Enclosure Design	Standard, 6 OVP's	Standard without OVP
Dimensions - H x W x D, mm (in)	610 x 610 x 254 (24 x 24 x 10)	610 x 610 x 254 (24 x 24 x 10)
Weight, kg (lb)	20 (44)	20 (44)
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum	
Fiber Connection Method	LC-LC Single- or Multi-mode duplex	
Environmental Rating	NEMA 4x	
Operating Temperature, °C (°F)	-40 to +80 (-40 to +176)	
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs	

Electrical Specifications

Nominal Operating Voltage		48 VDC
Nominal Discharge Current (I_n) per UL 1449 3rd Ed	20 kA 8/20 µs	N/A
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs	N/A
Maximum Impulse (Lightning) Current (I_{imp}) per IEC 61643-1	5 kA 10/350 µs	N/A
Maximum Continuous Operating Voltage (U_c)	75 VDC	N/A
Voltage Protection Rating per UL1449 3rd Ed	400 V	N/A
Protection Class as per IEC 61643-1	Class 1	N/A
Strikesorb OVP Compliance	ANSI/UL 1449-3rd Ed	N/A
	IEEE C62.41	N/A
	NEMA LS-1	N/A
	IEC 61643-1	N/A
	IEC 61643-12	N/A
	EN 61643-11	N/A

* This data is provisional and subject to change.

ATTACHMENT 4

HMB

HMB Acoustics LLC 3 Cherry Tree Lane, Avon, CT 06001 860-677-5955

August 8, 2014

Harry M. Rocheville, EIT
Civil Engineer
Centek Engineering, Inc.
63-2 North Branford Road
Branford, CT 06405

Subject: 14014.000 Simsbury NW: Noise Compliance Study

Dear Mr. Rocheville:

The noise levels for the V1 and V2 wall mounted HVAC units were calculated while each one was operating separately. Typically, only one of the two units on the equipment shelter operates at any one time. The noise level was then projected to each property line. The resultant noise level was compared to the State of CT Noise Regulation. The Regulation allows a noise level of 55 dBA (daytime); and 45 dBA (nighttime) between a Residential Zone Emitter and a Residential Zone Receptor's property line. I found that the V1 and V2 air-conditioning units meet the conditions for compliance as set forth in the noise regulations at all property lines.

Allan Smardin
HMB Acoustics LLC

PROJECT INFORMATION:	Centek Job #: 14014.000
Applicant:	Cellco Partnership d.b.a. Verizon Wireless
Applicant Site ID:	Simsbury NW
Site Owner:	Simsbury FD
Site Address:	344 Firetown Rd. Simsbury, CT
Subject Zoning District:	Residential
Abutting Zoning District(s):	All: Residential

APPLICANT EQUIPMENT:

ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West
V-1	Wall Mounted HVAC	Bard / W61A1-105EPXXXJ	36	239	169	57
V-2	Wall Mounted HVAC	Bard / W61A1-105EPXXXJ	29	246	170	57

EXISTING COLOCATORS:

☐ AT&T	☐ Metro PCS	☒ Other: Simsbury FD
☐ Sprint	☒ T Mobile	☐ Other:
☐ Nextel	☐ None	☐ Other:

EXISTING COLOCATOR EQUIPMENT OWNER:

ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

EXISTING COLOCATOR EQUIPMENT OWNER:

ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

EXISTING COLOCATOR EQUIPMENT OWNER:						
ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

EXISTING COLOCATOR EQUIPMENT OWNER:						
ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

EXISTING COLOCATOR EQUIPMENT OWNER:						
ID	Noise Emitter	Make/Model	Prop. Line. Dist. (FT)			
			North	South	East	West

CONCLUSION:			
Daytime Regulation:	55 dBA	**Nighttime Regulation:**	45 dBA
Compliance:	☒ Yes ☐ No	**Compliance:**	☒ Yes ☐ No

BASIS OF FINDINGS:

North property line: V1=41 dBA, V2=42 dBA

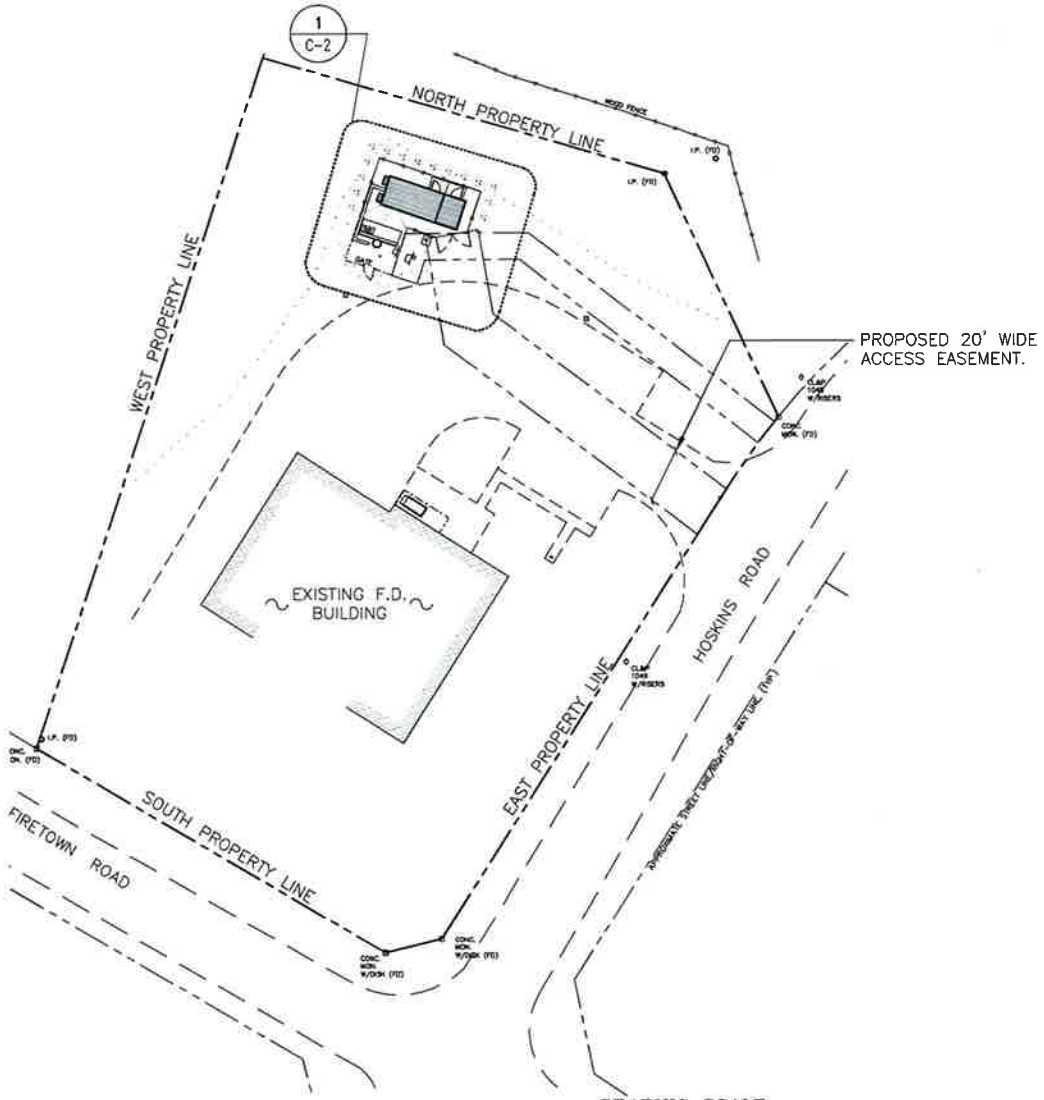
South property line: V1=34 dBA, V2=34 dBA

