**Cellco Partnership d/b/a**
**Verizon Wireless**
Cullen Morgan
Site Acquisition Consultant
750 W Center Street
Suite 301
West Bridgewater, MA 02379
(941)549-7263
cmorgan@clinellc.com

July 16, 2024

Members of the Siting Council
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

**RE: NOTICE OF EXEMPT MODIFICATION**
**80 Shuttle Meadow Road, Southington, CT 06489**
**Latitude: 41.63858333**
**Longitude: -72.8411**
**Site: STTN-SOUTHINGTON (ATC #302475)**

Dear Members of the Siting Council:

Cellco Partnership d/b/a Verizon Wireless ("Verizon") currently maintains twelve (12) antennas at the 143-foot level of the existing 150-foot tower at 515 Morehouse Road, Easton, CT 06612. The 149-foot tower is owned by American Tower Corporation, and the underlying property is owned by an American Tower subsidiary. Verizon now intends to replace (6) Antennas, and install (3) RRUs. All tower-mounted equipment modifications will take place at the 143-foot level of the tower.

**Planned Modifications:**

Remove Existing:
(6) NNHH-65B-R4 Antennas
(3) B5/B13 RRH-BR04C RRUs

Install New:
(3) MT6413-77A Antennas
(3) XXDWMM-12.5-65-8T CBRS Antennas
(3) RF4461D-13A RRUs

Existing to Remain:
(6) NNHH-65B-R4 Antennas
(3) B2/B66A RRH-BR049 RRUs
(2) 1-5/8" Hybrids

This facility was approved by the CT Siting Council in Docket No. 40, dated May 15, 1984, with conditions. We used the information from the previous filing. Please see attached.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies§ 16- SOj-73, or construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.SA. § 16-SOj-73, a copy of this letter is being sent to Town Council Chairman Paul Chaplinsky, Jr., chief elected official for the Town of Southington, Jeffrey Pooler, Chief Building Official for the Town of Southington, and American Tower Corporation, the property owner and tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing structure.
2. The proposed modifications will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

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

Respectfully,
**Cullen Morgan**
**Site Acquisition Consultant**
**Centerline Communications, LLC (Agent to Verizon)**
**Mobile: (941) 549-7263**
**cmorgan@clinellc.com**

Attachments
cc: Town Council Chairman Paul Chaplinsky, Jr., chief elected official – Town of Southington
Jeffrey Pooler, Chief Building Official – Town of Southington
American Tower Corporation – Property Owner & Tower Owner

C/O CULLEN MORGAN
9415497263
CENTERLINE COMMUNICATIONS LLC
12579 SAGEWOOD DRIVE
VENICE FL 34293

**2 LBS** **1 OF 1**

**SHIP TO:**
CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE
**NEW BRITAIN CT 06051-2655**

**CT 067 9-06**

**UPS GROUND**
TRACKING #: 1Z 9Y4 503 03 2271 2499

BILLING: P/P

Reference # 1: 13703662 STTN-SOUTHINGTON

CS 24.5.00. MACNV50 30.0A 07/2024*

TM

CENTERLINE

# EXHIBIT A

## Original Decision and Order

DOCKET NO. 40

ORIGINAL

| | | |
|---|---|---|
| AN APPLICATION SUBMITTED BY THE SOUTHERN NEW ENGLAND TELEPHONE COMPANY FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION, MAINTENANCE, AND OPERATION OF FACILITIES TO PROVIDE CELLULAR SERVICE IN THE HARTFORD AND MIDDLESEX COUNTIES. | : | CONNECTICUT SITING COUNCIL |
| | : | May 15, 1984 |

## D E C I S I O N  A N D  O R D E R

Pursuant to the foregoing opinion, the Council hereby directs that a certificate of environmental compatibility and public need as required by section 16-50k of the General Statutes of Connecticut, revisions of 1958, revised to 1983, as amended, be issued to Southern New England Telephone for the construction, operation, and maintenance of a telecommunications tower and associated equipment to provide cellular service at each of the following sites:

Shuttle Meadow Road, Southington, Connecticut;
Mountain Street, Hartford, Connecticut;
Prestige Park Road, East Hartford, Connecticut;
Beckley Road, Berlin, Connecticut;
Slicer tract, Niederwerfer Road, South Windsor, Connecticut; and
Kikapoo Road, Middlefield, Connecticut.

The facilities shall be constructed, operated, and maintained as specified in the Council's record on this matter, and subject to the following conditions.

1. The towers shall be no taller than necessary to provide the proposed service and in no event shall exceed

   a) 150 feet at the Southington site,
   b) 100 feet at the Hartford site,
   c) 150 feet at the East Hartford site,
   d) 150 feet at the Berlin site,
   e) 75 feet at the South Windsor site, and
   f) 75 feet at the Middlefield site.

2. A fence not lower than eight feet shall surround each tower and its associated equipment.

3. The applicant or its successor shall notify the Council if and when directional antennas or any other equipment is added to any of these facilities.
4. The applicant or its successor shall permit in accordance with representations made by it during the proceeding public or private entities to share space on the facilities, for due consideration received, or shall provide any requesting entity with specific legal, technical, environmental, or economic reasons precluding such tower sharing.
5. Unless necessary to comply with condition number seven, below, no lights shall be installed on any of these towers.
6. The facility construction shall be conducted in accordance with all applicable federal, state, and municipal laws and regulations.
7. The applicant shall submit a development and management plan (D&M) for the South Windsor, Southington, and Berlin sites pursuant to sections 16-50j-85 through 16-50j-87 of the regulations of state agencies, except that irrelevant items in section 16-50j-86 need only be identified as such. The D&M plans shall include appropriate evergreen screening of the sites. The applicant shall comply with the reporting requirements of section 16-50j-87 for all sites. The applicant shall consult with Mrs. Claire Aubin and the Town of South Windsor in the preparation of the South Windsor site D&M.
8. Construction activities shall take place during daylight working hours.
9. This decision and order shall be void and the towers and associated equipment approved herein shall be dismantled and removed,

or reapplication for any new use shall be made to the Connecticut Siting Council before any such new use is made, if the towers do not provide or permanently cease to provide cellular service following completion of construction.

10. This decision and order shall be void if all construction authorized is not completed within three years of the issuance of this decision.

Pursuant to section 16-50p(c) of the General Statutes, we hereby direct that a copy of the opinion and decision and order be served on each person listed below. A notice of the issuance shall be published in the Hartford Courant, Journal Inquirer, and the Middletown Press.

The parties to this proceeding are

| | |
|---|---|
| Southern New England Telephone Company<br>Room 314<br>227 Church Street<br>New Haven, Connecticut 06506 | (Applicant) |
| ATTN: Mr. Peter J. Tyrrell, Esquire | (its attorney) |
| Town of South Windsor<br>1540 Sullivan Avenue<br>South Windsor, Connecticut 06074 | represented by:<br>Mr. Richard M. Rittenband<br>Town Attorney<br>1734 Ellington Road<br>South Windsor, Connecticut 06074 |
| Frank Niederwerfer<br>260 Niederwerfer Road<br>South Windsor, Connecticut 06074 | (service waived) |
| Claire Aubin<br>407 Niederwerfer Road<br>South Windsor, Connecticut 06074 | (service waived) |

Betty S. Kleiner
Chairman
Hartford Audubon Society, Inc.
5 Flintlock Ridge
Simsbury, Connecticut 06070

(service waived)

Roger Thorpe
2916 Ellington Road
South Windsor, Connecticut 06074

Intervenors in this proceeding are

Dwight A. Johnson
Murtha, Cullina, Richter
and Pinney
101 Pearl Street
P.O. Box 3197
Hartford, Connecticut 06103-0197

representing:

Metromedia TeleCommunications
Nutmeg Telecommunications, Inc.
CSI of New Haven
CSI of Stamford
Cellular Communications, Inc.
LIN Cellular Corp.
Cellular Mobile Services
Maxcell TeleCommunications, Inc.
Mobile Cellular Telephone, Inc.
Cellular Dynamics
Connecticut Corridor Cellular
Chase/Post Cellular

# CERTIFICATION

The undersigned members of the Connecticut Siting Council hereby certify that they have heard this case or read the record thereof, and that we voted as follows:

Dated at New Britain, Connecticut, this 15th day of May, 1984.

| Council Members | Vote Cast |
|---|---|
| Gloria Dibble Pond<br>Chairperson | Yes |
| Commissioner John Downey<br>Designee: Commissioner Peter G. Boucher | Yes |
| Commissioner Stanley Pac<br>Designee: Christopher Cooper | Yes |
| Owen L. Clark | Yes |
| Fred J. Doocy | ~~Yes~~ Abstain |
| Mortimer A. Gelston | Yes |
| James G. Horsfall | Absent |
| Janet Sitty | Yes |
| Colin C. Tait | Absent |

STATE OF CONNECTICUT )
: ss. New Britain, May 15, 1984
COUNTY OF HARTFORD )

I hereby certify that the foregoing is a true and correct copy of the decision and order issued by the Connecticut Siting Council, State of Connecticut.

ATTEST:

Christopher S. Wood, Executive Director
Connecticut Siting Council

CENTERLINE

# EXHIBIT B

## Property Card

# 80 SHUTTLE MEADOW RD

| | | | |
|---|---|---|---|
| **Location** | 80 SHUTTLE MEADOW RD | **Mblu** | 184/ / 019/ / |
| **Acct#** | 11918 | **Owner** | SOUTHERN NEW ENGLAND TELEPHONE CO |
| **Assessment** | $176,420 | **Appraisal** | $252,030 |
| **PID** | 16574 | **Building Count** | 1 |

### Current Value

| Appraisal | | | |
|---|---|---|---|
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2020 | $8,010 | $244,020 | $252,030 |
| **Assessment** | | | |
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2020 | $5,610 | $170,810 | $176,420 |

### Owner of Record

| | | | |
|---|---|---|---|
| **Owner** | SOUTHERN NEW ENGLAND TELEPHONE CO | **Sale Price** | $0 |
| **Co-Owner** | SITE# 302475 - STTN SOUTHINGTON CT | **Certificate** | |
| **Address** | C/O AMERICAN TOWER LAND MNGMT<br>PO Box 723597<br>Atlanta, GA 30339 | **Book & Page** | 0331/0320 |
| | | **Sale Date** | 02/14/1983 |
| | | **Instrument** | 25 |

### Ownership History

| Ownership History | | | | | |
|---|---|---|---|---|---|
| **Owner** | **Sale Price** | **Certificate** | **Book & Page** | **Instrument** | **Sale Date** |
| SOUTHERN NEW ENGLAND TELEPHONE CO | $0 | | 0331/0320 | 25 | 02/14/1983 |

### Building Information

#### Building 1 : Section 1

**Year Built:**
**Living Area:** 0
**Building Percent Good:**

| Building Attributes | |
|---|---|
| **Field** | **Description** |

| | |
|---|---|
| Style | Vacant w/OB |
| Model | |
| Grade: | |
| Stories | |
| Occupancy | |
| Exterior Wall 1 | |
| Exterior Wall 2 | |
| Roof Structure | |
| Roof Cover | |
| Interior Wall 1 | |
| Interior Wall 2 | |
| Interior Flr 1 | |
| Interior Flr 2 | |
| Heat Fuel | |
| Heat Type: | |
| AC Type: | |
| Total Bedrooms: | |
| Full Bthrms: | |
| Half Baths: | |
| Extra Fixtures | |
| Total Rooms: | |
| Bath Style: | |
| Kitchen Style: | |
| Total Kitchens | |
| Fireplaces | |
| Whirlpool Tubs | |
| Fin Bsmt Area | |
| Fin Bsmt Quality | |
| Bsmt Garages | |
| . | |
| Bsmt Type | |
| Attic Type | |
| Cath Ceiling | |
| Fndtn Cndtn | |
| Basement | |

### Building Photo

184 019 05/24/2015

(https://images.vgsi.com/photos2/SouthingtonCTPhotos//\00\04\94\50.JP

### Building Layout

(ParcelSketch.ashx?pid=16574&bid=16574)

| Building Sub-Areas (sq ft) | Legend |
|---|---|
| No Data for Building Sub-Areas | |

### Extra Features

| Extra Features | Legend |
|---|---|
| No Data for Extra Features | |

## Land

### Land Use

| | |
|---|---|
| **Use Code** | 433V |
| **Description** | Radio, Television Trans Ld |
| **Zone** | R-80 |
| **Alt Land Appr** | No |
| **Category** | |

### Land Line Valuation

| | |
|---|---|
| **Size (Acres)** | 0.17 |
| **Depth** | |

## Outbuildings

| Outbuildings | | | | | Legend |
|---|---|---|---|---|---|
| **Code** | **Description** | **Sub Code** | **Sub Description** | **Size** | **Bldg #** |
| FN1 | Fence - Chain | | | 400.00 L.F. | 1 |
| SHD1 | Shed | MS | Masonry | 572.00 S.F. | 1 |
| GEN | Generator | | Generator | 0.00 Units | 1 |
| GEN | Generator | | Generator | 0.00 Units | 1 |

## Valuation History

| Appraisal | | | |
|---|---|---|---|
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2023 | $8,010 | $244,020 | $252,030 |
| 2022 | $8,010 | $244,020 | $252,030 |
| 2021 | $8,010 | $244,020 | $252,030 |
| 2020 | $8,010 | $244,020 | $252,030 |
| 2019 | $18,560 | $227,860 | $246,420 |

| Assessment | | | |
|---|---|---|---|
| **Valuation Year** | **Improvements** | **Land** | **Total** |
| 2023 | $5,610 | $170,810 | $176,420 |
| 2022 | $5,610 | $170,810 | $176,420 |
| 2021 | $5,610 | $170,810 | $176,420 |
| 2020 | $5,610 | $170,810 | $176,420 |
| 2019 | $12,990 | $159,500 | $172,490 |

CENTERLINE

# EXHIBIT C

## Structural Analysis Report

AMERICAN TOWER®
CORPORATION

This report was prepared for American Tower Corporation by

TOWER ENGINEERING PROFESSIONALS

# Structural Analysis Report

| | | |
|---|---|---|
| **Structure** | : | 150 ft Monopole |
| **ATC Asset Name** | : | Sttn - Southington |
| **ATC Asset Number** | : | 302475 |
| **Engineering Number** | : | 13703662_C3_03 |
| **Proposed Carrier** | : | VERIZON WIRELESS |
| **Carrier Site Name** | : | SOUTHINGTON 3 CT - A |
| **Carrier Site Number** | : | 468851 |
| **Site Location** | : | 80 Shuttle Meadow Road<br>Southington, CT 06489-1313<br>41.6386, -72.8411 |
| **County** | : | Hartford |
| **Date** | : | May 4, 2023 |
| **Max Usage** | : | 99% |
| **Analysis Result** | : | Pass |

Prepared By:

Michael Dugan
TEP

Reviewed By:

STATE OF CONNECTICUT
AARON THOMAS RUCKER
32608
LICENSED
PROFESSIONAL ENGINEER

05/04/2023

**COA: PEC.0001553**

## Introduction

The purpose of this report is to summarize results of a structural analysis performed on the 150 ft Monopole tower to reflect the change in loading by VERIZON WIRELESS.

## Supporting Documents

| | |
|---|---|
| **Tower Drawing:** | SpectraSite Mapping Site #CT-0011, dated May 29, 2002<br>AT&T Technologies Project #AT-8935, dated April 13, 1984 |
| **Foundation Drawing:** | Girard & Co. Engineers Project #38922, dated May 18, 1983<br>Mapping by Delta Oaks Group Project #BG121-11413-01, dated October 20, 2021 |
| **Geotechnical Report:** | GeoTechnologies Project #1-02-0934-EA, dated July 12, 2002 |
| **Modification:** | ATC Job #40480332, dated May 25, 2007<br>ATC Job #42608538, dated April 22, 2009<br>ATC Job #OAA740798_C6_05, dated January 22, 2019<br>ATC Job #12978549_C6_11, dated September 14, 2020<br>ATC Job #14098054_C6_06, dated September 6, 2022 |

## Analysis

The tower was analyzed using American Tower Corporation's tower analysis software. This program considers an elastic three-dimensional model and second-order effects per ANSI/TIA-222.

| | |
|---|---|
| **Basic Wind Speed:** | 120 mph (3-second gust) |
| **Basic Wind Speed w/ Ice:** | 50 mph (3-second gust) w/ 1.50" radial ice concurrent |
| **Code(s):** | ANSI/TIA-222-H / 2021 IBC / 2022 Connecticut State Building Code |
| **Exposure Category:** | B |
| **Risk Category:** | II |
| **Topographic Factor Procedure:** | Method 1 |
| **Topographic Category:** | 1 |
| **Spectral Response:** | Ss = 0.20, $S_1$ = 0.06 |
| **Site Class:** | D - Stiff Soil - Default |

***Wind load and ice thickness have been reduced by applicable existing structure load modification factors in accordance with TIA-222-H, ANNEX-S***

## Conclusion

Based on the analysis results, the structure meets the requirements per the applicable codes listed above. The tower and foundation can support the equipment as described in this report.

If you have any questions or require additional information, please contact American Tower via email at **Engineering@americantower.com** Please include the American Tower site name, site number, and engineering number in the subject line for any questions.

## Proposed Carrier Final Loading

| Elev.* | Qty | Equipment | Lines | Carrier |
|---|---|---|---|---|
| 143.0’ | 1 | Raycap RVZDC-6627-PF-48 | (2) 1 5/8" Hybriflex | VERIZON WIRELESS |
| | 3 | Samsung B2/B66A RRH-BR049 | | |
| | 3 | Samsung B5/B13 RRH-BR04C | | |
| | 3 | Samsung MT6407-77A | | |
| | 3 | Samsung Outdoor CBRS 20W RRH –Clip-on Antenna | | |
| | 3 | Samsung RT4401-48A | | |
| | 6 | Commscope NNHH-65B-R4 | | |
| | 1 | Site-Pro RMQP-496 w/ HRK-12 | | |

*(If table breaks across pages, please see previous page for data in merged cells)*

***Contracted elevations are shown for appurtenances within contracted installation tolerances. Appurtenances outside of contract limits are shown at installed elevations.***

## Other Existing/Reserved Loading

| Elev.* | Qty | Equipment | Lines | Carrier |
|---|---|---|---|---|
| 153.0’ | 1 | Andrew SBNH-1D6565C (60.8 lbs) | (2) 0.39" (10mm) Fiber Trunk<br>(6) 0.78" (19.7mm) 8 AWG 6<br>(1) 3" conduit<br>(12) 7/8" Coax | AT&T MOBILITY |
| | 1 | Kathrein Scala 80010966 | | |
| | 1 | Raycap DC6-48-60-18-8F ("Squid") | | |
| | 2 | KMW AM-X-CD-16-65-00T-RET | | |
| | 2 | Kathrein Scala 80010965 | | |
| | 2 | Raycap DC6-48-60-18-8F (23.5" Height) | | |
| | 3 | CCI DTMABP7819VG12A (w/ Bracket) | | |
| | 3 | Ericsson RRUS 32 B2 | | |
| | 3 | Ericsson RRUS 4426 B66 | | |
| | 3 | Ericsson RRUS 4478 B14 | | |
| | 3 | Ericsson RRUS 4478 B5 | | |
| | 3 | Ericsson RRUS-11 (50 lbs.) | | |
| | 3 | Ericsson RRUS-32 (77 lbs) | | |
| | 3 | Powerwave Allgon 7770.00 | | |
| | 3 | Quintel QS66512-3 (112 lbs.) | | |
| | 6 | CCI TPX-070821 | | |
| | 6 | Kaelus DBCT108F1V92-1 | | |
| 150.0’ | 1 | Platform w/ Handrails | | |
| 130.0’ | 3 | Site-Pro UWS6-NP Collar | (12) 1 5/8" Coax<br>(3) 1.99" (50.7mm) Hybrid | T-MOBILE |
| | 3 | Ericsson 4480 BAND 71 | | |
| | 3 | RFS APXVAALL24 43-U-NA20 | | |
| 111.2’ | 1 | dB Systems 5100A | (6) 7/8" Coax | L3HARRIS TECHNOLOGIES, INC. |
| 111.1’ | 4 | dB Systems 5100A-D | | |
| 105.0’ | 3 | Side Arm | | |
| 104.0’ | 1 | VertexRSI 101V VPD | | |

*(If table breaks across pages, please see previous page for data in merged cells)*

***Contracted elevations are shown for appurtenances within contracted installation tolerances. Appurtenances outside of contract limits are shown at installed elevations.***

## Structure Usages

| Structural Component | Usage | Pass/Fail |
|---|---|---|
| Anchor Rods | 73% | Pass |
| Base Plate | 31% | Pass |
| Shaft | 92% | Pass |
| Flange Bolts | 25% | Pass |
| Flange Plates | 22% | Pass |
| Reinforcement | 79% | Pass |

## Foundation Reactions & Usages

| Reaction Component | Analysis Reactions | Usage |
|---|---|---|
| Moment (k-ft) | 2860.0 | 89% |
| Axial (k) | 51.8 | 99% |
| Shear (k) | 26.9 | 49% |

The structure base reactions resulting from this analysis were found to be acceptable through analysis based on geotechnical and foundation information, therefore no modification or reinforcement of the foundation will be required.