North property line: V1=27 dBA, V2=27 dBA

North property line: V1=39 dBA, V2=39 dBA

The dBA levels take into account the acoustical shielding effect provided by other structures on the property.

Prepared By: Alan Smardin, HMB ACOUSTICS LLC Date: 8/8/14



1 / C-1 **SITE PLAN**
SCALE: 1" = 45'

APPROXIMATE NORTH

NO.	DATE	DESCRIPTION
0	06/07/14	INITIAL ISSUE

PROFESSIONAL ENGINEER SEAL

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

Cellco Partnership d/b/a Verizon Wireless

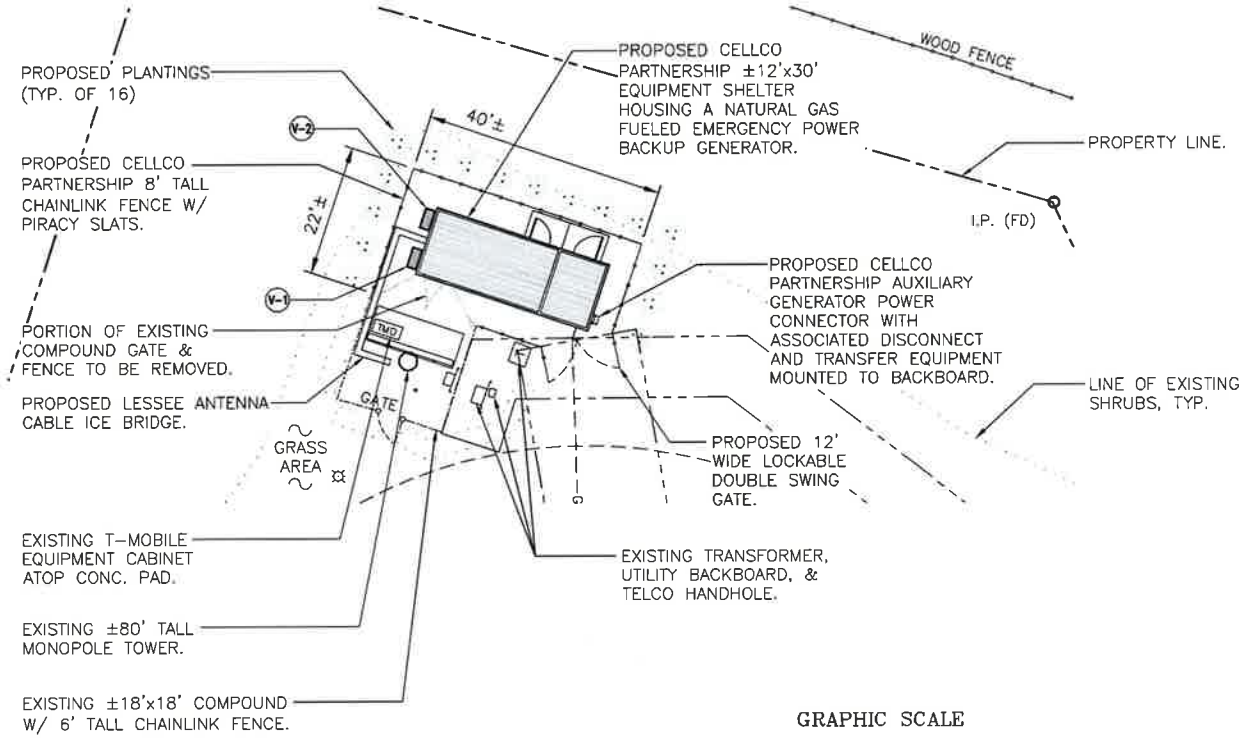
SIMSBURY NORTH WEST

344 FIRETOWN ROAD
SIMSBURY, CT 06070

DATE:	06/07/14
SCALE:	AS SHOWN
JOB NO.	14014.000

SHEET NO.
C-1

NOISE EMMITTER INFORMATION		
(V-1)	WALL MOUNTED HVAC UNIT, MAKE: BARD,	MODEL: W61A1-A05EPXXXJ
(V-2)	WALL MOUNTED HVAC UNIT, MAKE: BARD,	MODEL: W61A1-A05EPXXXJ



1 / C-2 **COMPOUND PLAN**

SCALE: 1" = 20'

APPROXIMATE NORTH

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

1 inch = 20 ft.