**Standard Conditions**

All engineering services performed by A.T. Engineering Services LLC are prepared on the basis that the information used is current and correct. This information may consist of, but is not limited to the following:

- Information supplied by the client regarding antenna, mounts, and feed line loading
- Information from drawings, design and analysis documents, and field notes in the possession of A.T. Engineering Services LLC

It is the responsibility of the client to ensure that the information provided to A.T. Engineering Services LLC and used in the performance of our engineering services is correct and complete.

All assets of American Tower Corporation, its affiliates, and subsidiaries (collectively "American Tower") are inspected at regular intervals. Based upon these inspections and in the absence of information to the contrary, American Tower assumes that all structures were constructed in accordance with the drawings and specifications.

Unless explicitly agreed by both the client and A.T. Engineering Services LLC, all services will be performed in accordance with the current revision of ANSI/TIA-222.

All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. A.T. Engineering Services LLC is not responsible for the conclusions, opinions and recommendations made by others based on the information supplied herein.

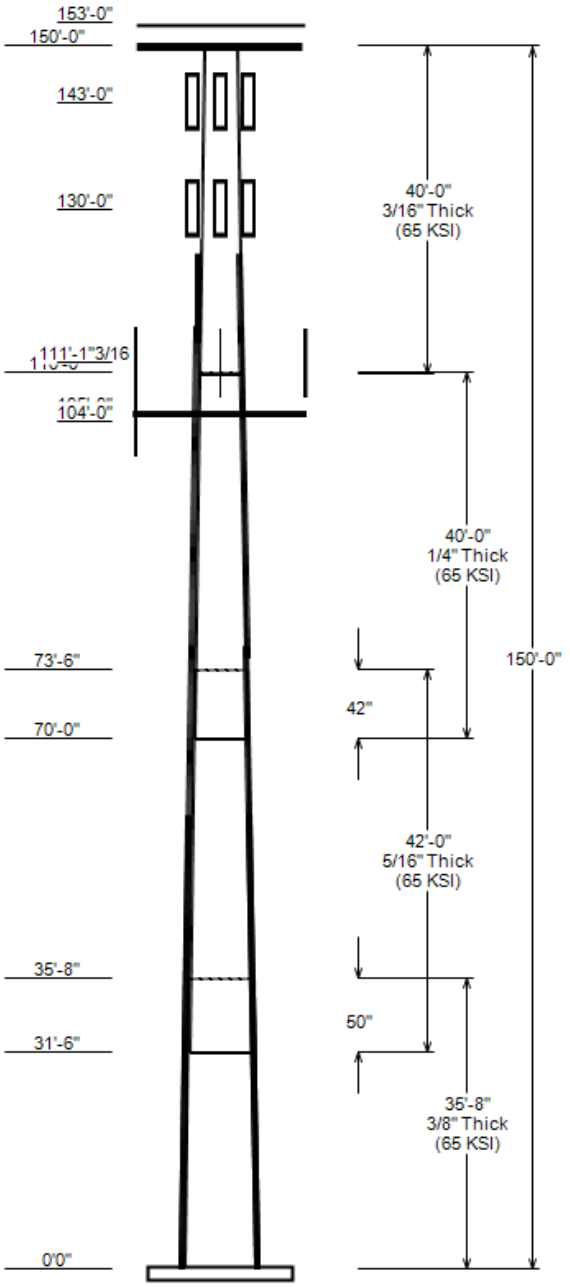
| | | | |
|---|---|---|---|
| ASSET: | 302475, Sttn - Southington | CODE: | ANSI/TIA-222-H |
| CUSTOMER: | VERIZON WIRELESS | PROJECT: | 13703662 |

## ANALYSIS PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| **Nominal Wind:** | 117 mph | **Ice Wind:** | 49 mph w/ 1.28" ice | **Service Wind:** | 60 mph |
| **Risk Category:** | II | **Exposure:** | B | **$S_s$:** 0.195 | **$S_1$:** 0.055 |
| **Topo Category:** | 1 | **Topo Factor:** | Method 1 | **Topo Feature:** | |
| **Structure Height:** | 150 ft | **Base Elevation:** | 0.00 ft | **Structure Type:** | Taper |
| **Base Diameter:** | 37 in | **Base Rotation:** | 0° | **Taper:** | 0.1610 (in/ft) |

## POLE SECTION PROPERTIES

| Section | Length (ft) | Flat Diameter (in) Top | Flat Diameter (in) Bottom | Thick (in) | Joint Type | Joint Length (in) | Pole Shape | Yield Strength (ksi) |
|---|---|---|---|---|---|---|---|---|
| 1 | 35.667 | 31.26 | 37.00 | 0.375 | | 0.000 | 12 Sides | 65 |
| 2 | 42.000 | 25.80 | 32.56 | 0.312 | Slip Joint | 50.000 | 12 Sides | 65 |
| 3 | 40.000 | 20.43 | 26.87 | 0.250 | Slip Joint | 42.000 | 12 Sides | 65 |
| 4 | 40.000 | 14.00 | 20.43 | 0.188 | Butt Joint | 0.000 | 12 Sides | 65 |




## DISCRETE APPURTENANCE

| Elev (ft) | Description |
|---|---|
| 153.0 | (6) CCI TPX-070821 |
| 153.0 | (6) Kaelus DBCT108F1V92-1 |
| 153.0 | (2) Raycap DC6-48-60-18-8F (23.5" |
| 153.0 | (3) CCI DTMABP7819VG12A (w/ Bracke |
| 153.0 | (1) Raycap DC6-48-60-18-8F ("Squid |
| 153.0 | (3) Ericsson RRUS 4426 B66 |
| 153.0 | (3) Ericsson RRUS 4478 B5 |
| 153.0 | (3) Ericsson RRUS 4478 B14 |
| 153.0 | (3) Ericsson RRUS-11 (50 lbs.) |
| 153.0 | (3) Ericsson RRUS 32 B2 |
| 153.0 | (3) Ericsson RRUS-32 (77 lbs) |
| 153.0 | (3) Powerwave Allgon 7770.00 |
| 153.0 | (2) KMW AM-X-CD-16-65-00T-RET |
| 153.0 | (3) Quintel QS66512-3 (112 lbs.) |
| 153.0 | (1) Andrew SBNH-1D6565C (60.8 lbs) |
| 153.0 | (2) Kathrein Scala 80010965 |
| 153.0 | (1) Kathrein Scala 80010966 |
| 150.0 | (1) Generic Flat Platform with Han |
| 143.0 | (3) Samsung Outdoor CBRS 20W RRH – |
| 143.0 | (3) Samsung RT4401-48A |
| 143.0 | (3) Samsung B2/B66A RRH-BR049 |
| 143.0 | (3) Samsung B5/B13 RRH-BR04C |
| 143.0 | (1) Raycap RVZDC-6627-PF-48 |
| 143.0 | (3) Samsung MT6407-77A |
| 143.0 | (6) Commscope NNHH-65B-R4 |
| 143.0 | (1) Site-Pro RMQP-496 w/ HRK-12 |
| 130.0 | (1) Site-Pro UWS6-NP Collar |
| 130.0 | (3) Ericsson 4480 BAND 71 |
| 130.0 | (3) RFS APXVAALL24 43-U-NA20 |
| 111.2 | (1) dB Systems 5100A |
| 111.1 | (4) dB Systems 5100A-D |
| 105.0 | (3) Round Side Arm |
| 104.0 | (1) VertexRSI 101V VPD |

## LINEAR APPURTENANCE

| Elev To (ft) | Description |
|---|---|
| 153.0 | (12) 7/8" Coax |
| 153.0 | (1) 3" conduit |
| 153.0 | (6) 0.78" (19.7mm) 8 AWG 6 |
| 153.0 | (2) 0.39" (10mm) Fiber Trunk |
| 143.0 | (2) 1 5/8" Hybriflex |
| 130.0 | (3) 1.99" (50.7mm) Hybrid |
| 130.0 | (6) 1 5/8" Coax |
| 130.0 | (6) 1 5/8" Coax |
| 129.0 | (1) W8 Brackets for #20 |
| 129.0 | (1) W8 Brackets for #20 |
| 129.0 | (1) W8 Brackets for #20 |
| 129.0 | (1) W8 Brackets for #20 |
| 129.0 | (1) #20 w/ W Brackets |
| 129.0 | (1) #20 w/ W Brackets |
| 129.0 | (1) #20 w/ W Brackets |
| 129.0 | (1) #20 w/ W Brackets |
| 119.0 | (1) W5 Brackets for #20 |
| 119.0 | (1) W5 Brackets for #20 |
| 119.0 | (1) W5 Brackets for #20 |
| 119.0 | (1) #20 w/ W Brackets |
| 119.0 | (1) #20 w/ W Brackets |
| 119.0 | (1) #20 w/ W Brackets |
| 119.0 | (1) #20 w/ W Brackets |
| 111.0 | (6) 7/8" Coax |
| 80.0 | (1) #20 w/ Angle Brackets |
| 80.0 | (1) #20 w/ Angle Brackets |
| 80.0 | (1) #20 w/ Angle Brackets |
| 80.0 | (1) #20 w/ Angle Brackets |
| 62.5 | (1) #20 w/ Angle Brackets |
| 62.5 | (1) #20 w/ Angle Brackets |
| 62.5 | (1) #20 w/ Angle Brackets |
| 62.5 | (1) #20 w/ Angle Brackets |

## GLOBAL BASE REACTIONS

| Load Case | Moment (kip-ft) | Axial (kip) | Shear (kip) |
|---|---|---|---|
| 1.2D + 1.0W | 2860.03 | 51.77 | 26.91 |
| 0.9D + 1.0W | 2811.95 | 38.82 | 26.88 |
| 1.2D + 1.0Di + 1.0Wi | 848.14 | 79.06 | 7.09 |
| 1.2D + 1.0Ev + 1.0Eh | 171.23 | 51.42 | 1.30 |
| 0.9D - 1.0Ev + 1.0Eh | 167.46 | 35.55 | 1.30 |
| 1.0D + 1.0W | 666.91 | 43.19 | 6.33 |

## ANALYSIS PARAMETERS

| | | | |
|---|---|---|---|
| **Location:** | Hartford County,CT | **Height:** | 150 ft |
| **Type and Shape:** | Taper, 12 Sides | **Base Diameter:** | 37.00 in |
| **Manufacturer:** | ITT Meyer | **Top Diameter:** | 14.00 in |
| **$K_d$ (non-service):** | 0.95 | **Taper:** | 0.1610 in/ft |
| **$K_e$:** | 0.98 | **Rotation:** | 0.000° |

## ICE & WIND PARAMETERS

| | | | |
|---|---|---|---|
| **Risk Category:** | II | **Design Wind Speed:** | 117 mph |
| **Exposure Category:** | B | **Design Wind Speed w/ Ice:** | 49 mph |
| **Topo Factor Procedure:** | Method 1 | **Design Ice Thickness:** | 1.28 in |
| **Topographic Category:** | 1 | **Service Wind Speed:** | 60 mph |
| **Crest Height:** | 0 ft | **HMSL:** | 489.00 ft |

## SEISMIC PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| **Analysis Method:** | Equivalent Lateral Force Method | | | | |
| **Site Class:** | D - Stiff Soil | | **Period Based on Rayleigh Method (sec):** | | 2.90 |
| **$T_L$ (sec):** | 6 | **P:** | 1 | **$C_s$:** | 0.030 |
| **$S_s$:** | 0.195 | **$S_1$:** | 0.055 | **$C_s$ Max:** | 0.030 |
| **$F_a$:** | 1.600 | **$F_v$:** | 2.400 | **$C_s$ Min:** | 0.030 |
| **$S_{ds}$:** | 0.208 | **$S_{d1}$:** | 0.088 | | |

## LOAD CASES

| | |
|---|---|
| 1.2D + 1.0W | 116.96 mph Wind with No Ice |
| 0.9D + 1.0W | 116.96 mph Wind with No Ice (Reduced DL) |
| 1.2D + 1.0Di + 1.0Wi | 48.73 mph Wind with 1.275" Radial Ice |
| 1.2D + 1.0Ev + 1.0Eh | Seismic |
| 0.9D - 1.0Ev + 1.0Eh | Seismic (Reduced DL) |
| 1.0D + 1.0W | 60 mph Wind with No Ice |

## SHAFT SECTION PROPERTIES

| | | | | | | | Bottom | | | | | | Top | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Section | Length (ft) | Thick (in) | Fy (ksi) | Joint Type | Joint Len (in) | Weight (lb) | Dia (in) | Elev (ft) | Area ($in^2$) | Ix ($in^4$) | W/t Ratio | D/t Ratio | Dia (in) | Elev (ft) | Area ($in^2$) | Ix ($in^4$) | W/t Ratio | D/t Ratio | Taper (in/ft) |
| 1-12 | 35.67 | 0.3750 | 65 | | 0.00 | 4,947 | 37.00 | 0.003 | 44.22 | 7,571.9 | 23.76 | 98.67 | 31.26 | 35.67 | 37.30 | 4,542.2 | 19.66 | 83.37 | 0.1608 |
| 2-12 | 42.00 | 0.3125 | 65 | Slip | 50.00 | 4,152 | 32.56 | 31.500 | 32.45 | 4,306.5 | 25.24 | 104.19 | 25.80 | 73.50 | 25.65 | 2,127.5 | 19.45 | 82.57 | 0.1608 |
| 3-12 | 40.00 | 0.2500 | 65 | Slip | 42.00 | 2,564 | 26.87 | 70.000 | 21.43 | 1,937.5 | 26.12 | 107.47 | 20.43 | 110.00 | 16.25 | 844.8 | 19.22 | 81.73 | 0.1608 |
| 4-12 | 40.00 | 0.1875 | 65 | Butt | 0.00 | 1,399 | 20.43 | 110.000 | 12.22 | 639.5 | 26.52 | 108.98 | 14.00 | 150.00 | 8.34 | 203.1 | 17.33 | 74.67 | 0.1608 |
| | | | **Total Shaft Weight** | | | **13,062** | | | | | | | | | | | | | |

## DISCRETE APPURTENANCE PROPERTIES

| Attach Elev (ft) | Description | Qty | Ka | Vert Ecc (ft) | No Ice Weight (lb) | No Ice EPAa (sf) | No Ice Orientation Factor | Ice Weight (lb) | Ice EPAa (sf) | Ice Orientation Factor |
|---|---|---|---|---|---|---|---|---|---|---|
| 153.00 | CCI TPX-070821 | 6 | 0.75 | 0.000 | 7.50 | 0.469 | 0.50 | 17.81 | 0.876 | 0.50 |
| 153.00 | Kathrein Scala 80010965 | 2 | 0.75 | 0.000 | 97.60 | 13.814 | 0.72 | 324.30 | 16.408 | 0.72 |
| 153.00 | Andrew SBNH-1D6565C (60.8 lbs) | 1 | 0.75 | 0.000 | 60.80 | 11.440 | 1.00 | 255.90 | 14.191 | 1.00 |
| 153.00 | Quintel QS66512-3 (112 lbs.) | 3 | 0.75 | 0.000 | 112.00 | 8.133 | 0.74 | 281.45 | 10.503 | 0.74 |
| 153.00 | KMW AM-X-CD-16-65-00T-RET | 2 | 0.75 | 0.000 | 48.50 | 8.024 | 0.75 | 186.20 | 10.396 | 0.75 |
| 153.00 | Powerwave Allgon 7770.00 | 3 | 0.75 | 0.000 | 35.00 | 5.508 | 0.65 | 131.66 | 7.316 | 0.65 |
| 153.00 | Ericsson RRUS-32 (77 lbs) | 3 | 0.75 | 0.000 | 77.00 | 3.314 | 0.50 | 159.70 | 4.406 | 0.50 |
| 153.00 | Ericsson RRUS 32 B2 | 3 | 0.75 | 0.000 | 53.00 | 2.743 | 0.50 | 115.54 | 3.737 | 0.50 |
| 153.00 | Ericsson RRUS-11 (50 lbs.) | 3 | 0.75 | 0.000 | 50.00 | 2.566 | 0.50 | 107.96 | 3.457 | 0.50 |
| 153.00 | Ericsson RRUS 4478 B5 | 3 | 0.75 | 0.000 | 59.90 | 1.842 | 0.50 | 106.92 | 2.605 | 0.50 |
| 153.00 | Ericsson RRUS 4478 B14 | 3 | 0.75 | 0.000 | 59.90 | 1.842 | 0.50 | 106.92 | 2.605 | 0.50 |
| 153.00 | Ericsson RRUS 4426 B66 | 3 | 0.75 | 0.000 | 48.40 | 1.650 | 0.50 | 86.36 | 2.372 | 0.50 |
| 153.00 | Raycap DC6-48-60-18-8F ("Squid | 1 | 0.75 | 0.000 | 18.90 | 1.470 | 1.00 | 71.38 | 2.064 | 1.00 |
| 153.00 | CCI DTMABP7819VG12A (w/ Bracke | 3 | 0.75 | 0.000 | 19.20 | 1.370 | 0.50 | 48.16 | 2.034 | 0.50 |
| 153.00 | Raycap DC6-48-60-18-8F (23.5" | 2 | 0.75 | 0.000 | 20.00 | 1.260 | 1.00 | 64.77 | 1.820 | 1.00 |
| 153.00 | Kaelus DBCT108F1V92-1 | 6 | 0.75 | 0.000 | 28.70 | 0.633 | 0.50 | 50.07 | 1.097 | 0.50 |
| 153.00 | Kathrein Scala 80010966 | 1 | 0.75 | 0.000 | 114.60 | 17.363 | 1.00 | 387.64 | 20.500 | 1.00 |
| 150.00 | Generic Flat Platform with Han | 1 | 1.00 | 0.000 | 2500.00 | 42.400 | 1.00 | 4010.56 | 60.233 | 1.00 |
| 143.00 | Site-Pro RMQP-496 w/ HRK-12 | 1 | 1.00 | 0.000 | 2445.80 | 21.760 | 1.00 | 3888.63 | 34.597 | 1.00 |
| 143.00 | Samsung Outdoor CBRS 20W RRH – | 3 | 0.75 | 0.000 | 4.40 | 0.892 | 0.50 | 19.64 | 1.433 | 0.50 |
| 143.00 | Samsung RT4401-48A | 3 | 0.75 | 0.000 | 18.60 | 0.996 | 0.50 | 41.47 | 1.575 | 0.50 |
| 143.00 | Samsung B2/B66A RRH-BR049 | 3 | 0.75 | 0.000 | 84.40 | 1.875 | 0.50 | 138.42 | 2.639 | 0.50 |
| 143.00 | Samsung B5/B13 RRH-BR04C | 3 | 0.75 | 0.000 | 70.30 | 1.875 | 0.50 | 118.74 | 2.639 | 0.50 |
| 143.00 | Raycap RVZDC-6627-PF-48 | 1 | 0.75 | 0.000 | 32.00 | 3.781 | 0.50 | 124.86 | 4.901 | 0.50 |
| 143.00 | Samsung MT6407-77A | 3 | 0.75 | 0.000 | 81.60 | 4.709 | 0.61 | 167.91 | 5.995 | 0.61 |
| 143.00 | Commscope NNHH-65B-R4 | 6 | 0.75 | 0.000 | 83.80 | 12.271 | 0.64 | 296.57 | 14.645 | 0.64 |
| 130.00 | Site-Pro UWS6-NP Collar | 1 | 1.00 | 0.000 | 96.00 | 1.500 | 1.00 | 148.12 | 2.630 | 1.00 |
| 130.00 | Ericsson 4480 BAND 71 | 3 | 0.80 | 0.000 | 81.00 | 2.878 | 0.50 | 144.79 | 3.819 | 0.50 |
| 130.00 | RFS APXVAALL24 43-U-NA20 | 3 | 0.80 | 0.000 | 122.80 | 20.243 | 0.63 | 449.21 | 23.351 | 0.63 |
| 111.20 | dB Systems 5100A | 1 | 1.00 | 0.000 | 21.00 | 2.048 | 1.00 | 65.09 | 3.165 | 1.00 |
| 111.10 | dB Systems 5100A-D | 4 | 1.00 | 0.000 | 38.00 | 3.093 | 1.00 | 118.79 | 4.252 | 1.00 |
| 105.00 | Round Side Arm | 3 | 1.00 | 0.000 | 300.00 | 10.400 | 0.67 | 420.18 | 14.864 | 0.67 |
| 104.00 | VertexRSI 101V VPD | 1 | 1.00 | 0.000 | 4.00 | 2.407 | 1.00 | 67.47 | 7.749 | 1.00 |
| **Totals** | **Row Count: 33** | **88** | | | **10,329.80** | | | **20,767.14** | | |

## LINEAR APPURTENANCE PROPERTIES

*Load Case Azimuth (deg): 0.00*

| Elev From (ft) | Elev To (ft) | Qty | Description | Diameter (in) | Weight (lb/ft) | Flat | Max/ Row | Distance Between Rows(in) | Distance Between Cols(in) | Azimuth (deg) | Distance From Face (in) | Exposed To Wind | Carrier |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 153.00 | 12 | 7/8" Coax | 1.09 | 0.33 | N | 0 | 0 | 0 | 0 | 0 | N | AT&T MOBILITY |
| 0.00 | 153.00 | 6 | 0.78" (19.7mm) 8 AWG | 0.78 | 0.59 | N | 0 | 0 | 0 | 0 | 0 | N | AT&T MOBILITY |
| 0.00 | 153.00 | 2 | 0.39" (10mm) Fiber Tr | 0.39 | 0.06 | N | 0 | 0 | 0 | 0 | 0 | N | AT&T MOBILITY |
| 0.00 | 153.00 | 1 | 3" conduit | 3.5 | 7.58 | N | 0 | 0 | 0 | 0 | 0 | N | AT&T MOBILITY |
| 0.00 | 143.00 | 2 | 1 5/8" Hybriflex | 1.98 | 1.3 | N | 1 | 0 | 0 | 0 | 0 | N | VERIZON WIRELESS |
| 0.00 | 130.00 | 6 | 1 5/8" Coax | 1.98 | 0.82 | N | 6 | 1 | 1 | 220 | 1 | Y | T-MOBILE |
| 0.00 | 130.00 | 6 | 1 5/8" Coax | 1.98 | 0.82 | N | 4 | 1 | 1 | 110 | 1 | Y | T-MOBILE |
| 0.00 | 130.00 | 3 | 1.99" (50.7mm) Hybrid | 1.99 | 1.9 | N | 3 | 1 | 1 | 200 | 1 | Y | T-MOBILE |
| 109.00 | 129.00 | 1 | W8 Brackets for #20 | 2.48 | 0 | Y | 1 | 0 | 0 | 15 | 2.9 | Y | |

## LINEAR APPURTENANCE PROPERTIES

*Load Case Azimuth (deg): 0.00*

| Elev From (ft) | Elev To (ft) | Qty | Description | Diameter (in) | Weight (lb/ft) | Flat | Max/ Row | Distance Between Rows(in) | Distance Between Cols(in) | Azimuth (deg) | Distance From Face (in) | Exposed To Wind | Carrier |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 109.00 | 129.00 | 1 | W8 Brackets for #20 | 2.48 | 0 | Y | 1 | 0 | 0 | 105 | 2.9 | Y | |
| 109.00 | 129.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 15 | 8.28 | Y | |
| 109.00 | 129.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 195 | 8.28 | Y | |
| 109.00 | 129.00 | 1 | W8 Brackets for #20 | 2.48 | 0 | Y | 1 | 0 | 0 | 195 | 2.9 | Y | |
| 109.00 | 129.00 | 1 | W8 Brackets for #20 | 2.48 | 0 | Y | 1 | 0 | 0 | 285 | 2.9 | Y | |
| 109.00 | 129.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 285 | 8.28 | Y | |
| 109.00 | 129.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 105 | 8.28 | Y | |
| 69.00 | 119.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 30 | 5.15 | Y | |
| 69.00 | 119.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 300 | 5.15 | Y | |
| 69.00 | 119.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 210 | 5.15 | Y | |
| 69.00 | 119.00 | 1 | #20 w/ W Brackets | 2.5 | 0 | N | 1 | 0 | 0 | 120 | 5.15 | Y | |
| 69.00 | 119.00 | 1 | W5 Brackets for #20 | 1.55 | 0 | Y | 1 | 0 | 0 | 300 | 1.8 | Y | |
| 69.00 | 119.00 | 1 | W5 Brackets for #20 | 1.55 | 0 | Y | 1 | 0 | 0 | 210 | 1.8 | Y | |
| 69.00 | 119.00 | 1 | W5 Brackets for #20 | 1.55 | 0 | Y | 1 | 0 | 0 | 120 | 1.8 | Y | |
| 69.00 | 119.00 | 1 | W5 Brackets for #20 | 1.55 | 0 | Y | 1 | 0 | 0 | 30 | 1.8 | Y | |
| 0.00 | 111.00 | 6 | 7/8" Coax | 1.09 | 0.33 | N | 6 | 1 | 1 | 0 | 1 | Y | L3HARRIS TECHNOLOGI |
| 0.00 | 80.00 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 330 | 0 | Y | |
| 0.00 | 80.00 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 60 | 0 | Y | |
| 0.00 | 80.00 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 150 | 0 | Y | |
| 0.00 | 80.00 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 240 | 0 | Y | |
| 0.00 | 62.50 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 270 | 0 | Y | |
| 0.00 | 62.50 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 0 | 0 | Y | |
| 0.00 | 62.50 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 90 | 0 | Y | |
| 0.00 | 62.50 | 1 | #20 w/ Angle Brackets | 4 | 4.68 | N | 1 | 0 | 0 | 180 | 0 | Y | |

## ADDITIONAL STEEL

| Elev From (ft) | Elev To (ft) | Qty | Description | Fy (ksi) | Intermediate Connectors: Offset (in) | Intermediate Connectors: Bracket Type | Intermediate Connectors: Spacing (in) | Intermediate Connectors: Length (in) | Intermediate Connectors: Connectors | Continuation? |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 55.48 | 4 | SOL #20 All Thread Bar | 80 | 2.19 | 6" Angle Bracket | 30.00 | 3.31 | 5/8" A36 U-Bolt | N |
| 0.00 | 76.25 | 4 | SOL #20 All Thread Bar | 80 | 2.19 | 6" Angle Bracket | 30.00 | 3.31 | 5/8" A36 U-Bolt | N |
| 74.92 | 115.54 | 4 | SOL #20 All Thread Bar | 80 | 5.15 | 6" T Bracket | 32.00 | 3.31 | 5/8" A36 U-Bolt | N |
| 113.56 | 124.44 | 4 | SOL #20 All Thread Bar | 80 | 8.28 | 6" T Bracket | 32.00 | 3.31 | 5/8" A36 U-Bolt | N |

## SEGMENT PROPERTIES

| Seg Top Elev (ft) | Description *(Max Length: 5 ft)* | Thick (in) | Flat Dia (in) | Area ($in^2$) | Ix ($in^4$) | W/t Ratio | D/t Ratio | F'y (ksi) | S ($in^3$) | Z ($in^3$) | Weight (lb) | Additional Reinforcing: Area ($in^2$) | Additional Reinforcing: Ix ($in^4$) | Additional Reinforcing: Weight (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | 0.3750 | 37.000 | 44.225 | 7,571.90 | 23.76 | 98.67 | 78.8 | 395.3 | 0.0 | 0.0 | 39.280 | 9,469.30 | 0.0 |
| 5.00 | | 0.3750 | 36.196 | 43.254 | 7,084.00 | 23.18 | 96.52 | 79.4 | 378.1 | 0.0 | 744.2 | 39.280 | 9,126.00 | 668.0 |
| 10.00 | | 0.3750 | 35.392 | 42.283 | 6,617.60 | 22.61 | 94.38 | 80.1 | 361.2 | 0.0 | 727.7 | 39.280 | 8,789.00 | 668.0 |
| 15.00 | | 0.3750 | 34.588 | 41.312 | 6,172.00 | 22.03 | 92.23 | 80.7 | 344.7 | 0.0 | 711.1 | 39.280 | 8,458.40 | 668.0 |
| 20.00 | | 0.3750 | 33.783 | 40.341 | 5,747.00 | 21.46 | 90.09 | 81.3 | 328.6 | 0.0 | 694.6 | 39.280 | 8,134.10 | 668.0 |
| 25.00 | | 0.3750 | 32.979 | 39.370 | 5,341.90 | 20.89 | 87.94 | 81.9 | 312.9 | 0.0 | 678.1 | 39.280 | 7,816.10 | 668.0 |
| 30.00 | | 0.3750 | 32.175 | 38.399 | 4,956.30 | 20.31 | 85.80 | 81.9 | 297.6 | 0.0 | 661.6 | 39.280 | 7,504.50 | 668.0 |
| 31.50 | Bot - Section 2 | 0.3750 | 31.934 | 38.107 | 4,844.30 | 20.14 | 85.16 | 81.9 | 293.1 | 0.0 | 195.3 | 39.280 | 7,412.30 | 200.4 |
| 35.00 | | 0.3750 | 31.371 | 37.427 | 4,589.70 | 19.74 | 83.66 | 81.9 | 282.6 | 0.0 | 832.9 | 39.280 | 7,436.00 | 467.6 |
| 35.67 | Top - Section 1 | 0.3125 | 31.889 | 31.773 | 4,043.60 | 24.66 | 102.04 | 77.8 | 245.0 | 0.0 | 157.0 | 39.280 | 7,395.10 | 89.1 |
| 40.00 | | 0.3125 | 31.192 | 31.072 | 3,781.70 | 24.07 | 99.81 | 78.5 | 234.2 | 0.0 | 463.3 | 39.280 | 7,132.20 | 578.9 |
| 45.00 | | 0.3125 | 30.388 | 30.263 | 3,493.90 | 23.38 | 97.24 | 79.2 | 222.1 | 0.0 | 521.8 | 39.280 | 6,834.70 | 668.0 |
| 50.00 | | 0.3125 | 29.583 | 29.454 | 3,221.00 | 22.69 | 94.67 | 80 | 210.3 | 0.0 | 508.0 | 39.280 | 6,543.60 | 668.0 |
| 55.00 | | 0.3125 | 28.779 | 28.645 | 2,962.80 | 22.00 | 92.09 | 80.7 | 198.9 | 0.0 | 494.2 | 39.280 | 6,258.80 | 668.0 |
| 55.48 | Reinf. Top | 0.3125 | 28.702 | 28.567 | 2,938.80 | 21.93 | 91.85 | 80.8 | 197.8 | 0.0 | 46.7 | 39.280 | 6,231.80 | 64.1 |
| 60.00 | | 0.3125 | 27.975 | 27.835 | 2,718.70 | 21.31 | 89.52 | 81.5 | 187.7 | 0.0 | 433.7 | 19.640 | 2,990.20 | 301.9 |
| 65.00 | | 0.3125 | 27.171 | 27.026 | 2,488.50 | 20.62 | 86.95 | 81.9 | 176.9 | 0.0 | 466.7 | 19.640 | 2,854.10 | 334.0 |
| 70.00 | Bot - Section 3 | 0.3125 | 26.367 | 26.217 | 2,271.60 | 19.93 | 84.37 | 81.9 | 166.4 | 0.0 | 452.9 | 19.640 | 2,721.30 | 334.0 |
| 73.50 | Top - Section 2 | 0.2500 | 26.304 | 20.973 | 1,817.20 | 25.51 | 105.21 | 76.9 | 133.5 | 0.0 | 561.3 | 19.640 | 2,711.00 | 233.8 |
| 74.92 | Reinf Bottom | 0.2500 | 26.075 | 20.789 | 1,769.80 | 25.27 | 104.30 | 77.2 | 131.1 | 0.0 | 100.9 | 19.640 | 2,673.90 | 94.9 |

## SEGMENT PROPERTIES

| Seg Top Elev (ft) | Description (Max Length: 5 ft) | Thick (in) | Flat Dia (in) | Area ($in^2$) | Ix ($in^4$) | W/t Ratio | D/t Ratio | F'y (ksi) | S ($in^3$) | Z ($in^3$) | Weight (lb) | Additional Reinforcing Area ($in^2$) | Additional Reinforcing Ix ($in^4$) | Additional Reinforcing Weight (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 75.00 | | 0.2500 | 26.063 | 20.779 | 1,767.10 | 25.25 | 104.25 | 77.2 | 131.0 | 0.0 | 5.7 | 39.280 | 6,387.30 | 10.7 |
| 76.25 | Reinf. Top | 0.2500 | 25.861 | 20.617 | 1,726.20 | 25.04 | 103.45 | 77.4 | 128.9 | 0.0 | 88.0 | 39.280 | 6,316.60 | 167.0 |
| 80.00 | | 0.2500 | 25.258 | 20.132 | 1,607.10 | 24.39 | 101.03 | 78.1 | 122.9 | 0.0 | 260.0 | 19.640 | 3,563.60 | 250.5 |
| 85.00 | | 0.2500 | 24.454 | 19.484 | 1,457.00 | 23.53 | 97.82 | 79.1 | 115.1 | 0.0 | 337.0 | 19.640 | 3,414.90 | 334.0 |
| 90.00 | | 0.2500 | 23.650 | 18.837 | 1,316.50 | 22.67 | 94.60 | 80 | 107.5 | 0.0 | 326.0 | 19.640 | 3,269.40 | 334.0 |
| 95.00 | | 0.2500 | 22.846 | 18.190 | 1,185.40 | 21.81 | 91.38 | 80.9 | 100.2 | 0.0 | 315.0 | 19.640 | 3,127.10 | 334.0 |
| 100.00 | | 0.2500 | 22.042 | 17.542 | 1,063.30 | 20.94 | 88.17 | 81.9 | 93.2 | 0.0 | 304.0 | 19.640 | 2,987.90 | 334.0 |
| 104.00 | | 0.2500 | 21.398 | 17.024 | 971.90 | 20.26 | 85.59 | 81.9 | 87.7 | 0.0 | 235.2 | 19.640 | 2,878.90 | 267.2 |
| 105.00 | | 0.2500 | 21.238 | 16.895 | 949.90 | 20.08 | 84.95 | 81.9 | 86.4 | 0.0 | 57.7 | 19.640 | 2,851.90 | 66.8 |
| 110.00 | Top - Section 3 | 0.2500 | 20.433 | 16.248 | 844.80 | 19.22 | 81.73 | 81.9 | 79.9 | 0.0 | 281.9 | 19.640 | 2,719.10 | 334.0 |
| 110.00 | Bot - Section 4 | 0.1875 | 20.433 | 12.223 | 639.50 | 26.52 | 108.98 | 75.8 | 60.5 | 0.0 | | 19.640 | 2,719.10 | |
| 111.10 | | 0.1875 | 20.256 | 12.117 | 622.90 | 26.27 | 108.03 | 76.1 | 59.4 | 0.0 | 45.6 | 19.640 | 2,690.30 | 73.5 |
| 111.20 | | 0.1875 | 20.240 | 12.107 | 621.40 | 26.25 | 107.95 | 76.1 | 59.3 | 0.0 | 4.1 | 19.640 | 2,687.70 | 6.7 |
| 113.56 | Reinf Bottom | 0.1875 | 19.861 | 11.878 | 586.80 | 25.70 | 105.92 | 76.7 | 57.1 | 0.0 | 96.3 | 19.640 | 2,626.50 | 157.6 |
| 115.00 | | 0.1875 | 19.629 | 11.738 | 566.30 | 25.37 | 104.69 | 77 | 55.7 | 0.0 | 57.9 | 39.280 | 6,271.90 | 192.4 |
| 115.54 | Reinf. Top | 0.1875 | 19.542 | 11.685 | 558.70 | 25.25 | 104.23 | 77.2 | 55.2 | 0.0 | 21.5 | 39.280 | 6,241.60 | 72.1 |
| 120.00 | | 0.1875 | 18.825 | 11.252 | 498.90 | 24.22 | 100.40 | 78.3 | 51.2 | 0.0 | 174.1 | 19.640 | 3,531.30 | 297.9 |
| 124.44 | Reinf. Top | 0.1875 | 18.111 | 10.821 | 443.70 | 23.20 | 96.59 | 79.4 | 47.3 | 0.0 | 166.7 | 19.640 | 3,399.70 | 296.6 |
| 125.00 | | 0.1875 | 18.021 | 10.767 | 437.10 | 23.07 | 96.11 | 79.5 | 46.9 | 0.0 | 20.6 | | | |
| 130.00 | | 0.1875 | 17.217 | 10.281 | 380.60 | 21.92 | 91.82 | 80.8 | 42.7 | 0.0 | 179.1 | | | |
| 135.00 | | 0.1875 | 16.413 | 9.796 | 329.20 | 20.77 | 87.53 | 81.9 | 38.7 | 0.0 | 170.8 | | | |
| 140.00 | | 0.1875 | 15.608 | 9.310 | 282.60 | 19.63 | 83.24 | 81.9 | 35.0 | 0.0 | 162.5 | | | |
| 143.00 | | 0.1875 | 15.126 | 9.019 | 256.90 | 18.94 | 80.67 | 81.9 | 32.8 | 0.0 | 93.6 | | | |
| 145.00 | | 0.1875 | 14.804 | 8.825 | 240.70 | 18.48 | 78.96 | 81.9 | 31.4 | 0.0 | 60.7 | | | |
| 150.00 | | 0.1875 | 14.000 | 8.339 | 203.10 | 17.33 | 74.67 | 81.9 | 28.0 | 0.0 | 146.0 | | | |
| | | | | | | | | | **Totals:** | | **13,062.0** | | | **12,239.7** |