REV	DATE	ISSUED BY/DESCRIPTION
0	08/07/14	NOISE EMITTER INFO

PROFESSIONAL ENGINEER SEAL

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

Cellco Partnership d/b/a Verizon Wireless

SIMSBURY NORTH WEST

344 FIRETOWN ROAD
SIMSBURY, CT 06070

DATE: 08/07/14
SCALE: AS SHOWN
JOB NO. 14014.000

SHEET NO. C-2

ATTACHMENT 5

Far Field Approximation
with downtilt variation

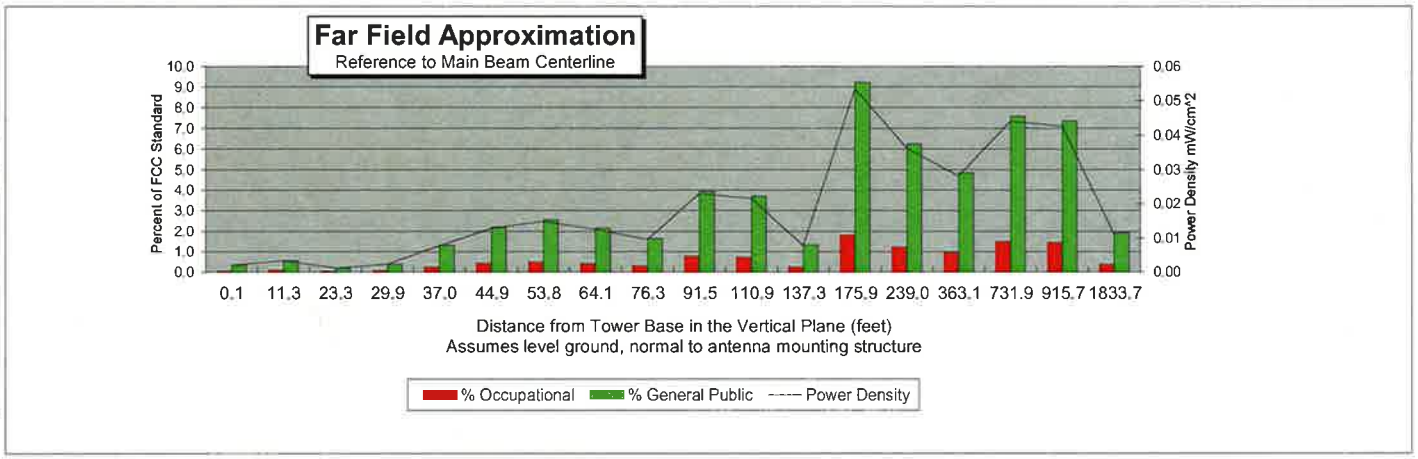
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Simsbury NW, CT
Site #:	
Date:	07/10/14
Name:	Mark Brauer
File Name:	Simsbury NW, CT - FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**67.0**
Antenna Gain (dBi):	**16.4**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**3927.0**



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	64.0	65.0	68.1	70.6	73.9	78.2	83.6	90.5	99.6	111.6	128.1	151.5	187.2	247.4	368.7	734.7	917.9	1834.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	11.3	23.3	29.9	37.0	44.9	53.8	64.1	76.3	91.5	110.9	137.3	175.9	239.0	363.1	731.9	915.7	1833.7	
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	
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	
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	
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	0.02	0.01	0.05	0.04	0.03	0.04	0.04	0.01	
Percent of Occupational 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	1.0	1.5	1.5	0.4	
Percent of General Population Standard	0.3	0.6	0.2	0.4	1.3	2.2	2.6	2.2	1.6	3.9	3.7	1.3	9.2	6.2	4.9	7.6	7.4	1.9	

Antenna Type LNX-6514DS
Max% 9.22%

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

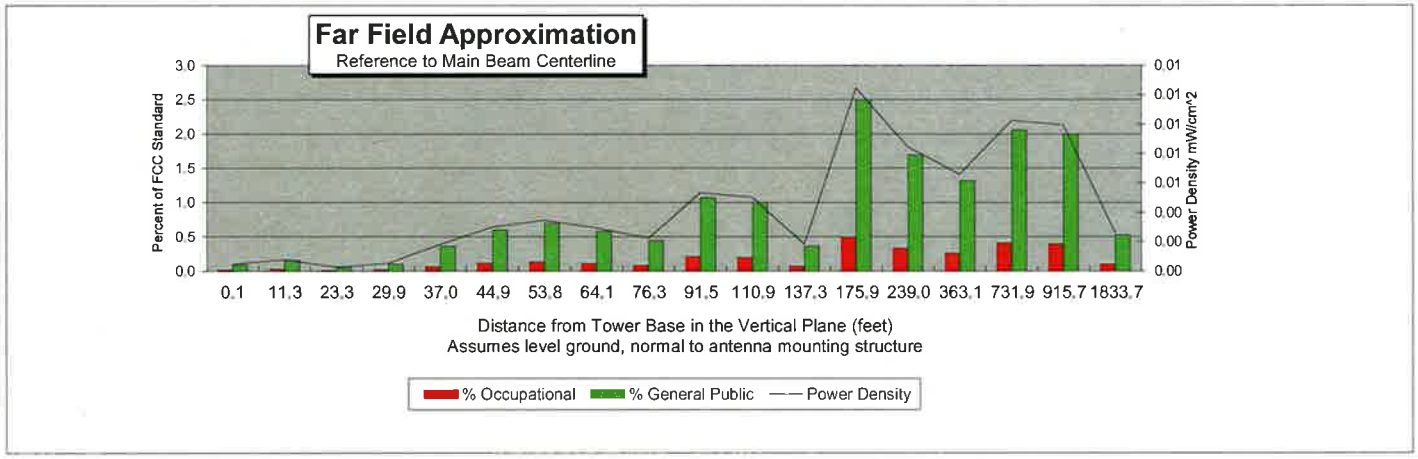
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Simsbury NW, CT
Site #:	
Date:	07/10/14
Name:	Mark Brauer
File Name:	Simsbury NW, CT - FF Power