## CALCULATED FORCES

Load Case: 1.2D + 1.0W — 116.96 mph Wind with No Ice — 26 Iterations

Gust Response Factor: 1.10
Dead load Factor: 1.20
Wind Load Factor: 1.00

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (ft-kips) | Phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -51.77 | -26.91 | 0.00 | -2,860.0 | 0.00 | 2,860.03 | 3,136.53 | 776.14 | 2,681.85 | 2,336.59 | 0 | 0 | 0.554 |
| 5.00 | -49.54 | -26.52 | 0.00 | -2,725.5 | 0.00 | 2,725.48 | 3,092.06 | 759.10 | 2,565.42 | 2,252.37 | 0.13 | -0.23 | 0.538 |
| 10.00 | -47.32 | -26.13 | 0.00 | -2,592.9 | 0.00 | 2,592.86 | 3,046.49 | 742.06 | 2,451.56 | 2,168.84 | 0.5 | -0.47 | 0.523 |
| 15.00 | -45.13 | -25.73 | 0.00 | -2,462.2 | 0.00 | 2,462.22 | 2,999.83 | 725.02 | 2,340.29 | 2,086.05 | 1.11 | -0.7 | 0.507 |
| 20.00 | -42.97 | -25.32 | 0.00 | -2,333.6 | 0.00 | 2,333.58 | 2,952.07 | 707.98 | 2,231.61 | 2,004.07 | 1.97 | -0.93 | 0.491 |
| 25.00 | -40.82 | -24.90 | 0.00 | -2,207.0 | 0.00 | 2,206.99 | 2,901.93 | 690.94 | 2,125.51 | 1,922.08 | 3.07 | -1.17 | 0.474 |
| 30.00 | -38.74 | -24.57 | 0.00 | -2,082.5 | 0.00 | 2,082.47 | 2,830.35 | 673.89 | 2,021.99 | 1,827.91 | 4.42 | -1.4 | 0.461 |
| 31.50 | -38.09 | -24.38 | 0.00 | -2,045.6 | 0.00 | 2,045.62 | 2,808.88 | 668.78 | 1,991.44 | 1,800.12 | 4.87 | -1.47 | 0.457 |
| 35.00 | -36.19 | -24.13 | 0.00 | -1,960.3 | 0.00 | 1,960.28 | 2,758.78 | 656.85 | 1,921.06 | 1,736.10 | 6.01 | -1.63 | 0.439 |
| 35.67 | -35.79 | -23.96 | 0.00 | -1,944.2 | 0.00 | 1,944.20 | 2,225.24 | 557.62 | 1,661.14 | 1,429.67 | 6.24 | -1.66 | 0.490 |
| 40.00 | -34.09 | -23.51 | 0.00 | -1,840.4 | 0.00 | 1,840.39 | 2,194.35 | 545.32 | 1,588.64 | 1,378.40 | 7.84 | -1.86 | 0.471 |
| 45.00 | -32.16 | -23.01 | 0.00 | -1,722.8 | 0.00 | 1,722.82 | 2,157.69 | 531.12 | 1,507.00 | 1,319.72 | 9.91 | -2.09 | 0.450 |
| 50.00 | -30.24 | -22.48 | 0.00 | -1,607.8 | 0.00 | 1,607.78 | 2,119.93 | 516.91 | 1,427.52 | 1,261.60 | 12.22 | -2.32 | 0.428 |
| 55.00 | -28.38 | -22.08 | 0.00 | -1,495.4 | 0.00 | 1,495.39 | 2,081.07 | 502.71 | 1,350.19 | 1,204.10 | 14.77 | -2.54 | 0.407 |
| 55.48 | -28.18 | -21.89 | 0.00 | -1,484.8 | 0.00 | 1,484.79 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 15.03 | -2.57 | 0.405 |
| 55.48 | -28.18 | -21.89 | 0.00 | -1,484.8 | 0.00 | 1,484.79 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 15.03 | -2.57 | 0.611 |
| 60.00 | -26.83 | -21.41 | 0.00 | -1,385.8 | 0.00 | 1,385.83 | 2,041.12 | 488.51 | 1,275.01 | 1,147.26 | 17.55 | -2.77 | 0.585 |
| 65.00 | -25.40 | -20.90 | 0.00 | -1,278.8 | 0.00 | 1,278.77 | 1,992.10 | 474.31 | 1,201.98 | 1,086.79 | 20.63 | -3.1 | 0.557 |
| 70.00 | -24.06 | -20.41 | 0.00 | -1,174.2 | 0.00 | 1,174.25 | 1,932.46 | 460.11 | 1,131.11 | 1,022.32 | 24.05 | -3.43 | 0.532 |
| 73.50 | -22.85 | -20.06 | 0.00 | -1,102.8 | 0.00 | 1,102.83 | 1,451.36 | 368.08 | 904.71 | 769.62 | 26.65 | -3.65 | 0.586 |
| 74.92 | -22.51 | -19.94 | 0.00 | -1,074.3 | 0.00 | 1,074.34 | 1,443.63 | 364.85 | 888.92 | 758.75 | 27.75 | -3.74 | 0.575 |
| 75.00 | -22.49 | -19.89 | 0.00 | -1,072.8 | 0.00 | 1,072.75 | 1,443.19 | 364.67 | 888.04 | 758.14 | 27.81 | -3.75 | 0.315 |
| 76.25 | -22.08 | -19.64 | 0.00 | -1,047.9 | 0.00 | 1,047.88 | 1,436.31 | 361.83 | 874.26 | 748.59 | 28.8 | -3.8 | 0.309 |
| 76.25 | -22.08 | -19.64 | 0.00 | -1,047.9 | 0.00 | 1,047.88 | 1,436.31 | 361.83 | 874.26 | 748.59 | 28.8 | -3.8 | 0.458 |
| 80.00 | -21.20 | -19.14 | 0.00 | -974.2 | 0.00 | 974.24 | 1,415.26 | 353.31 | 833.59 | 720.08 | 31.83 | -3.93 | 0.431 |
| 85.00 | -20.15 | -18.59 | 0.00 | -878.5 | 0.00 | 878.53 | 1,386.24 | 341.95 | 780.86 | 682.41 | 36.09 | -4.19 | 0.395 |

CALCULATED FORCES

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90.00 | -19.11 | -18.03 | 0.00 | -785.6 | 0.00 | 785.56 | 1,356.12 | 330.59 | 729.85 | 645.17 | 40.6 | -4.43 | 0.359 |
| 95.00 | -18.10 | -17.47 | 0.00 | -695.4 | 0.00 | 695.39 | 1,324.90 | 319.23 | 680.56 | 608.43 | 45.36 | -4.66 | 0.324 |
| 100.00 | -17.12 | -16.93 | 0.00 | -608.1 | 0.00 | 608.06 | 1,293.04 | 307.87 | 633.00 | 572.44 | 50.35 | -4.87 | 0.288 |
| 104.00 | -16.35 | -16.48 | 0.00 | -540.4 | 0.00 | 540.36 | 1,254.87 | 298.78 | 596.19 | 538.95 | 54.5 | -5.03 | 0.262 |
| 105.00 | -15.14 | -15.38 | 0.00 | -523.9 | 0.00 | 523.88 | 1,245.33 | 296.51 | 587.16 | 530.74 | 55.56 | -5.07 | 0.255 |
| 110.00 | -14.21 | -14.81 | 0.00 | -447.0 | 0.00 | 447.00 | 1,197.61 | 285.15 | 543.05 | 490.61 | 60.96 | -5.26 | 0.224 |
| 110.00 | -14.21 | -14.81 | 0.00 | -447.0 | 0.00 | 447.00 | 833.77 | 214.52 | 409.72 | 343.68 | 60.96 | -5.26 | 0.259 |
| 111.10 | -13.89 | -14.22 | 0.00 | -430.7 | 0.00 | 430.71 | 829.49 | 212.65 | 402.60 | 338.90 | 62.18 | -5.29 | 0.250 |
| 111.20 | -13.85 | -14.06 | 0.00 | -429.3 | 0.00 | 429.29 | 829.10 | 212.48 | 401.95 | 338.47 | 62.29 | -5.3 | 0.249 |
| 113.56 | -13.46 | -13.76 | 0.00 | -396.1 | 0.00 | 396.12 | 819.73 | 208.45 | 386.88 | 328.25 | 64.93 | -5.38 | 0.231 |
| 115.00 | -13.12 | -13.58 | 0.00 | -376.3 | 0.00 | 376.30 | 813.89 | 206.00 | 377.83 | 322.04 | 66.55 | -5.43 | 0.105 |
| 115.54 | -12.99 | -13.36 | 0.00 | -369.0 | 0.00 | 368.97 | 811.68 | 205.08 | 374.47 | 319.72 | 67.17 | -5.44 | 0.103 |
| 115.54 | -12.99 | -13.36 | 0.00 | -369.0 | 0.00 | 368.97 | 811.68 | 205.08 | 374.47 | 319.72 | 67.17 | -5.44 | 0.163 |
| 120.00 | -12.29 | -12.75 | 0.00 | -309.4 | 0.00 | 309.38 | 792.92 | 197.48 | 347.23 | 300.64 | 72.28 | -5.5 | 0.137 |
| 124.44 | -11.59 | -12.29 | 0.00 | -252.8 | 0.00 | 252.79 | 773.38 | 189.91 | 321.14 | 281.88 | 77.43 | -5.59 | 0.113 |
| 124.44 | -11.59 | -12.29 | 0.00 | -252.8 | 0.00 | 252.79 | 773.38 | 189.91 | 321.14 | 281.88 | 77.43 | -5.59 | 0.916 |
| 125.00 | -11.48 | -12.14 | 0.00 | -245.9 | 0.00 | 245.90 | 770.85 | 188.96 | 317.92 | 279.54 | 78.09 | -5.6 | 0.899 |
| 130.00 | -10.31 | -10.23 | 0.00 | -185.2 | 0.00 | 185.19 | 747.69 | 180.44 | 289.91 | 258.78 | 84.33 | -6.3 | 0.733 |
| 135.00 | -9.94 | -10.03 | 0.00 | -134.0 | 0.00 | 134.05 | 722.05 | 171.92 | 263.18 | 237.98 | 91.25 | -6.9 | 0.580 |
| 140.00 | -9.61 | -9.84 | 0.00 | -83.9 | 0.00 | 83.92 | 686.26 | 163.40 | 237.75 | 214.85 | 98.72 | -7.37 | 0.408 |
| 143.00 | -5.32 | -6.34 | 0.00 | -54.4 | 0.00 | 54.39 | 664.79 | 158.28 | 223.11 | 201.53 | 103.41 | -7.58 | 0.279 |
| 145.00 | -5.22 | -6.18 | 0.00 | -41.7 | 0.00 | 41.70 | 650.48 | 154.88 | 213.61 | 192.90 | 106.6 | -7.69 | 0.226 |
| 150.00 | 0.00 | -5.41 | 0.00 | -10.8 | 0.00 | 10.82 | 614.69 | 146.35 | 190.76 | 172.13 | 114.72 | -7.84 | 0.064 |

CALCULATED FORCES

Load Case: 0.9D + 1.0W — 116.96 mph Wind with No Ice (Reduced DL) — 26 Iterations

Gust Response Factor: 1.10
Dead load Factor: 0.90
Wind Load Factor: 1.00

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (ft-kips) | Phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -38.82 | -26.88 | 0.00 | -2,812.0 | 0.00 | 2,811.95 | 3,136.53 | 776.14 | 2,681.85 | 2,336.59 | 0 | 0 | 0.542 |
| 5.00 | -37.11 | -26.44 | 0.00 | -2,677.5 | 0.00 | 2,677.54 | 3,092.06 | 759.10 | 2,565.42 | 2,252.37 | 0.12 | -0.23 | 0.527 |
| 10.00 | -35.43 | -26.00 | 0.00 | -2,545.3 | 0.00 | 2,545.32 | 3,046.49 | 742.06 | 2,451.56 | 2,168.84 | 0.49 | -0.46 | 0.511 |
| 15.00 | -33.77 | -25.56 | 0.00 | -2,415.3 | 0.00 | 2,415.32 | 2,999.83 | 725.02 | 2,340.29 | 2,086.05 | 1.09 | -0.69 | 0.495 |
| 20.00 | -32.12 | -25.11 | 0.00 | -2,287.5 | 0.00 | 2,287.54 | 2,952.07 | 707.98 | 2,231.61 | 2,004.07 | 1.93 | -0.92 | 0.479 |
| 25.00 | -30.49 | -24.66 | 0.00 | -2,162.0 | 0.00 | 2,162.00 | 2,901.93 | 690.94 | 2,125.51 | 1,922.08 | 3.02 | -1.14 | 0.463 |
| 30.00 | -28.92 | -24.31 | 0.00 | -2,038.7 | 0.00 | 2,038.70 | 2,830.35 | 673.89 | 2,021.99 | 1,827.91 | 4.34 | -1.37 | 0.450 |
| 31.50 | -28.42 | -24.11 | 0.00 | -2,002.2 | 0.00 | 2,002.24 | 2,808.88 | 668.78 | 1,991.44 | 1,800.12 | 4.78 | -1.44 | 0.446 |
| 35.00 | -26.99 | -23.85 | 0.00 | -1,917.9 | 0.00 | 1,917.87 | 2,758.78 | 656.85 | 1,921.06 | 1,736.10 | 5.89 | -1.6 | 0.428 |
| 35.67 | -26.68 | -23.66 | 0.00 | -1,902.0 | 0.00 | 1,901.97 | 2,225.24 | 557.62 | 1,661.14 | 1,429.67 | 6.12 | -1.63 | 0.477 |
| 40.00 | -25.39 | -23.20 | 0.00 | -1,799.4 | 0.00 | 1,799.45 | 2,194.35 | 545.32 | 1,588.64 | 1,378.40 | 7.69 | -1.82 | 0.459 |
| 45.00 | -23.93 | -22.67 | 0.00 | -1,683.5 | 0.00 | 1,683.47 | 2,157.69 | 531.12 | 1,507.00 | 1,319.72 | 9.72 | -2.05 | 0.438 |
| 50.00 | -22.48 | -22.13 | 0.00 | -1,570.1 | 0.00 | 1,570.12 | 2,119.93 | 516.91 | 1,427.52 | 1,261.60 | 11.98 | -2.27 | 0.417 |
| 55.00 | -21.08 | -21.74 | 0.00 | -1,459.5 | 0.00 | 1,459.47 | 2,081.07 | 502.71 | 1,350.19 | 1,204.10 | 14.48 | -2.49 | 0.396 |
| 55.48 | -20.91 | -21.53 | 0.00 | -1,449.0 | 0.00 | 1,449.04 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 14.73 | -2.51 | 0.393 |
| 55.48 | -20.91 | -21.53 | 0.00 | -1,449.0 | 0.00 | 1,449.04 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 14.73 | -2.51 | 0.595 |
| 60.00 | -19.89 | -21.03 | 0.00 | -1,351.7 | 0.00 | 1,351.70 | 2,041.12 | 488.51 | 1,275.01 | 1,147.26 | 17.21 | -2.71 | 0.569 |
| 65.00 | -18.80 | -20.50 | 0.00 | -1,246.6 | 0.00 | 1,246.55 | 1,992.10 | 474.31 | 1,201.98 | 1,086.79 | 20.22 | -3.03 | 0.542 |
| 70.00 | -17.78 | -19.99 | 0.00 | -1,144.0 | 0.00 | 1,144.03 | 1,932.46 | 460.11 | 1,131.11 | 1,022.32 | 23.57 | -3.35 | 0.516 |
| 73.50 | -16.87 | -19.65 | 0.00 | -1,074.1 | 0.00 | 1,074.06 | 1,451.36 | 368.08 | 904.71 | 769.62 | 26.11 | -3.57 | 0.569 |
| 74.92 | -16.61 | -19.53 | 0.00 | -1,046.2 | 0.00 | 1,046.16 | 1,443.63 | 364.85 | 888.92 | 758.75 | 27.19 | -3.66 | 0.558 |
| 75.00 | -16.59 | -19.48 | 0.00 | -1,044.6 | 0.00 | 1,044.60 | 1,443.19 | 364.67 | 888.04 | 758.14 | 27.25 | -3.67 | 0.305 |
| 76.25 | -16.29 | -19.22 | 0.00 | -1,020.2 | 0.00 | 1,020.25 | 1,436.31 | 361.83 | 874.26 | 748.59 | 28.21 | -3.71 | 0.299 |
| 76.25 | -16.29 | -19.22 | 0.00 | -1,020.2 | 0.00 | 1,020.25 | 1,436.31 | 361.83 | 874.26 | 748.59 | 28.21 | -3.71 | 0.444 |
| 80.00 | -15.62 | -18.72 | 0.00 | -948.2 | 0.00 | 948.17 | 1,415.26 | 353.31 | 833.59 | 720.08 | 31.18 | -3.84 | 0.418 |
| 85.00 | -14.82 | -18.16 | 0.00 | -854.6 | 0.00 | 854.58 | 1,386.24 | 341.95 | 780.86 | 682.41 | 35.34 | -4.09 | 0.383 |
| 90.00 | -14.04 | -17.60 | 0.00 | -763.8 | 0.00 | 763.76 | 1,356.12 | 330.59 | 729.85 | 645.17 | 39.75 | -4.33 | 0.348 |
| 95.00 | -13.28 | -17.04 | 0.00 | -675.8 | 0.00 | 675.75 | 1,324.90 | 319.23 | 680.56 | 608.43 | 44.4 | -4.55 | 0.313 |
| 100.00 | -12.54 | -16.50 | 0.00 | -590.6 | 0.00 | 590.57 | 1,293.04 | 307.87 | 633.00 | 572.44 | 49.27 | -4.76 | 0.278 |
| 104.00 | -11.96 | -16.06 | 0.00 | -524.6 | 0.00 | 524.57 | 1,254.87 | 298.78 | 596.19 | 538.95 | 53.33 | -4.92 | 0.253 |
| 105.00 | -11.07 | -14.98 | 0.00 | -508.5 | 0.00 | 508.51 | 1,245.33 | 296.51 | 587.16 | 530.74 | 54.36 | -4.95 | 0.246 |
| 110.00 | -10.38 | -14.43 | 0.00 | -433.6 | 0.00 | 433.60 | 1,197.61 | 285.15 | 543.05 | 490.61 | 59.64 | -5.13 | 0.216 |
| 110.00 | -10.38 | -14.43 | 0.00 | -433.6 | 0.00 | 433.60 | 833.77 | 214.52 | 409.72 | 343.68 | 59.64 | -5.13 | 0.250 |
| 111.10 | -10.15 | -13.85 | 0.00 | -417.7 | 0.00 | 417.73 | 829.49 | 212.65 | 402.60 | 338.90 | 60.82 | -5.17 | 0.241 |
| 111.20 | -10.12 | -13.68 | 0.00 | -416.3 | 0.00 | 416.34 | 829.10 | 212.48 | 401.95 | 338.47 | 60.93 | -5.17 | 0.240 |
| 113.56 | -9.84 | -13.39 | 0.00 | -384.0 | 0.00 | 384.05 | 819.73 | 208.45 | 386.88 | 328.25 | 63.51 | -5.25 | 0.222 |
| 115.00 | -9.58 | -13.22 | 0.00 | -364.8 | 0.00 | 364.77 | 813.89 | 206.00 | 377.83 | 322.04 | 65.1 | -5.3 | 0.101 |
| 115.54 | -9.49 | -13.00 | 0.00 | -357.6 | 0.00 | 357.63 | 811.68 | 205.08 | 374.47 | 319.72 | 65.7 | -5.31 | 0.099 |
| 115.54 | -9.49 | -13.00 | 0.00 | -357.6 | 0.00 | 357.63 | 811.68 | 205.08 | 374.47 | 319.72 | 65.7 | -5.31 | 0.156 |
| 120.00 | -8.97 | -12.40 | 0.00 | -299.6 | 0.00 | 299.65 | 792.92 | 197.48 | 347.23 | 300.64 | 70.68 | -5.37 | 0.131 |
| 124.44 | -8.45 | -11.96 | 0.00 | -244.6 | 0.00 | 244.60 | 773.38 | 189.91 | 321.14 | 281.88 | 75.71 | -5.45 | 0.108 |
| 124.44 | -8.45 | -11.96 | 0.00 | -244.6 | 0.00 | 244.60 | 773.38 | 189.91 | 321.14 | 281.88 | 75.71 | -5.45 | 0.883 |
| 125.00 | -8.36 | -11.79 | 0.00 | -237.9 | 0.00 | 237.90 | 770.85 | 188.96 | 317.92 | 279.54 | 76.35 | -5.46 | 0.866 |
| 130.00 | -7.50 | -9.88 | 0.00 | -178.9 | 0.00 | 178.94 | 747.69 | 180.44 | 289.91 | 258.78 | 82.44 | -6.14 | 0.704 |
| 135.00 | -7.21 | -9.66 | 0.00 | -129.6 | 0.00 | 129.56 | 722.05 | 171.92 | 263.18 | 237.98 | 89.18 | -6.72 | 0.558 |
| 140.00 | -6.96 | -9.47 | 0.00 | -81.3 | 0.00 | 81.28 | 686.26 | 163.40 | 237.75 | 214.85 | 96.46 | -7.18 | 0.392 |
| 143.00 | -3.83 | -6.13 | 0.00 | -52.9 | 0.00 | 52.87 | 664.79 | 158.28 | 223.11 | 201.53 | 101.03 | -7.38 | 0.270 |
| 145.00 | -3.76 | -5.96 | 0.00 | -40.6 | 0.00 | 40.62 | 650.48 | 154.88 | 213.61 | 192.90 | 104.13 | -7.48 | 0.218 |
| 150.00 | 0.00 | -5.41 | 0.00 | -10.8 | 0.00 | 10.82 | 614.69 | 146.35 | 190.76 | 172.13 | 112.04 | -7.63 | 0.064 |

## CALCULATED FORCES

Load Case: 1.2D + 1.0Di + 1.0Wi — 48.73 mph Wind with 1.275" Radial Ice — 25 Iterations