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**67.0**
Antenna Gain (dBi):	**15.8**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1050.0**



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	64.0	65.0	68.1	70.6	73.9	78.2	83.6	90.5	99.6	111.6	128.1	151.5	187.2	247.4	368.7	734.7	917.9	1834.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	11.3	23.3	29.9	37.0	44.9	53.8	64.1	76.3	91.5	110.9	137.3	175.9	239.0	363.1	731.9	915.7	1833.7	
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	
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	
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	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	
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	0.5	0.3	0.3	0.4	0.4	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.4	0.6	0.7	0.6	0.4	1.1	1.0	0.4	2.5	1.7	1.3	2.1	2.0	0.5	

Antenna Type LNX-6514DS
Max% 2.50%

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

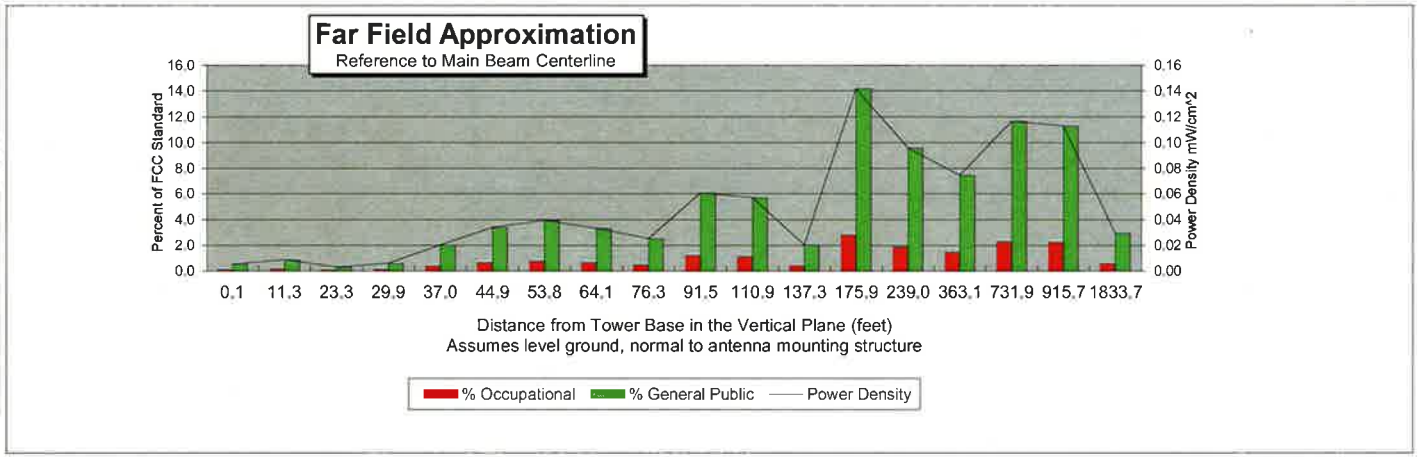
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Simsbury NW, CT
Site #:	
Date:	07/10/14
Name:	Mark Brauer
File Name:	Simsbury NW, CT - FF Power

Operating Freq. (MHz)	**1970.0**
Antenna Height (ft):	**67.0**
Antenna Gain (dBi):	**19.2**
Antenna Size (in.):	**74.9**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**5460.0**



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	64.0	65.0	68.1	70.6	73.9	78.2	83.6	90.5	99.6	111.6	128.1	151.5	187.2	247.4	368.7	734.7	917.9	1834.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	11.3	23.3	29.9	37.0	44.9	53.8	64.1	76.3	91.5	110.9	137.3	175.9	239.0	363.1	731.9	915.7	1833.7	
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	
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	
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	
Power Density (mW/cm^2)	0.01	0.01	0.00	0.01	0.02	0.03	0.04	0.03	0.03	0.06	0.06	0.02	0.14	0.10	0.07	0.12	0.11	0.03	
Percent of Occupational Standard	0.1	0.2	0.1	0.1	0.4	0.7	0.8	0.7	0.5	1.2	1.1	0.4	2.8	1.9	1.5	2.3	2.3	0.6	
Percent of General Population Standard	0.5	0.9	0.3	0.6	2.0	3.4	3.9	3.3	2.5	6.1	5.7	2.1	14.1	9.6	7.5	11.6	11.3	3.0	

Antenna Type HBX-6514DS
Max% 14.15%

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

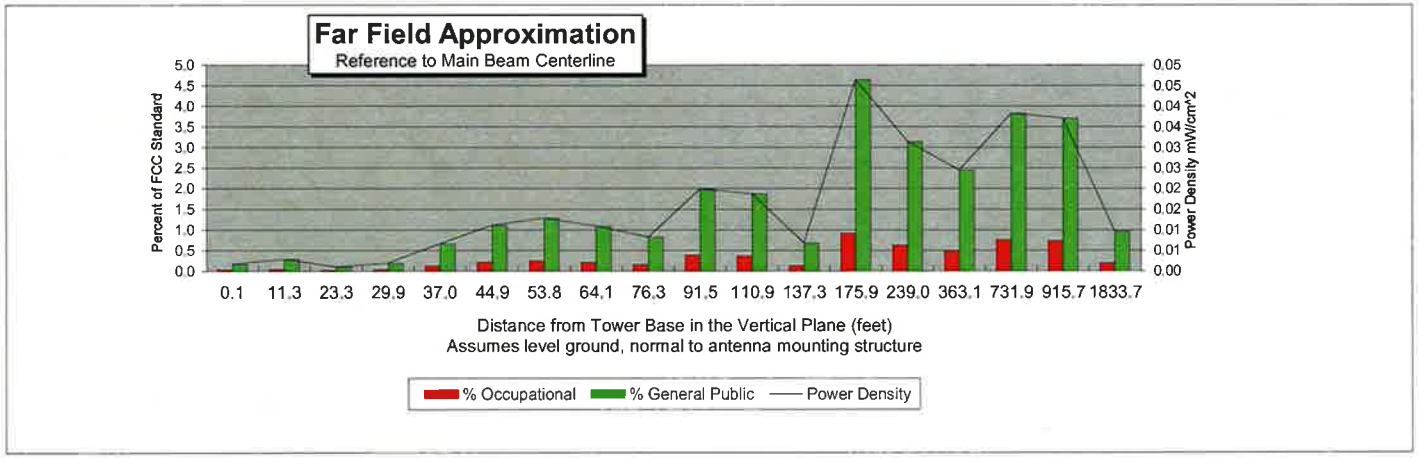
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Simsbury NW, CT
Site #:	
Date:	07/10/14
Name:	Mark Brauer
File Name:	Simsbury NW, CT - FF Power

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**67.0**
Antenna Gain (dBi):	**19.3**
Antenna Size (in.):	**74.9**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1750.0**



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	64.0	65.0	68.1	70.6	73.9	78.2	83.6	90.5	99.6	111.6	128.1	151.5	187.2	247.4	368.7	734.7	917.9	1834.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	11.3	23.3	29.9	37.0	44.9	53.8	64.1	76.3	91.5	110.9	137.3	175.9	239.0	363.1	731.9	915.7	1833.7	
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	
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	
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	
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	0.02	0.01	0.05	0.03	0.02	0.04	0.04	0.01	
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.2	0.2	0.4	0.4	0.1	0.9	0.6	0.5	0.8	0.7	0.2	
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.7	1.1	1.3	1.1	0.8	2.0	1.9	0.7	4.6	3.1	2.4	3.8	3.7	1.0	

Antenna Type HBX-6517DS
Max% 4.64%

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 6

ALL-POINTS TECHNOLOGY CORPORATION

WETLAND INVESTIGATION

August 15, 2014

Verizon Wireless
99 East River Drive
East Hartford, CT 06108

APT Project No.: CT1411190

Attn: Alexandria Carter

Re: Proposed Simsbury NW Facility
Firetown Fire Station
344 Firetown Road
Simsbury, Connecticut

Dear Ms. Carter,

All-Points Technology Corporation, P.C. ("APT") understands that a wireless telecommunications facility ("Facility") is proposed by Verizon Wireless at 344 Firetown Road in Simsbury, Connecticut ("Subject Property"). At your request, Dean Gustafson, a Connecticut registered Professional Soil Scientist with APT conducted an inspection of the Subject Property on June 25, 2014 to determine the presence or absence of wetlands and watercourses within approximately 200 feet of proposed development activities ("Study Area"). The delineation methodology followed was consistent with both the Connecticut Inland Wetlands and Watercourses Act (IWWA) and the *Corps of Engineers Wetland Delineation Manual* (1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*, Version 2.0 (January 2012). The results of this wetland investigation are provided below.

Site and Project Description:

The Subject Property consists of an approximately 1.29-acre municipally developed parcel that consists of the Firetown Fire Station and an 80-foot tall monopole wireless telecommunications Facility located in the northwestern portion of the Subject Property. Verizon Wireless proposes to collocate on the existing monopole at a 67-foot antenna centerline height and expand the existing 18-foot by 18-foot fenced compound to the north in a maintained lawn area to accommodate Verizon's equipment shelter. The generally 22-foot by 40-foot compound expansion will house a 12-foot by 30-foot equipment shelter that will enclose Verizon Wireless' ground equipment as well as a natural gas fueled emergency power backup generator. Access is proposed to be gained off of the existing paved access that currently provides access to the fire station and to the Facility from both Firetown Road and Hoskins Road; a short (±18 foot) gravel drive will be constructed to access Verizon Wireless' compound from the existing paved drive. The Study Area is dominated by the developed areas that include the fire station building, paved access drives and maintained lawn and landscaping. The surrounding land use generally consists of residential development.

One wetland area was delineated within the Study Area consisting of a forested headwater wetland system located along the west property boundary. Please refer to the enclosed Wetland Delineation Map for the approximate location of the identified wetland resource area. Wetlands were marked with pink and blue plastic flagging tape numbered with the following sequence: WF 1-01 to 1-10. General weather conditions encountered during the June inspection included mid 80° F temperatures with sunny skies.

Regulation of Wetlands:

Wetlands and watercourses are regulated by local, state and federal regulations, with each regulatory agency differing slightly in their definition and regulatory authority of resource areas, as discussed below. The proposed Facility is under the exclusive jurisdiction of the State of Connecticut Siting Council and therefore exempt from local regulation, although local wetland regulations are considered by the Siting Council. If wetlands are identified on the Subject Property and direct impact is proposed, those wetlands may be considered Waters of the United States and therefore the activity may also be subject to jurisdiction by the U.S. Army Corps of Engineers ("ACOE") New England District.

Town of Simsbury: The Town of Simsbury regulates activities within wetlands and watercourses and within 100 feet of wetlands and watercourses through administration of the Connecticut Inland Wetlands and Watercourses Act (IWWA).

State of Connecticut: **Freshwater Wetlands:** The IWWA requires the regulation of activities affecting or having the potential to affect wetlands under Sec. 22a-36 through 22a-45 of the Connecticut General Statutes. The IWWA is administered through local municipalities. The IWWA defines wetlands as areas of poorly drained, very poorly drained, floodplain, and alluvial soils, as delineated by a soil scientist. Watercourses are defined as bogs, swamps, or marshes, as well as lakes, ponds, rivers, streams, etc., whether natural or man-made, permanent or intermittent. Intermittent watercourse determinations are based on the presence of a defined permanent channel and bank, and two of the following characteristics: (1) evidence of scour or deposits of recent alluvium or detritus; (2) the presence of standing or flowing water for a duration longer than a particular storm incident; and (3) the presence of hydrophytic vegetation.