Gust Response Factor: 1.10
Dead load Factor: 1.20
Wind Load Factor: 1.00

Ice Dead Load Factor 1.00

Ice Importance Factor 1.00

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (ft-kips) | Phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -79.06 | -7.09 | 0.00 | -848.1 | 0.00 | 848.14 | 3,136.53 | 776.14 | 2,681.85 | 2,336.59 | 0 | 0 | 0.175 |
| 5.00 | -76.36 | -7.09 | 0.00 | -812.7 | 0.00 | 812.71 | 3,092.06 | 759.10 | 2,565.42 | 2,252.37 | 0.04 | -0.07 | 0.171 |
| 10.00 | -73.62 | -7.08 | 0.00 | -777.3 | 0.00 | 777.28 | 3,046.49 | 742.06 | 2,451.56 | 2,168.84 | 0.15 | -0.14 | 0.167 |
| 15.00 | -70.87 | -7.07 | 0.00 | -741.9 | 0.00 | 741.86 | 2,999.83 | 725.02 | 2,340.29 | 2,086.05 | 0.33 | -0.21 | 0.162 |
| 20.00 | -68.13 | -7.05 | 0.00 | -706.5 | 0.00 | 706.50 | 2,952.07 | 707.98 | 2,231.61 | 2,004.07 | 0.59 | -0.28 | 0.158 |
| 25.00 | -65.40 | -7.03 | 0.00 | -671.2 | 0.00 | 671.22 | 2,901.93 | 690.94 | 2,125.51 | 1,922.08 | 0.92 | -0.35 | 0.153 |
| 30.00 | -62.69 | -7.00 | 0.00 | -636.1 | 0.00 | 636.07 | 2,830.35 | 673.89 | 2,021.99 | 1,827.91 | 1.32 | -0.42 | 0.149 |
| 31.50 | -61.87 | -6.99 | 0.00 | -625.6 | 0.00 | 625.57 | 2,808.88 | 668.78 | 1,991.44 | 1,800.12 | 1.46 | -0.44 | 0.148 |
| 35.00 | -59.52 | -6.96 | 0.00 | -601.1 | 0.00 | 601.11 | 2,758.78 | 656.85 | 1,921.06 | 1,736.10 | 1.8 | -0.49 | 0.143 |
| 35.67 | -59.07 | -6.95 | 0.00 | -596.5 | 0.00 | 596.47 | 2,225.24 | 557.62 | 1,661.14 | 1,429.67 | 1.87 | -0.5 | 0.160 |
| 40.00 | -56.84 | -6.90 | 0.00 | -566.4 | 0.00 | 566.37 | 2,194.35 | 545.32 | 1,588.64 | 1,378.40 | 2.36 | -0.56 | 0.154 |
| 45.00 | -54.28 | -6.84 | 0.00 | -531.8 | 0.00 | 531.85 | 2,157.69 | 531.12 | 1,507.00 | 1,319.72 | 2.98 | -0.63 | 0.147 |
| 50.00 | -51.73 | -6.78 | 0.00 | -497.6 | 0.00 | 497.63 | 2,119.93 | 516.91 | 1,427.52 | 1,261.60 | 3.68 | -0.7 | 0.141 |
| 55.00 | -49.21 | -6.72 | 0.00 | -463.7 | 0.00 | 463.74 | 2,081.07 | 502.71 | 1,350.19 | 1,204.10 | 4.46 | -0.77 | 0.134 |
| 55.48 | -48.96 | -6.70 | 0.00 | -460.5 | 0.00 | 460.52 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 4.54 | -0.78 | 0.133 |
| 55.48 | -48.96 | -6.70 | 0.00 | -460.5 | 0.00 | 460.52 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 4.54 | -0.78 | 0.201 |
| 60.00 | -47.05 | -6.64 | 0.00 | -430.2 | 0.00 | 430.24 | 2,041.12 | 488.51 | 1,275.01 | 1,147.26 | 5.31 | -0.84 | 0.192 |
| 65.00 | -45.05 | -6.59 | 0.00 | -397.0 | 0.00 | 397.04 | 1,992.10 | 474.31 | 1,201.98 | 1,086.79 | 6.25 | -0.95 | 0.183 |
| 70.00 | -43.13 | -6.52 | 0.00 | -364.1 | 0.00 | 364.11 | 1,932.46 | 460.11 | 1,131.11 | 1,022.32 | 7.29 | -1.05 | 0.175 |
| 73.50 | -41.40 | -6.43 | 0.00 | -341.3 | 0.00 | 341.30 | 1,451.36 | 368.08 | 904.71 | 769.62 | 8.09 | -1.12 | 0.193 |
| 74.92 | -40.85 | -6.40 | 0.00 | -332.2 | 0.00 | 332.17 | 1,443.63 | 364.85 | 888.92 | 758.75 | 8.43 | -1.15 | 0.189 |
| 75.00 | -40.82 | -6.39 | 0.00 | -331.7 | 0.00 | 331.66 | 1,443.19 | 364.67 | 888.04 | 758.14 | 8.44 | -1.15 | 0.105 |
| 76.25 | -40.23 | -6.33 | 0.00 | -323.7 | 0.00 | 323.67 | 1,436.31 | 361.83 | 874.26 | 748.59 | 8.75 | -1.16 | 0.103 |
| 76.25 | -40.23 | -6.33 | 0.00 | -323.7 | 0.00 | 323.67 | 1,436.31 | 361.83 | 874.26 | 748.59 | 8.75 | -1.16 | 0.153 |
| 80.00 | -38.79 | -6.20 | 0.00 | -299.9 | 0.00 | 299.93 | 1,415.26 | 353.31 | 833.59 | 720.08 | 9.68 | -1.2 | 0.144 |
| 85.00 | -37.08 | -6.05 | 0.00 | -268.9 | 0.00 | 268.93 | 1,386.24 | 341.95 | 780.86 | 682.41 | 10.98 | -1.28 | 0.131 |
| 90.00 | -35.38 | -5.89 | 0.00 | -238.7 | 0.00 | 238.67 | 1,356.12 | 330.59 | 729.85 | 645.17 | 12.36 | -1.36 | 0.119 |
| 95.00 | -33.70 | -5.73 | 0.00 | -209.2 | 0.00 | 209.21 | 1,324.90 | 319.23 | 680.56 | 608.43 | 13.82 | -1.43 | 0.107 |
| 100.00 | -32.04 | -5.55 | 0.00 | -180.6 | 0.00 | 180.57 | 1,293.04 | 307.87 | 633.00 | 572.44 | 15.35 | -1.49 | 0.095 |
| 104.00 | -30.67 | -5.35 | 0.00 | -158.4 | 0.00 | 158.39 | 1,254.87 | 298.78 | 596.19 | 538.95 | 16.62 | -1.54 | 0.086 |
| 105.00 | -28.96 | -5.05 | 0.00 | -153.0 | 0.00 | 153.03 | 1,245.33 | 296.51 | 587.16 | 530.74 | 16.94 | -1.55 | 0.083 |
| 110.00 | -27.29 | -4.75 | 0.00 | -127.8 | 0.00 | 127.76 | 1,197.61 | 285.15 | 543.05 | 490.61 | 18.6 | -1.6 | 0.072 |
| 110.00 | -27.29 | -4.75 | 0.00 | -127.8 | 0.00 | 127.76 | 833.77 | 214.52 | 409.72 | 343.68 | 18.6 | -1.6 | 0.084 |
| 111.10 | -26.45 | -4.54 | 0.00 | -122.5 | 0.00 | 122.53 | 829.49 | 212.65 | 402.60 | 338.90 | 18.97 | -1.61 | 0.081 |
| 111.20 | -26.35 | -4.50 | 0.00 | -122.1 | 0.00 | 122.08 | 829.10 | 212.48 | 401.95 | 338.47 | 19 | -1.61 | 0.080 |
| 113.56 | -25.54 | -4.29 | 0.00 | -111.5 | 0.00 | 111.47 | 819.73 | 208.45 | 386.88 | 328.25 | 19.8 | -1.64 | 0.074 |
| 115.00 | -24.92 | -4.17 | 0.00 | -105.3 | 0.00 | 105.29 | 813.89 | 206.00 | 377.83 | 322.04 | 20.3 | -1.65 | 0.035 |
| 115.54 | -24.70 | -4.09 | 0.00 | -103.0 | 0.00 | 103.04 | 811.68 | 205.08 | 374.47 | 319.72 | 20.49 | -1.65 | 0.034 |
| 115.54 | -24.70 | -4.09 | 0.00 | -103.0 | 0.00 | 103.04 | 811.68 | 205.08 | 374.47 | 319.72 | 20.49 | -1.65 | 0.054 |
| 120.00 | -23.21 | -3.70 | 0.00 | -84.8 | 0.00 | 84.82 | 792.92 | 197.48 | 347.23 | 300.64 | 22.04 | -1.67 | 0.046 |
| 124.44 | -21.93 | -3.41 | 0.00 | -68.4 | 0.00 | 68.41 | 773.38 | 189.91 | 321.14 | 281.88 | 23.61 | -1.69 | 0.038 |
| 124.44 | -21.93 | -3.41 | 0.00 | -68.4 | 0.00 | 68.41 | 773.38 | 189.91 | 321.14 | 281.88 | 23.61 | -1.69 | 0.271 |
| 125.00 | -21.81 | -3.37 | 0.00 | -66.5 | 0.00 | 66.50 | 770.85 | 188.96 | 317.92 | 279.54 | 23.81 | -1.7 | 0.267 |
| 130.00 | -18.97 | -2.76 | 0.00 | -49.7 | 0.00 | 49.66 | 747.69 | 180.44 | 289.91 | 258.78 | 25.69 | -1.89 | 0.217 |
| 135.00 | -18.49 | -2.73 | 0.00 | -35.8 | 0.00 | 35.84 | 722.05 | 171.92 | 263.18 | 237.98 | 27.75 | -2.05 | 0.176 |
| 140.00 | -18.02 | -2.68 | 0.00 | -22.2 | 0.00 | 22.21 | 686.26 | 163.40 | 237.75 | 214.85 | 29.97 | -2.17 | 0.130 |
| 143.00 | -10.37 | -1.71 | 0.00 | -14.2 | 0.00 | 14.16 | 664.79 | 158.28 | 223.11 | 201.53 | 31.35 | -2.23 | 0.086 |
| 145.00 | -10.20 | -1.66 | 0.00 | -10.8 | 0.00 | 10.75 | 650.48 | 154.88 | 213.61 | 192.90 | 32.29 | -2.25 | 0.072 |
| 150.00 | 0.00 | -1.26 | 0.00 | -2.4 | 0.00 | 2.43 | 614.69 | 146.35 | 190.76 | 172.13 | 34.68 | -2.29 | 0.014 |

CALCULATED FORCES

Load Case: 1.0D + 1.0W — 60 mph Wind with No Ice — 24 Iterations

Gust Response Factor: 1.10
Dead load Factor: 1.00
Wind Load Factor: 1.00

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (ft-kips) | Mu MX (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (ft-kips) | Phi Mn (ft-kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -43.19 | -6.33 | 0.00 | -666.9 | 0.00 | 666.91 | 3,136.53 | 776.14 | 2,681.85 | 2,336.59 | 0 | 0 | 0.134 |
| 5.00 | -41.41 | -6.23 | 0.00 | -635.3 | 0.00 | 635.26 | 3,092.06 | 759.10 | 2,565.42 | 2,252.37 | 0.03 | -0.05 | 0.130 |
| 10.00 | -39.64 | -6.13 | 0.00 | -604.1 | 0.00 | 604.10 | 3,046.49 | 742.06 | 2,451.56 | 2,168.84 | 0.12 | -0.11 | 0.126 |
| 15.00 | -37.89 | -6.03 | 0.00 | -573.4 | 0.00 | 573.45 | 2,999.83 | 725.02 | 2,340.29 | 2,086.05 | 0.26 | -0.16 | 0.123 |
| 20.00 | -36.16 | -5.93 | 0.00 | -543.3 | 0.00 | 543.29 | 2,952.07 | 707.98 | 2,231.61 | 2,004.07 | 0.46 | -0.22 | 0.119 |
| 25.00 | -34.45 | -5.83 | 0.00 | -513.6 | 0.00 | 513.65 | 2,901.93 | 690.94 | 2,125.51 | 1,922.08 | 0.72 | -0.27 | 0.115 |
| 30.00 | -32.75 | -5.74 | 0.00 | -484.5 | 0.00 | 484.52 | 2,830.35 | 673.89 | 2,021.99 | 1,827.91 | 1.03 | -0.33 | 0.111 |
| 31.50 | -32.24 | -5.70 | 0.00 | -475.9 | 0.00 | 475.91 | 2,808.88 | 668.78 | 1,991.44 | 1,800.12 | 1.13 | -0.34 | 0.110 |
| 35.00 | -30.69 | -5.64 | 0.00 | -456.0 | 0.00 | 455.96 | 2,758.78 | 656.85 | 1,921.06 | 1,736.10 | 1.4 | -0.38 | 0.106 |
| 35.67 | -30.39 | -5.60 | 0.00 | -452.2 | 0.00 | 452.20 | 2,225.24 | 557.62 | 1,661.14 | 1,429.67 | 1.45 | -0.39 | 0.118 |
| 40.00 | -29.03 | -5.49 | 0.00 | -428.0 | 0.00 | 427.96 | 2,194.35 | 545.32 | 1,588.64 | 1,378.40 | 1.83 | -0.43 | 0.114 |
| 45.00 | -27.47 | -5.37 | 0.00 | -400.5 | 0.00 | 400.51 | 2,157.69 | 531.12 | 1,507.00 | 1,319.72 | 2.31 | -0.49 | 0.108 |
| 50.00 | -25.93 | -5.24 | 0.00 | -373.7 | 0.00 | 373.68 | 2,119.93 | 516.91 | 1,427.52 | 1,261.60 | 2.85 | -0.54 | 0.103 |
| 55.00 | -24.40 | -5.15 | 0.00 | -347.5 | 0.00 | 347.47 | 2,081.07 | 502.71 | 1,350.19 | 1,204.10 | 3.44 | -0.59 | 0.098 |
| 55.48 | -24.25 | -5.10 | 0.00 | -345.0 | 0.00 | 345.00 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 3.5 | -0.6 | 0.097 |
| 55.48 | -24.25 | -5.10 | 0.00 | -345.0 | 0.00 | 345.00 | 2,077.29 | 501.35 | 1,342.87 | 1,198.61 | 3.5 | -0.6 | 0.147 |
| 60.00 | -23.18 | -4.99 | 0.00 | -321.9 | 0.00 | 321.94 | 2,041.12 | 488.51 | 1,275.01 | 1,147.26 | 4.09 | -0.64 | 0.140 |
| 65.00 | -22.06 | -4.87 | 0.00 | -297.0 | 0.00 | 297.00 | 1,992.10 | 474.31 | 1,201.98 | 1,086.79 | 4.8 | -0.72 | 0.134 |
| 70.00 | -21.00 | -4.75 | 0.00 | -272.7 | 0.00 | 272.68 | 1,932.46 | 460.11 | 1,131.11 | 1,022.32 | 5.6 | -0.8 | 0.128 |
| 73.50 | -20.01 | -4.67 | 0.00 | -256.1 | 0.00 | 256.06 | 1,451.36 | 368.08 | 904.71 | 769.62 | 6.2 | -0.85 | 0.141 |
| 74.92 | -19.74 | -4.64 | 0.00 | -249.4 | 0.00 | 249.44 | 1,443.63 | 364.85 | 888.92 | 758.75 | 6.46 | -0.87 | 0.138 |
| 75.00 | -19.72 | -4.63 | 0.00 | -249.1 | 0.00 | 249.06 | 1,443.19 | 364.67 | 888.04 | 758.14 | 6.48 | -0.87 | 0.076 |
| 76.25 | -19.40 | -4.57 | 0.00 | -243.3 | 0.00 | 243.28 | 1,436.31 | 361.83 | 874.26 | 748.59 | 6.71 | -0.88 | 0.075 |
| 76.25 | -19.40 | -4.57 | 0.00 | -243.3 | 0.00 | 243.28 | 1,436.31 | 361.83 | 874.26 | 748.59 | 6.71 | -0.88 | 0.111 |
| 80.00 | -18.68 | -4.45 | 0.00 | -226.2 | 0.00 | 226.16 | 1,415.26 | 353.31 | 833.59 | 720.08 | 7.41 | -0.91 | 0.104 |
| 85.00 | -17.83 | -4.32 | 0.00 | -203.9 | 0.00 | 203.91 | 1,386.24 | 341.95 | 780.86 | 682.41 | 8.4 | -0.97 | 0.096 |
| 90.00 | -16.99 | -4.19 | 0.00 | -182.3 | 0.00 | 182.30 | 1,356.12 | 330.59 | 729.85 | 645.17 | 9.45 | -1.03 | 0.087 |
| 95.00 | -16.17 | -4.06 | 0.00 | -161.4 | 0.00 | 161.36 | 1,324.90 | 319.23 | 680.56 | 608.43 | 10.56 | -1.08 | 0.079 |
| 100.00 | -15.35 | -3.93 | 0.00 | -141.1 | 0.00 | 141.07 | 1,293.04 | 307.87 | 633.00 | 572.44 | 11.72 | -1.13 | 0.070 |
| 104.00 | -14.71 | -3.83 | 0.00 | -125.4 | 0.00 | 125.35 | 1,254.87 | 298.78 | 596.19 | 538.95 | 12.69 | -1.17 | 0.064 |
| 105.00 | -13.65 | -3.57 | 0.00 | -121.5 | 0.00 | 121.52 | 1,245.33 | 296.51 | 587.16 | 530.74 | 12.93 | -1.18 | 0.062 |
| 110.00 | -12.86 | -3.44 | 0.00 | -103.7 | 0.00 | 103.67 | 1,197.61 | 285.15 | 543.05 | 490.61 | 14.19 | -1.22 | 0.055 |
| 110.00 | -12.86 | -3.44 | 0.00 | -103.7 | 0.00 | 103.67 | 833.77 | 214.52 | 409.72 | 343.68 | 14.19 | -1.22 | 0.064 |
| 111.10 | -12.55 | -3.30 | 0.00 | -99.9 | 0.00 | 99.88 | 829.49 | 212.65 | 402.60 | 338.90 | 14.47 | -1.23 | 0.061 |
| 111.20 | -12.52 | -3.26 | 0.00 | -99.6 | 0.00 | 99.55 | 829.10 | 212.48 | 401.95 | 338.47 | 14.5 | -1.23 | 0.061 |
| 113.56 | -12.18 | -3.19 | 0.00 | -91.8 | 0.00 | 91.85 | 819.73 | 208.45 | 386.88 | 328.25 | 15.11 | -1.25 | 0.057 |
| 115.00 | -11.89 | -3.15 | 0.00 | -87.2 | 0.00 | 87.25 | 813.89 | 206.00 | 377.83 | 322.04 | 15.49 | -1.26 | 0.026 |
| 115.54 | -11.78 | -3.10 | 0.00 | -85.6 | 0.00 | 85.55 | 811.68 | 205.08 | 374.47 | 319.72 | 15.64 | -1.26 | 0.026 |
| 115.54 | -11.78 | -3.10 | 0.00 | -85.6 | 0.00 | 85.55 | 811.68 | 205.08 | 374.47 | 319.72 | 15.64 | -1.26 | 0.041 |
| 120.00 | -11.16 | -2.96 | 0.00 | -71.7 | 0.00 | 71.72 | 792.92 | 197.48 | 347.23 | 300.64 | 16.82 | -1.28 | 0.035 |
| 124.44 | -10.55 | -2.85 | 0.00 | -58.6 | 0.00 | 58.58 | 773.38 | 189.91 | 321.14 | 281.88 | 18.02 | -1.3 | 0.029 |
| 124.44 | -10.55 | -2.85 | 0.00 | -58.6 | 0.00 | 58.58 | 773.38 | 189.91 | 321.14 | 281.88 | 18.02 | -1.3 | 0.222 |
| 125.00 | -10.50 | -2.82 | 0.00 | -57.0 | 0.00 | 56.99 | 770.85 | 188.96 | 317.92 | 279.54 | 18.18 | -1.3 | 0.218 |
| 130.00 | -9.46 | -2.37 | 0.00 | -42.9 | 0.00 | 42.90 | 747.69 | 180.44 | 289.91 | 258.78 | 19.63 | -1.46 | 0.179 |
| 135.00 | -9.19 | -2.32 | 0.00 | -31.1 | 0.00 | 31.07 | 722.05 | 171.92 | 263.18 | 237.98 | 21.24 | -1.6 | 0.143 |
| 140.00 | -8.94 | -2.28 | 0.00 | -19.5 | 0.00 | 19.47 | 686.26 | 163.40 | 237.75 | 214.85 | 22.98 | -1.71 | 0.104 |
| 143.00 | -5.06 | -1.47 | 0.00 | -12.6 | 0.00 | 12.65 | 664.79 | 158.28 | 223.11 | 201.53 | 24.07 | -1.76 | 0.070 |
| 145.00 | -4.97 | -1.43 | 0.00 | -9.7 | 0.00 | 9.71 | 650.48 | 154.88 | 213.61 | 192.90 | 24.81 | -1.78 | 0.058 |
| 150.00 | 0.00 | -1.27 | 0.00 | -2.6 | 0.00 | 2.55 | 614.69 | 146.35 | 190.76 | 172.13 | 26.71 | -1.82 | 0.015 |

## EQUIVALENT LATERAL FORCES METHOD ANALYSIS

*(Based on ASCE7-16 Chapters 11, 12 and 15)*

| | |
|---|---|
| Spectral Response Acceleration for Short Period ($S_S$): | 0.195 |
| Spectral Response Acceleration at 1.0 Second Period ($S_1$): | 0.055 |
| Long-Period Transition Period ($T_L$ – Seconds): | 6 |
| Importance Factor ($I_e$): | 1.000 |
| Site Coefficient $F_a$: | 1.600 |
| Site Coefficient $F_v$: | 2.400 |
| Response Modification Coefficient (R): | 1.500 |
| Design Spectral Response Acceleration at Short Period ($S_{ds}$): | 0.208 |
| Design Spectral Response Acceleration at 1.0 Second Period ($S_{d1}$): | 0.088 |
| Seismic Response Coefficient ($C_s$): | 0.030 |
| Upper Limit $C_S$: | 0.030 |
| Lower Limit $C_S$: | 0.030 |
| Period based on Rayleigh Method (sec): | 2.900 |
| Redundancy Factor (p): | 1.000 |
| Seismic Force Distribution Exponent (k): | 2.000 |
| Total Unfactored Dead Load: | 43.190 k |
| Seismic Base Shear (E): | 1.300 k |

## SEISMIC FORCES

**1.2D + 1.0Ev + 1.0Eh** **Seismic**

| Segment | Height Above Base (ft) | Weight (lb) | $W_z$ (lb-ft) | $C_{vx}$ | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|
| 43 | 147.5 | 222 | 4,830 | 0.014 | 18 | 276 |
| 42 | 144 | 91 | 1,889 | 0.005 | 7 | 113 |
| 41 | 141.5 | 147 | 2,942 | 0.008 | 11 | 182 |
| 40 | 137.5 | 252 | 4,756 | 0.014 | 18 | 312 |
| 39 | 132.5 | 260 | 4,561 | 0.013 | 17 | 323 |
| 38 | 127.5 | 346 | 5,621 | 0.016 | 21 | 429 |
| 37 | 124.72 | 39 | 610 | 0.002 | 2 | 49 |
| 36 | 122.22 | 611 | 9,132 | 0.026 | 34 | 759 |
| 35 | 117.77 | 621 | 8,609 | 0.024 | 32 | 771 |
| 34 | 115.27 | 112 | 1,484 | 0.004 | 5 | 139 |
| 33 | 114.28 | 298 | 3,895 | 0.011 | 14 | 370 |
| 32 | 112.38 | 333 | 4,201 | 0.012 | 15 | 413 |
| 31 | 111.15 | 14 | 175 | 0.000 | 1 | 18 |
| 30 | 110.55 | 158 | 1,927 | 0.006 | 7 | 196 |
| 29 | 107.5 | 793 | 9,159 | 0.026 | 34 | 984 |
| 28 | 104.5 | 160 | 1,745 | 0.005 | 6 | 198 |
| 27 | 102 | 644 | 6,697 | 0.019 | 25 | 799 |
| 26 | 97.5 | 815 | 7,743 | 0.022 | 29 | 1,011 |
| 25 | 92.5 | 826 | 7,064 | 0.020 | 26 | 1,025 |
| 24 | 87.5 | 837 | 6,405 | 0.018 | 24 | 1,039 |
| 23 | 82.5 | 848 | 5,769 | 0.016 | 21 | 1,052 |
| 22 | 78.125 | 713 | 4,353 | 0.012 | 16 | 885 |
| 21 | 75.625 | 323 | 1,845 | 0.005 | 7 | 401 |
| 20 | 74.96 | 21 | 116 | 0.000 | 0 | 26 |
| 19 | 74.21 | 272 | 1,501 | 0.004 | 6 | 338 |
| 18 | 71.75 | 984 | 5,067 | 0.014 | 19 | 1,222 |
| 17 | 67.5 | 1,057 | 4,817 | 0.014 | 18 | 1,313 |
| 16 | 62.5 | 1,118 | 4,366 | 0.012 | 16 | 1,388 |
| 15 | 57.74 | 1,065 | 3,549 | 0.010 | 13 | 1,322 |
| 14 | 55.24 | 146 | 445 | 0.001 | 2 | 181 |
| 13 | 52.5 | 1,526 | 4,206 | 0.012 | 15 | 1,895 |
| 12 | 47.5 | 1,540 | 3,474 | 0.010 | 13 | 1,912 |
| 11 | 42.5 | 1,554 | 2,806 | 0.008 | 10 | 1,929 |
| 10 | 37.8334 | 1,358 | 1,943 | 0.006 | 7 | 1,686 |
| 9 | 35.3334 | 295 | 368 | 0.001 | 1 | 366 |
| 8 | 33.25 | 1,555 | 1,719 | 0.005 | 6 | 1,931 |
| 7 | 30.75 | 505 | 477 | 0.001 | 2 | 627 |
| 6 | 27.5 | 1,693 | 1,281 | 0.004 | 5 | 2,102 |

SEISMIC FORCES

**1.2D + 1.0Ev + 1.0Eh** **Seismic**

| Segment | Height Above Base (ft) | Weight (lb) | $W_z$ (lb-ft) | $C_{vx}$ | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|
| 5 | 22.5 | 1,710 | 866 | 0.002 | 3 | 2,123 |
| 4 | 17.5 | 1,726 | 529 | 0.002 | 2 | 2,144 |
| 3 | 12.5 | 1,743 | 272 | 0.001 | 1 | 2,164 |
| 2 | 7.5 | 1,759 | 99 | 0.000 | 0 | 2,185 |
| 1 | 2.5 | 1,776 | 11 | 0.000 | 0 | 2,205 |
| CCI TPX-070821 | 150 | 45 | 1,012 | 0.003 | 4 | 56 |
| Kaelus DBCT108F1V92-1 | 150 | 172 | 3,874 | 0.011 | 14 | 214 |
| Raycap DC6-48-60-18-8F (23.5" Height) | 150 | 40 | 900 | 0.003 | 3 | 50 |
| CCI DTMABP7819VG12A (w/ Bracket) | 150 | 58 | 1,296 | 0.004 | 5 | 72 |
| Raycap DC6-48-60-18-8F ("Squid") | 150 | 19 | 425 | 0.001 | 2 | 23 |
| Ericsson RRUS 4426 B66 | 150 | 145 | 3,267 | 0.009 | 12 | 180 |
| Ericsson RRUS 4478 B14 | 150 | 180 | 4,043 | 0.012 | 15 | 223 |
| Ericsson RRUS 4478 B5 | 150 | 180 | 4,043 | 0.012 | 15 | 223 |
| Ericsson RRUS-11 (50 lbs.) | 150 | 150 | 3,375 | 0.010 | 12 | 186 |
| Ericsson RRUS 32 B2 | 150 | 159 | 3,578 | 0.010 | 13 | 197 |
| Ericsson RRUS-32 (77 lbs) | 150 | 231 | 5,198 | 0.015 | 19 | 287 |
| Powerwave Allgon 7770.00 | 150 | 105 | 2,362 | 0.007 | 9 | 130 |
| KMW AM-X-CD-16-65-00T-RET | 150 | 97 | 2,182 | 0.006 | 8 | 120 |
| Quintel QS66512-3 (112 lbs.) | 150 | 336 | 7,560 | 0.022 | 28 | 417 |
| Andrew SBNH-1D6565C (60.8 lbs) | 150 | 61 | 1,368 | 0.004 | 5 | 75 |
| Kathrein Scala 80010965 | 150 | 195 | 4,392 | 0.012 | 16 | 242 |
| Kathrein Scala 80010966 | 150 | 115 | 2,578 | 0.007 | 9 | 142 |
| Generic Flat Platform with Handrails | 150 | 2,500 | 56,250 | 0.160 | 207 | 3,104 |
| Samsung Outdoor CBRS 20W RRH –Clip-on Antenna | 143 | 13 | 270 | 0.001 | 1 | 16 |
| Samsung RT4401-48A | 143 | 56 | 1,141 | 0.003 | 4 | 69 |
| Samsung B2/B66A RRH-BR049 | 143 | 253 | 5,178 | 0.015 | 19 | 314 |
| Samsung B5/B13 RRH-BR04C | 143 | 211 | 4,313 | 0.012 | 16 | 262 |
| Raycap RVZDC-6627-PF-48 | 143 | 32 | 654 | 0.002 | 2 | 40 |
| Samsung MT6407-77A | 143 | 245 | 5,006 | 0.014 | 18 | 304 |
| Commscope NNHH-65B-R4 | 143 | 503 | 10,282 | 0.029 | 38 | 624 |
| Site-Pro RMQP-496 w/ HRK-12 | 143 | 2,446 | 50,014 | 0.142 | 184 | 3,037 |
| Site-Pro UWS6-NP Collar | 130 | 96 | 1,622 | 0.005 | 6 | 119 |
| Ericsson 4480 BAND 71 | 130 | 243 | 4,107 | 0.012 | 15 | 302 |
| RFS APXVAALL24 43-U-NA20 | 130 | 368 | 6,226 | 0.018 | 23 | 457 |
| dB Systems 5100A | 111.2 | 21 | 260 | 0.001 | 1 | 26 |
| dB Systems 5100A-D | 111.1 | 152 | 1,876 | 0.005 | 7 | 189 |
| Round Side Arm | 105 | 900 | 9,922 | 0.028 | 37 | 1,117 |
| VertexRSI 101V VPD | 104 | 4 | 43 | 0.000 | 0 | 5 |
| | **Totals:** | **43,191** | **351,944** | **1.000** | **1,296** | **53,626** |

SEISMIC FORCES

**0.9D - 1.0Ev + 1.0Eh** **Seismic (Reduced DL)**

| Segment | Height Above Base (ft) | Weight (lb) | $W_z$ (lb-ft) | $C_{vx}$ | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|
| 43 | 147.5 | 222 | 4,830 | 0.014 | 18 | 191 |
| 42 | 144 | 91 | 1,889 | 0.005 | 7 | 78 |
| 41 | 141.5 | 147 | 2,942 | 0.008 | 11 | 126 |
| 40 | 137.5 | 252 | 4,756 | 0.014 | 18 | 216 |
| 39 | 132.5 | 260 | 4,561 | 0.013 | 17 | 223 |
| 38 | 127.5 | 346 | 5,621 | 0.016 | 21 | 297 |
| 37 | 124.72 | 39 | 610 | 0.002 | 2 | 34 |
| 36 | 122.22 | 611 | 9,132 | 0.026 | 34 | 525 |
| 35 | 117.77 | 621 | 8,609 | 0.024 | 32 | 533 |
| 34 | 115.27 | 112 | 1,484 | 0.004 | 5 | 96 |
| 33 | 114.28 | 298 | 3,895 | 0.011 | 14 | 256 |
| 32 | 112.38 | 333 | 4,201 | 0.012 | 15 | 286 |
| 31 | 111.15 | 14 | 175 | 0.000 | 1 | 12 |
| 30 | 110.55 | 158 | 1,927 | 0.006 | 7 | 135 |
| 29 | 107.5 | 793 | 9,159 | 0.026 | 34 | 680 |
| 28 | 104.5 | 160 | 1,745 | 0.005 | 6 | 137 |
| 27 | 102 | 644 | 6,697 | 0.019 | 25 | 553 |

SEISMIC FORCES

**0.9D - 1.0Ev + 1.0Eh** **Seismic (Reduced DL)**

| Segment | Height Above Base (ft) | Weight (lb) | $W_z$ (lb-ft) | $C_{vx}$ | Horizontal Force (lb) | Vertical Force (lb) |
|---|---|---|---|---|---|---|
| 26 | 97.5 | 815 | 7,743 | 0.022 | 29 | 699 |
| 25 | 92.5 | 826 | 7,064 | 0.020 | 26 | 709 |
| 24 | 87.5 | 837 | 6,405 | 0.018 | 24 | 718 |
| 23 | 82.5 | 848 | 5,769 | 0.016 | 21 | 728 |
| 22 | 78.125 | 713 | 4,353 | 0.012 | 16 | 612 |
| 21 | 75.625 | 323 | 1,845 | 0.005 | 7 | 277 |
| 20 | 74.96 | 21 | 116 | 0.000 | 0 | 18 |
| 19 | 74.21 | 272 | 1,501 | 0.004 | 6 | 234 |
| 18 | 71.75 | 984 | 5,067 | 0.014 | 19 | 845 |
| 17 | 67.5 | 1,057 | 4,817 | 0.014 | 18 | 907 |
| 16 | 62.5 | 1,118 | 4,366 | 0.012 | 16 | 959 |
| 15 | 57.74 | 1,065 | 3,549 | 0.010 | 13 | 914 |
| 14 | 55.24 | 146 | 445 | 0.001 | 2 | 125 |
| 13 | 52.5 | 1,526 | 4,206 | 0.012 | 15 | 1,310 |
| 12 | 47.5 | 1,540 | 3,474 | 0.010 | 13 | 1,322 |
| 11 | 42.5 | 1,554 | 2,806 | 0.008 | 10 | 1,334 |
| 10 | 37.8334 | 1,358 | 1,943 | 0.006 | 7 | 1,165 |
| 9 | 35.3334 | 295 | 368 | 0.001 | 1 | 253 |
| 8 | 33.25 | 1,555 | 1,719 | 0.005 | 6 | 1,335 |
| 7 | 30.75 | 505 | 477 | 0.001 | 2 | 433 |
| 6 | 27.5 | 1,693 | 1,281 | 0.004 | 5 | 1,454 |
| 5 | 22.5 | 1,710 | 866 | 0.002 | 3 | 1,468 |
| 4 | 17.5 | 1,726 | 529 | 0.002 | 2 | 1,482 |
| 3 | 12.5 | 1,743 | 272 | 0.001 | 1 | 1,496 |
| 2 | 7.5 | 1,759 | 99 | 0.000 | 0 | 1,510 |
| 1 | 2.5 | 1,776 | 11 | 0.000 | 0 | 1,524 |
| CCI TPX-070821 | 150 | 45 | 1,012 | 0.003 | 4 | 39 |
| Kaelus DBCT108F1V92-1 | 150 | 172 | 3,874 | 0.011 | 14 | 148 |
| Raycap DC6-48-60-18-8F (23.5" Height) | 150 | 40 | 900 | 0.003 | 3 | 34 |
| CCI DTMABP7819VG12A (w/ Bracket) | 150 | 58 | 1,296 | 0.004 | 5 | 49 |
| Raycap DC6-48-60-18-8F ("Squid") | 150 | 19 | 425 | 0.001 | 2 | 16 |
| Ericsson RRUS 4426 B66 | 150 | 145 | 3,267 | 0.009 | 12 | 125 |
| Ericsson RRUS 4478 B14 | 150 | 180 | 4,043 | 0.012 | 15 | 154 |
| Ericsson RRUS 4478 B5 | 150 | 180 | 4,043 | 0.012 | 15 | 154 |
| Ericsson RRUS-11 (50 lbs.) | 150 | 150 | 3,375 | 0.010 | 12 | 129 |
| Ericsson RRUS 32 B2 | 150 | 159 | 3,578 | 0.010 | 13 | 136 |
| Ericsson RRUS-32 (77 lbs) | 150 | 231 | 5,198 | 0.015 | 19 | 198 |
| Powerwave Allgon 7770.00 | 150 | 105 | 2,362 | 0.007 | 9 | 90 |
| KMW AM-X-CD-16-65-00T-RET | 150 | 97 | 2,182 | 0.006 | 8 | 83 |
| Quintel QS66512-3 (112 lbs.) | 150 | 336 | 7,560 | 0.022 | 28 | 288 |
| Andrew SBNH-1D6565C (60.8 lbs) | 150 | 61 | 1,368 | 0.004 | 5 | 52 |
| Kathrein Scala 80010965 | 150 | 195 | 4,392 | 0.012 | 16 | 168 |
| Kathrein Scala 80010966 | 150 | 115 | 2,578 | 0.007 | 9 | 98 |
| Generic Flat Platform with Handrails | 150 | 2,500 | 56,250 | 0.160 | 207 | 2,146 |
| Samsung Outdoor CBRS 20W RRH –Clip-on Antenna | 143 | 13 | 270 | 0.001 | 1 | 11 |
| Samsung RT4401-48A | 143 | 56 | 1,141 | 0.003 | 4 | 48 |
| Samsung B2/B66A RRH-BR049 | 143 | 253 | 5,178 | 0.015 | 19 | 217 |
| Samsung B5/B13 RRH-BR04C | 143 | 211 | 4,313 | 0.012 | 16 | 181 |
| Raycap RVZDC-6627-PF-48 | 143 | 32 | 654 | 0.002 | 2 | 27 |
| Samsung MT6407-77A | 143 | 245 | 5,006 | 0.014 | 18 | 210 |
| Commscope NNHH-65B-R4 | 143 | 503 | 10,282 | 0.029 | 38 | 432 |
| Site-Pro RMQP-496 w/ HRK-12 | 143 | 2,446 | 50,014 | 0.142 | 184 | 2,099 |
| Site-Pro UWS6-NP Collar | 130 | 96 | 1,622 | 0.005 | 6 | 82 |
| Ericsson 4480 BAND 71 | 130 | 243 | 4,107 | 0.012 | 15 | 209 |
| RFS APXVAALL24 43-U-NA20 | 130 | 368 | 6,226 | 0.018 | 23 | 316 |
| dB Systems 5100A | 111.2 | 21 | 260 | 0.001 | 1 | 18 |
| dB Systems 5100A-D | 111.1 | 152 | 1,876 | 0.005 | 7 | 130 |
| Round Side Arm | 105 | 900 | 9,922 | 0.028 | 37 | 773 |
| VertexRSI 101V VPD | 104 | 4 | 43 | 0.000 | 0 | 3 |
| | **Totals:** | **43,191** | **351,944** | **1.000** | **1,296** | **37,075** |