ACOE: The U.S. Army Corps of Engineers regulates the discharge of dredged or fill material into waters of the United States under Section 404 of the Clean Water Act. Waters of the United States are navigable waters, tributaries to navigable waters, wetlands adjacent to those waters, and/or isolated wetlands that have a demonstrated interstate commerce connection. The ACOE Wetlands Delineation Manual defines wetlands as "[t]hose areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been approved by the ACOE.

Soil Description:

Soil types encountered throughout the Study Area were generally consistent with digitally available soil survey information obtained from the Natural Resources Conservation Service ("NRCS")[1]. Wetland soils field identified consist of Scarboro muck and Raypol silt loam. The non-wetland soils were examined along the wetland boundary and more distant upland areas during the delineation, including the proposed Facility location. They are dominated by Udorthents-Urban land complex, Hinckley gravelly sandy loam and Merrimac sandy loam. Detailed descriptions of wetland and upland soil types are provided below.

Wetland Soils:

The **Raypol** series consists of very deep, poorly drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to gently sloping soils in shallow drainageways and low-lying positions on terraces and plains. The soils have a water table at or near the surface much of the year.

The **Scarboro** series consists of very deep, very poorly drained soils on outwash plains, deltas, and terraces. They are nearly level soils in depressions. The water table is at or near the surface for 6 to 12 months of the year, and many areas are ponded for short periods. This is a mineral soil, but it has a mucky surface horizon.

Upland Soils:

The **Hinckley** series consists of very deep, excessively drained soils formed in water-sorted material (outwash). They are nearly level to very steep soils on terraces, outwash plains, deltas, kames, and eskers. The soils in this series are shallow to sand and gravel (12 to 30 inches).

The **Merrimac** series consists of very deep, somewhat excessively drained soils formed in glacial outwash. They are nearly level to very steep soils on outwash terraces and plains and other glacio-fluvial landforms. Sandy loam textures do not extend below a depth of 27 inches, but a minimum thickness of 5 inches of sandy loam overlies any lower B or 2C horizon that is loamy fine sand or coarser.

Udorthents is a miscellaneous land type used to denote moderately well to excessively drained earthen material which has been so disturbed by cutting, filling, or grading that the original soil profile can no longer be discerned.

Urban land is a miscellaneous land type consisting mostly of buildings, paved roads and parking lots. Typically included with this unit are small, intermingled areas disturbed by cutting, filling, or grading such that the original soil profile can no longer be discerned.

Wetlands Discussion:

Wetland 1 Classification Summary:

Wetland 1[2] (WF 1-01 to 1-10)	**System** Palustrine	**Subsystem**	**Class** Forested	**Subclass** Broad-leaved Deciduous	**Water Regime** Seasonally Flooded	**Special Modifier** Partly Drained
Watercourse Type (none)	Perennial ☐	Intermittent ☐	Tidal ☐	**Special Aquatic Habitat** (None)	Vernal Pool ☐	Other ☐

[1] NRCS Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/, accessed on June 23, 2014.

[2] Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm - contents.

Wetland 1 Description:

Wetland 1 is a groundwater depressional headwater wetland formed in fine textured glacial outwash deposits. This forested wetland system drains to the south along the west property boundary into a culvert under Firetown Road. An intermittent watercourse forms at the outlet end of the culvert off the Subject Property via a dug drainage swale that drains through a residential property located on the south side of Firetown Road. This wetland forms one of the headwater areas to Great Pond, located approximately 0.37 mile to the south.

Wetland 1 Dominant Vegetation:

Dominant Wetland Species Common Name (Latin Name)	**Dominant Adjacent Upland Species** Common Name (Latin Name)
Red Maple (Acer rubrum)	Maintained lawn
Silky Dogwood (Cornus amomum)	Catalpa
Elderberry (Sambucus canadensis)	Norway Spruce
Skunk Cabbage (Symplocarpus foetidus)	Asiatic Bittersweet* (Celastrus orbiculatus)
Sensitive Fern (Onoclea sensibilis)	Winged Euonymus* (Euonymus alata)
Cinnamon Fern (Osmunda cinnamomea)	Black Cherry (Prunus serotina)
Jewelweed (Impatiens capensis)	Sugar Maple (Acer saccharum)
Multiflora Rose* (Rosa multiflora)	Multiflora Rose* (Rosa multiflora)
Swamp Rose (Rosa palustris)	Honeysuckle Bushes
Tussock Sedge (Carex stricta)	
Joe Pye Weed (Eupatorium maculatum)	

* denotes Connecticut Invasive Plants Council invasive species

Summary:

Based on APT's understanding of the proposed Verizon Wireless development and a review of the Site Plan prepared by Centek Engineering (Sheet No. C-1, latest revision date 08/11/14), no direct impact to wetlands is associated with the proposed development of the tower/compound or gravel access. The proposed Verizon Wireless compound expansion would be located 24± feet east of Wetland 1 (measured from the west compound fence to wetland flag WF 8); this is no closer to wetlands than the existing Facility compound. The nearest proposed activity to wetlands is associated with a proposed level spreader that will treat stormwater runoff from the proposed Facility, 9± feet east of wetland flag WF 8.