**1.2D + 1.0Ev + 1.0Eh** **Seismic**

CALCULATED FORCES

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (fr-kips) | Mu Mx (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (kips) | Phi Mn (kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -51.42 | -1.30 | 0.00 | -171.23 | 0.00 | 171.23 | 3,136.53 | 776.14 | 2,682 | 2,336.59 | 0.00 | 0.00 | 0.04 |
| 5.00 | -49.24 | -1.31 | 0.00 | -164.73 | 0.00 | 164.73 | 3,092.06 | 759.10 | 2,565 | 2,252.37 | 0.01 | -0.01 | 0.04 |
| 10.00 | -47.07 | -1.32 | 0.00 | -158.17 | 0.00 | 158.17 | 3,046.49 | 742.06 | 2,452 | 2,168.84 | 0.03 | -0.03 | 0.04 |
| 15.00 | -44.93 | -1.33 | 0.00 | -151.56 | 0.00 | 151.56 | 2,999.83 | 725.02 | 2,340 | 2,086.05 | 0.07 | -0.04 | 0.04 |
| 20.00 | -42.80 | -1.34 | 0.00 | -144.91 | 0.00 | 144.91 | 2,952.07 | 707.98 | 2,232 | 2,004.07 | 0.12 | -0.06 | 0.04 |
| 25.00 | -40.70 | -1.34 | 0.00 | -138.23 | 0.00 | 138.23 | 2,901.93 | 690.94 | 2,126 | 1,922.08 | 0.19 | -0.07 | 0.04 |
| 30.00 | -40.07 | -1.34 | 0.00 | -131.53 | 0.00 | 131.53 | 2,830.35 | 673.89 | 2,022 | 1,827.91 | 0.27 | -0.09 | 0.04 |
| 31.50 | -38.14 | -1.34 | 0.00 | -129.51 | 0.00 | 129.51 | 2,808.88 | 668.78 | 1,991 | 1,800.12 | 0.30 | -0.09 | 0.04 |
| 35.00 | -37.78 | -1.34 | 0.00 | -124.83 | 0.00 | 124.83 | 2,758.78 | 656.85 | 1,921 | 1,736.10 | 0.37 | -0.10 | 0.03 |
| 35.67 | -36.09 | -1.34 | 0.00 | -123.93 | 0.00 | 123.93 | 2,225.24 | 557.62 | 1,661 | 1,429.67 | 0.38 | -0.10 | 0.04 |
| 40.00 | -34.16 | -1.33 | 0.00 | -118.15 | 0.00 | 118.15 | 2,194.35 | 545.32 | 1,589 | 1,378.40 | 0.48 | -0.12 | 0.04 |
| 45.00 | -32.25 | -1.32 | 0.00 | -111.50 | 0.00 | 111.50 | 2,157.69 | 531.12 | 1,507 | 1,319.72 | 0.61 | -0.13 | 0.04 |
| 50.00 | -30.36 | -1.31 | 0.00 | -104.89 | 0.00 | 104.89 | 2,119.93 | 516.91 | 1,428 | 1,261.60 | 0.75 | -0.15 | 0.03 |
| 55.00 | -30.17 | -1.31 | 0.00 | -98.35 | 0.00 | 98.35 | 2,081.07 | 502.71 | 1,350 | 1,204.10 | 0.91 | -0.16 | 0.03 |
| 55.48 | -28.85 | -1.30 | 0.00 | -97.72 | 0.00 | 97.72 | 2,077.29 | 501.35 | 1,343 | 1,198.61 | 0.93 | -0.16 | 0.03 |
| 55.48 | -28.85 | -1.30 | 0.00 | -97.72 | 0.00 | 97.72 | 2,077.29 | 501.35 | 1,343 | 1,198.61 | 0.93 | -0.16 | 0.05 |
| 60.00 | -27.46 | -1.29 | 0.00 | -91.85 | 0.00 | 91.85 | 2,041.12 | 488.51 | 1,275 | 1,147.26 | 1.09 | -0.17 | 0.05 |
| 65.00 | -26.15 | -1.27 | 0.00 | -85.42 | 0.00 | 85.42 | 1,992.10 | 474.31 | 1,202 | 1,086.79 | 1.28 | -0.20 | 0.04 |
| 70.00 | -24.93 | -1.26 | 0.00 | -79.05 | 0.00 | 79.05 | 1,932.46 | 460.11 | 1,131 | 1,022.32 | 1.50 | -0.22 | 0.04 |
| 73.50 | -24.59 | -1.26 | 0.00 | -74.64 | 0.00 | 74.64 | 1,451.36 | 368.08 | 905 | 769.62 | 1.67 | -0.23 | 0.05 |
| 74.92 | -24.56 | -1.26 | 0.00 | -72.85 | 0.00 | 72.85 | 1,443.63 | 364.85 | 889 | 758.75 | 1.74 | -0.24 | 0.05 |
| 75.00 | -24.16 | -1.25 | 0.00 | -72.75 | 0.00 | 72.75 | 1,443.19 | 364.67 | 888 | 758.14 | 1.74 | -0.24 | 0.03 |
| 76.25 | -23.28 | -1.23 | 0.00 | -71.19 | 0.00 | 71.19 | 1,436.31 | 361.83 | 874 | 748.59 | 1.81 | -0.24 | 0.03 |
| 76.25 | -23.28 | -1.23 | 0.00 | -71.19 | 0.00 | 71.19 | 1,436.31 | 361.83 | 874 | 748.59 | 1.81 | -0.24 | 0.04 |
| 80.00 | -22.23 | -1.21 | 0.00 | -66.56 | 0.00 | 66.56 | 1,415.26 | 353.31 | 834 | 720.08 | 2.00 | -0.25 | 0.04 |
| 85.00 | -21.19 | -1.19 | 0.00 | -60.50 | 0.00 | 60.50 | 1,386.24 | 341.95 | 781 | 682.41 | 2.28 | -0.27 | 0.03 |
| 90.00 | -20.16 | -1.17 | 0.00 | -54.55 | 0.00 | 54.55 | 1,356.12 | 330.59 | 730 | 645.17 | 2.57 | -0.29 | 0.03 |
| 95.00 | -19.15 | -1.14 | 0.00 | -48.72 | 0.00 | 48.72 | 1,324.90 | 319.23 | 681 | 608.43 | 2.88 | -0.30 | 0.03 |
| 100.00 | -18.35 | -1.11 | 0.00 | -43.03 | 0.00 | 43.03 | 1,293.04 | 307.87 | 633 | 572.44 | 3.20 | -0.32 | 0.03 |
| 104.00 | -18.15 | -1.11 | 0.00 | -38.58 | 0.00 | 38.58 | 1,254.87 | 298.78 | 596 | 538.95 | 3.47 | -0.33 | 0.03 |
| 105.00 | -16.05 | -1.03 | 0.00 | -37.48 | 0.00 | 37.48 | 1,245.33 | 296.51 | 587 | 530.74 | 3.54 | -0.33 | 0.02 |
| 110.00 | -15.85 | -1.02 | 0.00 | -32.34 | 0.00 | 32.34 | 1,197.61 | 285.15 | 543 | 490.61 | 3.90 | -0.35 | 0.02 |
| 110.00 | -15.85 | -1.02 | 0.00 | -32.34 | 0.00 | 32.34 | 833.77 | 214.52 | 410 | 343.68 | 3.90 | -0.35 | 0.03 |
| 111.10 | -15.64 | -1.01 | 0.00 | -31.22 | 0.00 | 31.22 | 829.49 | 212.65 | 403 | 338.90 | 3.98 | -0.35 | 0.03 |
| 111.20 | -15.21 | -0.99 | 0.00 | -31.12 | 0.00 | 31.12 | 829.10 | 212.48 | 402 | 338.47 | 3.99 | -0.35 | 0.02 |
| 113.56 | -14.83 | -0.98 | 0.00 | -28.77 | 0.00 | 28.77 | 819.73 | 208.45 | 387 | 328.25 | 4.16 | -0.35 | 0.02 |
| 115.00 | -14.70 | -0.97 | 0.00 | -27.36 | 0.00 | 27.36 | 813.89 | 206.00 | 378 | 322.04 | 4.27 | -0.36 | 0.01 |
| 115.54 | -13.93 | -0.94 | 0.00 | -26.84 | 0.00 | 26.84 | 811.68 | 205.08 | 374 | 319.72 | 4.31 | -0.36 | 0.01 |
| 115.54 | -13.93 | -0.94 | 0.00 | -26.84 | 0.00 | 26.84 | 811.68 | 205.08 | 374 | 319.72 | 4.31 | -0.36 | 0.02 |
| 120.00 | -13.17 | -0.90 | 0.00 | -22.66 | 0.00 | 22.66 | 792.92 | 197.48 | 347 | 300.64 | 4.65 | -0.36 | 0.02 |
| 124.44 | -13.12 | -0.90 | 0.00 | -18.66 | 0.00 | 18.66 | 773.38 | 189.91 | 321 | 281.88 | 4.99 | -0.37 | 0.01 |
| 124.44 | -13.12 | -0.90 | 0.00 | -18.66 | 0.00 | 18.66 | 773.38 | 189.91 | 321 | 281.88 | 4.99 | -0.37 | 0.08 |
| 125.00 | -12.69 | -0.88 | 0.00 | -18.16 | 0.00 | 18.16 | 770.85 | 188.96 | 318 | 279.54 | 5.03 | -0.37 | 0.08 |
| 130.00 | -11.49 | -0.82 | 0.00 | -13.75 | 0.00 | 13.75 | 747.69 | 180.44 | 290 | 258.78 | 5.45 | -0.42 | 0.07 |
| 135.00 | -11.17 | -0.81 | 0.00 | -9.64 | 0.00 | 9.64 | 722.05 | 171.92 | 263 | 237.98 | 5.92 | -0.47 | 0.06 |
| 140.00 | -10.99 | -0.80 | 0.00 | -5.60 | 0.00 | 5.60 | 686.26 | 163.40 | 238 | 214.85 | 6.42 | -0.50 | 0.04 |
| 143.00 | -6.22 | -0.47 | 0.00 | -3.19 | 0.00 | 3.19 | 664.79 | 158.28 | 223 | 201.53 | 6.74 | -0.51 | 0.03 |
| 145.00 | -5.94 | -0.45 | 0.00 | -2.25 | 0.00 | 2.25 | 650.48 | 154.88 | 214 | 192.90 | 6.96 | -0.52 | 0.02 |
| 150.00 | 0.00 | -0.40 | 0.00 | 0.00 | 0.00 | 0.00 | 614.69 | 146.35 | 191 | 172.13 | 7.51 | -0.53 | 0.00 |

**0.9D - 1.0Ev + 1.0Eh** **Seismic (Reduced DL)**

CALCULATED FORCES

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (fr-kips) | Mu Mx (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (kips) | Phi Mn (kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | -35.55 | -1.30 | 0.00 | -167.46 | 0.00 | 167.46 | 3,136.53 | 776.14 | 2,682 | 2,336.59 | 0.00 | 0.00 | 0.04 |
| 5.00 | -34.04 | -1.31 | 0.00 | -160.96 | 0.00 | 160.96 | 3,092.06 | 759.10 | 2,565 | 2,252.37 | 0.01 | -0.01 | 0.04 |
| 10.00 | -32.54 | -1.31 | 0.00 | -154.43 | 0.00 | 154.43 | 3,046.49 | 742.06 | 2,452 | 2,168.84 | 0.03 | -0.03 | 0.04 |

CALCULATED FORCES

| Seg Elev (ft) | Pu FY (-) (kips) | Vu FX (-) (kips) | Tu MY (ft-kips) | Mu MZ (fr-kips) | Mu Mx (ft-kips) | Resultant Moment (ft-kips) | Phi Pn (kips) | Phi Vn (kips) | Phi Tn (kips) | Phi Mn (kips) | Total Deflect (in) | Rotation (deg) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15.00 | -31.06 | -1.32 | 0.00 | -147.86 | 0.00 | 147.86 | 2,999.83 | 725.02 | 2,340 | 2,086.05 | 0.07 | -0.04 | 0.04 |
| 20.00 | -29.59 | -1.32 | 0.00 | -141.28 | 0.00 | 141.28 | 2,952.07 | 707.98 | 2,232 | 2,004.07 | 0.12 | -0.06 | 0.03 |
| 25.00 | -28.14 | -1.32 | 0.00 | -134.67 | 0.00 | 134.67 | 2,901.93 | 690.94 | 2,126 | 1,922.08 | 0.18 | -0.07 | 0.03 |
| 30.00 | -27.71 | -1.32 | 0.00 | -128.07 | 0.00 | 128.07 | 2,830.35 | 673.89 | 2,022 | 1,827.91 | 0.26 | -0.08 | 0.03 |
| 31.50 | -26.37 | -1.32 | 0.00 | -126.08 | 0.00 | 126.08 | 2,808.88 | 668.78 | 1,991 | 1,800.12 | 0.29 | -0.09 | 0.03 |
| 35.00 | -26.12 | -1.32 | 0.00 | -121.47 | 0.00 | 121.47 | 2,758.78 | 656.85 | 1,921 | 1,736.10 | 0.36 | -0.10 | 0.03 |
| 35.67 | -24.95 | -1.31 | 0.00 | -120.59 | 0.00 | 120.59 | 2,225.24 | 557.62 | 1,661 | 1,429.67 | 0.37 | -0.10 | 0.04 |
| 40.00 | -23.62 | -1.31 | 0.00 | -114.90 | 0.00 | 114.90 | 2,194.35 | 545.32 | 1,589 | 1,378.40 | 0.47 | -0.11 | 0.03 |
| 45.00 | -22.30 | -1.30 | 0.00 | -108.37 | 0.00 | 108.37 | 2,157.69 | 531.12 | 1,507 | 1,319.72 | 0.59 | -0.13 | 0.03 |
| 50.00 | -20.99 | -1.28 | 0.00 | -101.89 | 0.00 | 101.89 | 2,119.93 | 516.91 | 1,428 | 1,261.60 | 0.74 | -0.14 | 0.03 |
| 55.00 | -20.86 | -1.28 | 0.00 | -95.47 | 0.00 | 95.47 | 2,081.07 | 502.71 | 1,350 | 1,204.10 | 0.89 | -0.16 | 0.03 |
| 55.48 | -19.95 | -1.27 | 0.00 | -94.86 | 0.00 | 94.86 | 2,077.29 | 501.35 | 1,343 | 1,198.61 | 0.91 | -0.16 | 0.03 |
| 55.48 | -19.95 | -1.27 | 0.00 | -94.86 | 0.00 | 94.86 | 2,077.29 | 501.35 | 1,343 | 1,198.61 | 0.91 | -0.16 | 0.04 |
| 60.00 | -18.99 | -1.26 | 0.00 | -89.11 | 0.00 | 89.11 | 2,041.12 | 488.51 | 1,275 | 1,147.26 | 1.06 | -0.17 | 0.04 |
| 65.00 | -18.08 | -1.24 | 0.00 | -82.83 | 0.00 | 82.83 | 1,992.10 | 474.31 | 1,202 | 1,086.79 | 1.25 | -0.19 | 0.04 |
| 70.00 | -17.23 | -1.23 | 0.00 | -76.61 | 0.00 | 76.61 | 1,932.46 | 460.11 | 1,131 | 1,022.32 | 1.46 | -0.21 | 0.04 |
| 73.50 | -17.00 | -1.22 | 0.00 | -72.31 | 0.00 | 72.31 | 1,451.36 | 368.08 | 905 | 769.62 | 1.63 | -0.23 | 0.04 |
| 74.92 | -16.98 | -1.22 | 0.00 | -70.57 | 0.00 | 70.57 | 1,443.63 | 364.85 | 889 | 758.75 | 1.69 | -0.23 | 0.04 |
| 75.00 | -16.70 | -1.22 | 0.00 | -70.48 | 0.00 | 70.48 | 1,443.19 | 364.67 | 888 | 758.14 | 1.70 | -0.23 | 0.02 |
| 76.25 | -16.09 | -1.20 | 0.00 | -68.96 | 0.00 | 68.96 | 1,436.31 | 361.83 | 874 | 748.59 | 1.76 | -0.24 | 0.02 |
| 76.25 | -16.09 | -1.20 | 0.00 | -68.96 | 0.00 | 68.96 | 1,436.31 | 361.83 | 874 | 748.59 | 1.76 | -0.24 | 0.04 |
| 80.00 | -15.36 | -1.18 | 0.00 | -64.45 | 0.00 | 64.45 | 1,415.26 | 353.31 | 834 | 720.08 | 1.95 | -0.25 | 0.03 |
| 85.00 | -14.65 | -1.16 | 0.00 | -58.56 | 0.00 | 58.56 | 1,386.24 | 341.95 | 781 | 682.41 | 2.22 | -0.26 | 0.03 |
| 90.00 | -13.94 | -1.13 | 0.00 | -52.77 | 0.00 | 52.77 | 1,356.12 | 330.59 | 730 | 645.17 | 2.50 | -0.28 | 0.03 |
| 95.00 | -13.24 | -1.10 | 0.00 | -47.11 | 0.00 | 47.11 | 1,324.90 | 319.23 | 681 | 608.43 | 2.80 | -0.29 | 0.03 |
| 100.00 | -12.69 | -1.08 | 0.00 | -41.60 | 0.00 | 41.60 | 1,293.04 | 307.87 | 633 | 572.44 | 3.12 | -0.31 | 0.02 |
| 104.00 | -12.54 | -1.07 | 0.00 | -37.29 | 0.00 | 37.29 | 1,254.87 | 298.78 | 596 | 538.95 | 3.38 | -0.32 | 0.02 |
| 105.00 | -11.09 | -1.00 | 0.00 | -36.21 | 0.00 | 36.21 | 1,245.33 | 296.51 | 587 | 530.74 | 3.45 | -0.32 | 0.02 |
| 110.00 | -10.96 | -0.99 | 0.00 | -31.24 | 0.00 | 31.24 | 1,197.61 | 285.15 | 543 | 490.61 | 3.79 | -0.34 | 0.02 |
| 110.00 | -10.96 | -0.99 | 0.00 | -31.24 | 0.00 | 31.24 | 833.77 | 214.52 | 410 | 343.68 | 3.79 | -0.34 | 0.02 |
| 111.10 | -10.81 | -0.98 | 0.00 | -30.15 | 0.00 | 30.15 | 829.49 | 212.65 | 403 | 338.90 | 3.87 | -0.34 | 0.02 |
| 111.20 | -10.51 | -0.96 | 0.00 | -30.05 | 0.00 | 30.05 | 829.10 | 212.48 | 402 | 338.47 | 3.88 | -0.34 | 0.02 |
| 113.56 | -10.25 | -0.95 | 0.00 | -27.77 | 0.00 | 27.77 | 819.73 | 208.45 | 387 | 328.25 | 4.05 | -0.34 | 0.02 |
| 115.00 | -10.16 | -0.94 | 0.00 | -26.41 | 0.00 | 26.41 | 813.89 | 206.00 | 378 | 322.04 | 4.15 | -0.35 | 0.01 |
| 115.54 | -9.63 | -0.91 | 0.00 | -25.90 | 0.00 | 25.90 | 811.68 | 205.08 | 374 | 319.72 | 4.19 | -0.35 | 0.01 |
| 115.54 | -9.63 | -0.91 | 0.00 | -25.90 | 0.00 | 25.90 | 811.68 | 205.08 | 374 | 319.72 | 4.19 | -0.35 | 0.02 |
| 120.00 | -9.10 | -0.87 | 0.00 | -21.85 | 0.00 | 21.85 | 792.92 | 197.48 | 347 | 300.64 | 4.52 | -0.35 | 0.01 |
| 124.44 | -9.07 | -0.87 | 0.00 | -17.97 | 0.00 | 17.97 | 773.38 | 189.91 | 321 | 281.88 | 4.85 | -0.36 | 0.01 |
| 124.44 | -9.07 | -0.87 | 0.00 | -17.97 | 0.00 | 17.97 | 773.38 | 189.91 | 321 | 281.88 | 4.85 | -0.36 | 0.08 |
| 125.00 | -8.77 | -0.85 | 0.00 | -17.49 | 0.00 | 17.49 | 770.85 | 188.96 | 318 | 279.54 | 4.89 | -0.36 | 0.07 |
| 130.00 | -7.94 | -0.79 | 0.00 | -13.23 | 0.00 | 13.23 | 747.69 | 180.44 | 290 | 258.78 | 5.30 | -0.41 | 0.06 |
| 135.00 | -7.72 | -0.78 | 0.00 | -9.26 | 0.00 | 9.26 | 722.05 | 171.92 | 263 | 237.98 | 5.75 | -0.45 | 0.05 |
| 140.00 | -7.60 | -0.77 | 0.00 | -5.37 | 0.00 | 5.37 | 686.26 | 163.40 | 238 | 214.85 | 6.24 | -0.48 | 0.04 |
| 143.00 | -4.30 | -0.45 | 0.00 | -3.07 | 0.00 | 3.07 | 664.79 | 158.28 | 223 | 201.53 | 6.55 | -0.50 | 0.02 |
| 145.00 | -4.11 | -0.43 | 0.00 | -2.16 | 0.00 | 2.16 | 650.48 | 154.88 | 214 | 192.90 | 6.76 | -0.50 | 0.02 |
| 150.00 | 0.00 | -0.40 | 0.00 | 0.00 | 0.00 | 0.00 | 614.69 | 146.35 | 191 | 172.13 | 7.29 | -0.51 | 0.00 |