Minor temporary impacts may be associated with Verizon Wireless' construction activities due to the close proximity to wetlands, particularly for the proposed level spreader stormwater management feature. Provided sedimentation and erosion controls are designed, installed and maintained during construction activities in accordance with the *2002 Connecticut Guidelines For Soil Erosion and Sediment Control*, temporary impacts would be minimized. However, due to the close proximity of the proposed development to nearby wetlands, APT recommends that a wetland protection plan be implemented to provide additional measures to avoid temporary wetland impacts. A proposed wetland protection plan is included as an attachment to this report and would be incorporated into the Council's Development and Management ("D&M") Plan, should the Facility be approved. Long term secondary impacts to wetland resources possibly associated with the operation of this Facility are minimized by the fact the development is unmanned, it minimizes the creation of impervious surfaces with the use of a gravel access drive and gravel compound, it creates minimal traffic and the wetland system currently experiences a high level of human activity associated with the fire station operation. Based on a review of the referenced plans, it appears that stormwater generated by the proposed development would be properly handled and treated in accordance with the *2004 Connecticut Stormwater Quality Manual*. APT suggests that Green Infrastructure/Low Impact Development

techniques[3] be considered where deemed appropriate through engineering analysis. APT understands that details of the erosion control and stormwater management plans would be developed during the D&M Plan phase of the project, should the Facility be approved by the Council. Provided these recommendations are implemented, it is APT's opinion that the proposed Verizon Wireless development would not result in a likely adverse impact to wetland resources.

In addition, as no direct impact to federal wetlands is anticipated with Verizon Wireless' development activities, **NO significant change in surface features** (e.g., wetland fill, deforestation or water diversion) would result in accordance with National Environmental Policy Act Categorical Exclusion checklist item 7.

If you have any questions regarding the above-referenced information, please feel free to contact me by telephone at (860) 663-1697 ext. 201 or via email at dgustafson@allpointstech.com.

Sincerely,

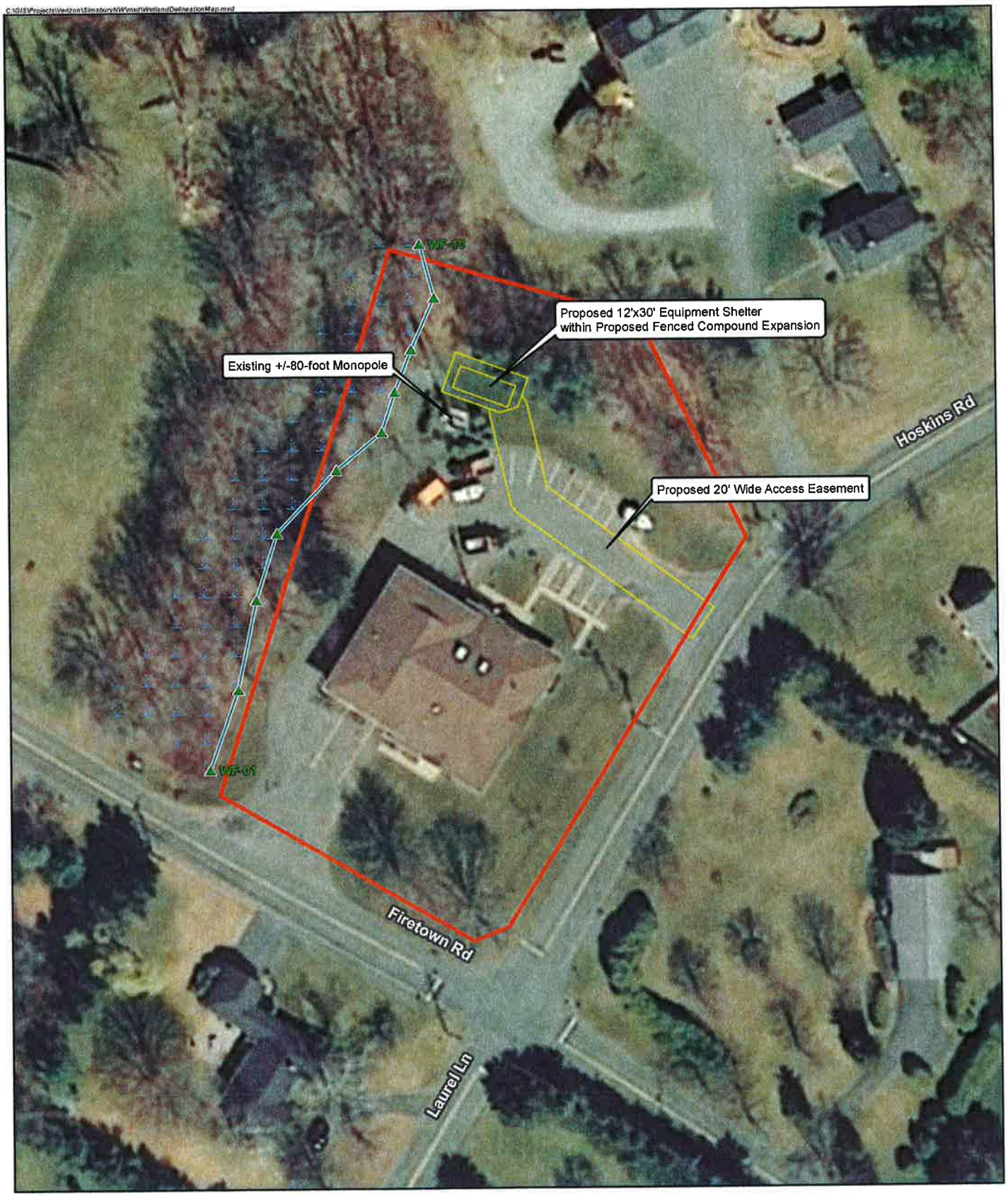
All-Points Technology Corporation, P.C.

Dean Gustafson
Professional Soil Scientist

Enclosure

[3] Connecticut Department of Energy & Environmental Protection. *Low Impact Development Appendix to the Connecticut Stormwater Quality Manual.* June 2011.

Wetland Delineation Map



Legend

- Wetland Flag
- Delineated Wetland Boundary
- Wetland Area
- Proposed Facility Layout
- Approximate Subject Parcel Boundary

Base Map Source: 2012 Aerial Photograph (CTECO)
Map Date: July 2014

N
W E
S

50 25 0 50 Feet

Wetland Delineation Map

Proposed Wireless
Telecommunications Facility
Simsbury Northwest
334 Firetown Road
Simsbury, Connecticut

verizonwireless

ALL-POINTS TECHNOLOGY CORPORATION

Wetland Protection Plan

ALL-POINTS
TECHNOLOGY CORPORATION

WETLAND PROTECTION PROGRAM

Portions of the proposed Verizon Wireless project are located in close proximity (±9 feet) to a wetland area. As a result, the following protective measures shall be followed to help avoid degradation of the nearby wetland system.

It is of the utmost importance that the Contractor complies with the requirement for the installation of protective measures and the education of its employees and subcontractors performing work on the project site. These measures will also provide protection to a nearby wetland system. This protection program shall be implemented regardless of time of year the construction activities occur. All-Points Technology Corporation, P.C. ("APT") will serve as the Environmental Monitor for this project to ensure that wetland protection measures are implemented properly. The Contractor shall contact Dean Gustafson, Senior Environmental Scientist at APT, at least 5 business days prior to the pre-construction meeting. Mr. Gustafson can be reached by telephone at (860) 663-1697 ext. 201 or via email at dgustafson@allpointstech.com.

The wetland protection program consists of several components: use of appropriate erosion control measures to control and contain erosion while avoiding/minimizing wildlife entanglement; periodic inspection and maintenance of isolation structures and erosion control measures; education of all contractors and sub-contractors prior to initiation of work on the site; protective measures; and, reporting.

1. **Erosion and Sedimentation Controls**

    a. Plastic netting used in a variety of erosion control products (i.e., erosion control blankets, fiber rolls [wattles], reinforced silt fence) has been found to entangle wildlife, including reptiles, amphibians, birds and small mammals. No permanent erosion control products or reinforced silt fence will be used on the project. Temporary Erosion control products will use either erosion control blankets and fiber rolls composed of processed fibers mechanically bound together to form a continuous matrix (net less) or netting composed of planar woven natural biodegradable fiber to avoid/minimize wildlife entanglement.

    b. Installation of erosion control measures shall be performed by the Contractor prior to any earthwork. APT will inspect the work zone area prior to and following barrier installation to ensure erosion controls are properly installed.

    c. In addition to required daily inspection by the Contractor, the fencing will be inspected for tears or breeches in the fabric following installation periodically by APT throughout the course of the construction project.

    d. The extent of the erosion controls will be as shown on the site plans. The Contractor shall have additional erosion control materials should field conditions warrant extending the fencing as directed by APT.

    e. All silt fencing and other erosion control devices shall be removed within 30 days of completion of work and permanent stabilization of site soils. If fiber rolls/wattles, straw bales, or other natural material erosion control products are used, such devices will not be left in place to biodegrade and shall be promptly removed after soils are stable so as not to create a barrier to migrating wildlife. Seed from seeding of soils should not spread over fiber rolls/wattles as it makes them harder to remove once soils are stabilized by vegetation.

ALL-POINTS TECHNOLOGY CORPORATION, P.C.
☒ 3 SADDLEBROOK DRIVE · KILLINGWORTH, CT 06419 · PHONE 860-663-1697 · FAX 860-663-0935
☐ P.O. BOX 504 · 116 GRANDVIEW ROAD · CONWAY, NH 03818 · PHONE 603-496-5853 · FAX 603-447-2124

2. **Contractor Education**

   a. Prior to work on site, the Contractor shall attend an educational session at the pre-construction meeting with APT. This orientation and educational session will consist of an introductory meeting with APT to understand the environmentally sensitive nature of the development site and the need to follow these protective measures.

3. **Petroleum Materials Storage and Spill Prevention**

   a. Certain precautions are necessary to store petroleum materials, refuel and contain and properly clean up any inadvertent fuel or petroleum (i.e., oil, hydraulic fluid, etc.) spill due to the project's location in proximity to sensitive wetlands.

   b. A spill containment kit consisting of a sufficient supply of absorbent pads and absorbent material will be maintained by the Contractor at the construction site throughout the duration of the project. In addition, a waste drum will be kept on site to contain any used absorbent pads/material for proper and timely disposal off site in accordance with applicable local, state and federal laws.

   c. The following petroleum and hazardous materials storage and refueling restrictions and spill response procedures will be adhered to by the Contractor.

      i. Petroleum and Hazardous Materials Storage and Refueling

         1. Refueling of vehicles or machinery shall occur a minimum of 100 feet from wetlands or watercourses and shall take place on an impervious pad with secondary containment designed to contain fuels.

         2. Any fuel or hazardous materials that must be kept on site shall be stored on an impervious surface utilizing secondary containment a minimum of 100 feet from wetlands or watercourses.

      ii. Initial Spill Response Procedures

         1. Stop operations and shut off equipment.

         2. Remove any sources of spark or flame.

         3. Contain the source of the spill.

         4. Determine the approximate volume of the spill.

         5. Identify the location of natural flow paths to prevent the release of the spill to sensitive nearby waterways or wetlands.

         6. Ensure that fellow workers are notified of the spill.

      iii. Spill Clean Up & Containment

         1. Obtain spill response materials from the on-site spill response kit. Place absorbent materials directly on the release area.

         2. Limit the spread of the spill by placing absorbent materials around the perimeter of the spill.

         3. Isolate and eliminate the spill source.

4. Contact appropriate local, state and/or federal agencies, as necessary.

5. Contact a disposal company to properly dispose of contaminated materials.

iv. Reporting

1. Complete an incident report.

2. Submit a completed incident report to appropriate local, state and/or federal agencies, as necessary.

4. Herbicide and Pesticide Restrictions

a. The use of herbicides and pesticides at the proposed wireless telecommunications facility is strictly prohibited.

5. Reporting

a. Any incidents of sediment release into the nearby wetland will be reported to the Connecticut Siting Council.