## ANALYSIS SUMMARY

| Load Case | Base Reactions Shear FX (kips) | Shear FZ (kips) | Axial FY (kips) | Moment MX (ft-kips) | Moment MY (ft-kips) | Moment MZ (ft-kips) | Max Usage Elev (ft) | Interaction Ratio |
|---|---|---|---|---|---|---|---|---|
| 1.2D + 1.0W | 26.91 | 0.00 | 51.77 | 0.00 | 0.00 | 2860.03 | 124.44 | 0.92 |
| 0.9D + 1.0W | 26.88 | 0.00 | 38.82 | 0.00 | 0.00 | 2811.95 | 124.44 | 0.88 |
| 1.2D + 1.0Di + 1.0Wi | 7.09 | 0.00 | 79.06 | 0.00 | 0.00 | 848.14 | 124.44 | 0.27 |
| 1.2D + 1.0Ev + 1.0Eh | 1.34 | 0.00 | 51.42 | 0.00 | 0.00 | 171.23 | 124.44 | 0.08 |
| 0.9D - 1.0Ev + 1.0Eh | 1.32 | 0.00 | 35.55 | 0.00 | 0.00 | 167.46 | 124.44 | 0.08 |
| 1.0D + 1.0W | 6.33 | 0.00 | 43.19 | 0.00 | 0.00 | 666.91 | 124.44 | 0.22 |

## ADDITIONAL STEEL SUMMARY

| Elev From (ft) | Elev To (ft) | Member | Intermediate Connectors VQ/I (k/in) | Shear Applied (kips) | phiVn (kips) | Ratio | Max Member Pu (kip) | phiPn (kip) | Ratio |
|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 55.48 | SOL #20 All Thread Bar | 209.6 | 6.3 | 16.8 | 0.3741 | 220.0 | 330.5 | 0.6657 |
| 0.00 | 76.25 | SOL #20 All Thread Bar | 363.1 | 10.9 | 16.8 | 0.648 | 259.9 | 330.5 | 0.7865 |
| 74.92 | 115.54 | SOL #20 All Thread Bar | 359.2 | 11.5 | 16.8 | 0.6838 | 223.6 | 327.4 | 0.6828 |
| 113.56 | 124.44 | SOL #20 All Thread Bar | 299.7 | 9.6 | 16.8 | 0.5706 | 101.4 | 327.4 | 0.3096 |

| Elev From (ft) | Elev To (ft) | Member | Upper Termination Connectors MQ/I (kips) | phiVn (kips) | Number Required | Number Actual | Ratio | Lower Termination Connectors MQ/I (kips) | phiVn (kip) | Number Required | Number Actual | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 55.48 | SOL #20 All Thread Bar | 169.7196 | 12 | 15 | 20 | 0.7072 | 0 | 12 | 0 | 0 | 0.0000 |
| 0.00 | 76.25 | SOL #20 All Thread Bar | 125.6714 | 12 | 11 | 14 | 0.7480 | 0 | 12 | 0 | 0 | 0.0000 |
| 74.92 | 115.54 | SOL #20 All Thread Bar | 51.6964 | 12 | 5 | 8 | 0.5385 | 150.7554 | 12 | 13 | 16 | 0.7852 |
| 113.56 | 124.44 | SOL #20 All Thread Bar | 72.0239 | 12 | 7 | 12 | 0.5002 | 65.4468 | 12 | 6 | 12 | 0.4545 |

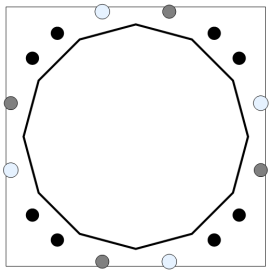
# BASE PLATE ANALYSIS @ 0 FT

## APPLIED REACTIONS

| Moment (k-ft) | Axial (k) | Shear (k) |
|---|---|---|
| 2860.03 | 51.77 | 26.91 |

## PLATE PARAMETERS (ID# 18534)

| | | |
|---|---|---|
| Width: | 44 | in |
| Shape: | Square | |
| Thickness: | 2.5 | in |
| Grade: | A572-60 | |
| Yield Strength: | 60 | ksi |
| Tensile Strength: | 75 | ksi |
| Clip Length: | | in |
| Rod Detail Type: | c | |
| Clear Distance | - | in |
| Base Weld Size: | 0.125 | in |
| Orientation Offset: | - | ° |
| Analysis Type: | Elastic | |
| Neutral Axis: | 319 | ° |



## ANCHOR ROD PARAMETERS

| Class | Arrangement | Quantity | Diameter (in) | Circle (in) | Grade | $F_y$ (ksi) | $F_u$ (ksi) | Spacing (in) | Offset (°) |
|---|---|---|---|---|---|---|---|---|---|
| Original [ID#19003] | Cluster | 8 | 2.25 | 44 | A615-75 | 75 | 100 | 6 | - |
| Bypass [ID#19002] | Radial | 4 | 2.25 | 43.88 | A615-75 | 75 | 100 | - | 75 |

## DYWIDAG BAR PARAMETERS

| Quantity | Bar Size | Bar Diameter (in) | $F_y$ (ksi) | $F_u$ (ksi) | Bracket Type | Bracket Offset (in) | Circle (in) | Offset (°) |
|---|---|---|---|---|---|---|---|---|
| 4 [ID# 1371] | #20 | 2.5 | 80 | 100 | Angle | 2.19 | 43.88 | 15 |

## COMPONENT PROPERTIES

| Component | ID | Gross Area ($in^2$) | Net Area ($in^2$) | Individual Inertia ($in^4$) | Moment of Inertia ($in^4$) | Threads/in |
|---|---|---|---|---|---|---|
| Pole | 37"ø x 0.375" (12 Sides) | 42.6566 | - | - | 7154.41 | - |
| Bolt Group | Original (8) 2.25"ø | 3.9761 | 3.2477 | 0.8393 | 5566.40 | 4.5 |
| Bolt Group | Bypass (4) 2.25"ø | 3.9761 | 3.2477 | 0.8393 | 3130.00 | 4.5 |
| Dywidag Group | (4) #20 | 4.9087 | 4.9087 | 1.9175 | 4733.45 | - |

## REACTION DISTRIBUTION

| Component | ID | Moment $M_u$ (k-ft) | Axial Load $P_u$ (k) | Shear $V_u$ (k) | Moment Factor |
|---|---|---|---|---|---|
| Pole | 37"ø x 0.375" (12 Sides) | 1197.4 | 51.77 | 26.91 | 0.419 |
| Bolt Group | Original (8) 2.25"ø | 1197.4 | - | 26.91 | 0.419 |
| Bolt Group | Bypass (4) 2.25"ø | 523.8 | - | 0.00 | 0.183 |
| Dywidag Group | (4) #20 | 1138.8 | - | - | 0.398 |

## BASE PLATE BEND LINE ANALYSIS @ 0 FT

**POLE PROPERTIES**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Flat-to-Flat Diameter: | 37.12 | in | Flat Width: | 9.948 | in | Neutral Axis: | 319 | ° |
| Point-to-Point Diameter: | 38.44 | in | Flat Radians: | 0.524 | rad | | | |
| Orientation Offset: | - | ° | | | | | | |

| Bend Line | Chord Length (in) | Additional Length (in) | Section Modulus ($in^3$) | Applied Moment $M_u$ (k-in) | Moment Capacity $\Phi M_n$ (k-in) | Flexure Result $M_u/\Phi M_n$ | |
|---|---|---|---|---|---|---|---|
| Flats | 25.100 | 0.00 | 39.219 | 656.4 | 2117.8 | 31.0% | ✓ |
| Corners | 23.791 | 0.00 | 37.173 | 428.3 | 2007.3 | 21.3% | ✓ |

## ELASTIC ANCHOR ROD ANALYSIS

| Class | Group Quantity | Rod Diameter (in) | Applied Axial Load $P_u$ (k) | Applied Shear Load $V_u$ (k) | Compressive Capacity $\Phi P_n$ (k) | Compressive Result | Interaction Result | |
|---|---|---|---|---|---|---|---|---|
| Original | 8 | 2.25 | 175.8 | 0.4 | 243.6 | 0.722 | 72.5% | ✓ |
| Bypass | 4 | 2.25 | 131.0 | 0.0 | 243.6 | 0.538 | 53.8% | ✓ |

## DYWIDAG BAR ANALYSIS

| Group Quantity | Bar Size | Bar Circle (in) | Applied Axial Load $P_u$ (k) | Compressive Capacity $\Phi P_n$ (k) | Compressive Result $P_u$ / $\Phi P_n$ | |
|---|---|---|---|---|---|---|
| 4 | #20 | 43.88 | 262.9 | 368.2 | 71.4% | ✓ |

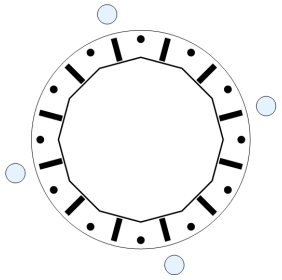
# UPPER FLANGE PLATE ANALYSIS @ 110 FT

## APPLIED REACTIONS

| Moment (k-ft) | Axial (k) | Shear (k) |
|---|---|---|
| 447 | 14.21 | 14.81 |

## PLATE PARAMETERS (ID# 18535)

| | | |
|---|---|---|
| Width: | 28 | in |
| Shape: | Round | |
| Thickness: | 1 | in |
| Grade: | A36 | |
| Yield Strength: | 36 | ksi |
| Tensile Strength: | 58 | ksi |
| Base Weld Size: | 0.125 | in |
| Orientation Offset: | - | ° |
| Analysis Type: | Elastic | |
| Neutral Axis: | 132 | ° |



## FLANGE BOLT PARAMETERS

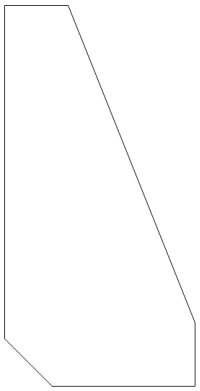
| Class | Arrangement | Quantity | Diameter (in) | Circle (in) | Grade | $F_y$ (ksi) | $F_u$ (ksi) | Spacing (in) | Offset (°) |
|---|---|---|---|---|---|---|---|---|---|
| Original [ID#19004] | Radial | 12 | 1 | 25.75 | A325 | 92 | 120 | - | - |

## DYWIDAG BAR PARAMETERS

| Quantity | Bar Size | Bar Diameter (in) | $F_y$ (ksi) | $F_u$ (ksi) | Bracket Type | Bracket Offset (in) | Circle (in) | Offset (°) |
|---|---|---|---|---|---|---|---|---|
| 4 [ID# 1372] | #20 | 2.5 | 80 | 100 | W5x19 | 5.15 | 33.23 | 15 |

## STIFFENER PARAMETERS

| | | |
|---|---|---|
| Arrangement: | Radial | |
| Quantity: | 12 | |
| Height: | 6 | in |
| Width: | 3 | in |
| Thickness: | 0.75 | in |
| Notch: | 0.75 | in |
| Grade: | A572-50 | |
| Yield Strength: | 50 | ksi |
| Tensile Strength: | 65 | ksi |
| Horizontal Weld Type: | Fillet | |
| Horizontal Weld Fillet Size: | 0.375 | in |
| Vertical Weld Fillet Size: | 0.313 | in |
| Weld Strength: | 70 | ksi |
| Orientation Offset: | - | ° |



## COMPONENT PROPERTIES

| Component | ID | Gross Area ($in^2$) | Net Area ($in^2$) | Individual Inertia ($in^4$) | Moment of Inertia ($in^4$) | Threads/in |
|---|---|---|---|---|---|---|
| Pole | 20.4333"ø x 0.1875" (12 Sides) | 11.7900 | - | - | 604.22 | - |
| Bolt Group | Original (12) 1"ø | 0.7854 | 0.6057 | 0.0292 | 545.75 | 8.0 |
| Dywidag Group | (4) #20 | 4.9087 | 4.9087 | 1.9175 | 2718.40 | - |
| Stiffeners | (12) 6"H x 3"W x 0.75"T | 1.6875 | 1.5188 | 6.7500 | 1261.72 | - |

## REACTION DISTRIBUTION

| Component | ID | Moment $M_u$ (k-ft) | Axial Load $P_u$ (k) | Shear $V_u$ (k) | Moment Factor |
|---|---|---|---|---|---|
| Pole | 20.4333"ø x 0.1875" (12 Sides) | 81.3 | 14.21 | 14.81 | 0.182 |
| Bolt Group | Original (12) 1"ø | 81.3 | - | 14.81 | 0.182 |
| Dywidag Group | (4) #20 | 365.7 | - | - | 0.818 |
| Stiffeners | (12) 6"H x 3"W x 0.75"T | 55.0 | - | 10.01 | 0.123 |

## UPPER FLANGE PLATE BEND LINE ANALYSIS @ 110 FT

**POLE PROPERTIES**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Flat-to-Flat Diameter: | 20.56 | in | Flat Width: | 5.509 | in | Neutral Axis: | 132 | ° |
| Point-to-Point Diameter: | 21.28 | in | Flat Radians: | 0.524 | rad | Bend Line Limits: | 3.408 to 4.446 | rad |
| Orientation Offset: | - | ° | | | | | | |

**PLATE PROPERTIES**

| Bend Line | Chord Length (in) | Additional Length (in) | Section Modulus ($in^3$) | Applied Moment $M_u$ (k-in) | Moment Capacity $\Phi M_n$ (k-in) | Flexure Result $M_u/\Phi M_n$ |
|---|---|---|---|---|---|---|
| Flats | 18.000 | 4.66 | 5.666 | 40.1 | 183.6 | 21.8% |
| Corners | 17.137 | 2.87 | 5.001 | 30.6 | 162.0 | 18.9% |
| Circumferential | 20.670 | 3.75 | 6.105 | 41.8 | 197.8 | 21.2% |

## ELASTIC FLANGE BOLT ANALYSIS

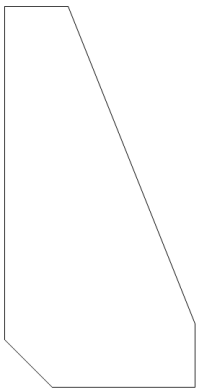
| Class | Group Quantity | Bolt Diameter (in) | Applied Axial Load $P_u$ (k) | Applied Shear Load $V_u$ (k) | Compressive Capacity $\Phi P_n$ (k) | Compressive Result | Interaction Result |
|---|---|---|---|---|---|---|---|
| Original | 12 | 1 | 13.2 | 0.4 | 54.5 | 0.242 | 25.2% |

## DYWIDAG BAR ANALYSIS

| Group Quantity | Bar Size | Bar Circle (in) | Applied Axial Load $P_u$ (k) | Compressive Capacity $\Phi P_n$ (k) | Compressive Result $P_u$ / $\Phi P_n$ |
|---|---|---|---|---|---|
| 4 | #20 | 33.23 | 120.2 | 368.2 | 32.7% |

## UPPER FLANGE PLATE STIFFENER ANALYSIS

| | | |
|---|---|---|
| Quantity: | 12 | |
| Height: | 6 | in |
| Width: | 3 | in |
| Effective Width: | 3.000 | in |
| Thickness: | 0.75 | in |
| Notch: | 0.75 | in |
| Grade: | A572-50 | |
| Yield Strength: | 50 | ksi |
| Tensile Strength: | 65 | ksi |
| Horizontal Weld Type: | Fillet | |
| Horizontal Weld Fillet Size: | 0.375 | in |
| Horizontal Weld Bevel Size: | | in |
| Vertical Weld Fillet Size: | 0.313 | in |
| Weld Strength: | 70 | ksi |
| Electrode Coefficient: | 1.000 | |



### PLATE COMPRESSION

| | | |
|---|---|---|
| Radius of Gyration: | 0.217 | $in^3$ |
| kl/r: | 16.63 | |
| $4.71 \sqrt{(E/F_y)}$: | 113.43 | |
| Buckling Stress, $F_e$: | 1035.22 | ksi |
| Crit. Buckling Stress, $F_{cr}$: | 907.89 | ksi |
| Applied Compression, $P_u$: | 9.44 | k |
| Compressive Capacity, ΦP: | 1378.86 | k |
| Compressive Result, $P_u/\Phi P_n$: | 0.3% | ✓ |

### PLATE TENSION

| | | |
|---|---|---|
| Gross Cross Section: | 1.6875 | $in^2$ |
| Net Cross Section: | 1.5188 | $in^2$ |
| Applied Tension, $T_u$: | 9.14 | k |
| Tensile Capacity, $\Phi T_n$: | 74.04 | k |
| Tension Result, Tu/ϕTn: | 6.2% | ✓ |

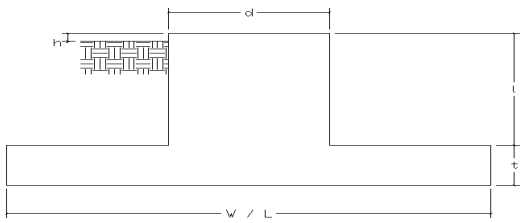
### VERTICAL WELD TO POLE

| | | |
|---|---|---|
| Vertical Eccentricity Ratio, $a=e_x/l$: | 0.167 | |
| Spacing Ratio, k: | 0.125 | |
| Weld Coefficient, C: | 3.660 | |
| Applied Compression, $P_u$: | 9.44 | k |
| Compressive Capacity, $\Phi P_n$: | 82.48 | k |
| Horizontal Eccentricity Ratio, $a=e_x/l$: | 0.333 | |
| Weld Coefficient, C: | 2.970 | |
| Applied Shear, $V_u$: | 0.07 | k |
| Shear Capacity, $\Phi V_n$: | 66.93 | k |
| Weld Result, $P_u/\Phi P_n + V_u/\Phi V_n$: | 11.5% | ✓ |

### HORIZONTAL WELD TO PLATE

| | | |
|---|---|---|
| Horizontal Eccentricity Ratio, $a=e_x/l$: | 0.167 | |
| Spacing Ratio, k: | 0.250 | |
| Weld Coefficient, C: | 4.040 | |
| Effective Fillet Size: | 0.375 | in |
| Applied Compression, $P_u$: | 9.44 | k |
| Compressive Capacity, $\Phi P_n$: | 54.54 | k |
| Vertical Eccentricity Ratio, $a=e_x/l$: | 0.333 | |
| Weld Coefficient, C: | 3.100 | |
| Applied Shear, $V_u$: | 0.07 | k |
| Shear Capacity, $\Phi V_n$: | 41.85 | k |
| Weld Result, $P_u/\Phi P_n + V_u/\Phi V_n$: | 17.5% | ✓ |

| | |
|---|---|
| Site Name: | Sttn - Southington |
| Site Number: | 302475 |
| Engineering Number: | 13703662_C3_03 |
| Engineer: | B. Lanier |
| Date: | 5/3/2023 |
| Tower Type: | MP |




**Design Loads (Factored) - Analysis per TIA-222-H Standards**

| | | | | | |
|---|---|---|---|---|---|
| Design / Analysis / Mapping: | Analysis | | | | |
| Compression/Leg: | 51.8 | k | Concrete Strength ($f'_c$): | 3000 | psi |
| Uplift/Leg: | 0.0 | k | Pad Tension Steel Depth: | 32.00 | in |
| Total Shear: | 26.9 | k | $\phi_{Shear}$: | 0.75 | |
| Moment: | 2860.0 | k-ft | $\phi_{Flexure\ /\ Tension}$: | 0.90 | |
| Tower + Appurtenance Weight: | 51.8 | k | $\phi_{Compression:}$ | 0.65 | |
| Depth to Base of Foundation (l + t - h): | 6.8 | ft | $\beta$: | 0.85 | |
| Diameter of Pier (d): | 5.0 | ft | Bottom Pad Rebar Size #: | 10 | |
| Height of Pier above Ground (h): | 0.5 | | # of Bottom Pad Rebar: | 36 | |
| Width of Pad (W): | 18.5 | ft | Pad Bottom Steel Area: | 45.72 | $in^2$ |
| Length of Pad (L): | 18.5 | ft | Pad Steel $F_y$: | 60000 | psi |
| Thickness of Pad (t): | 3.0 | ft | Top Pad Rebar Size #: | 5 | |
| Tower Leg Center to Center: | 0.0 | ft | # of Top Pad Rebar: | 36 | |
| Number of Tower Legs: | 1.0 | (1 if MP or GT) | Pad Top Steel Area: | 11.16 | $in^2$ |
| Tower Center from Mat Center: | 0.0 | ft | Pier Rebar Size #: | 11 | |
| Depth Below Ground Surface to Water Table: | 9.0 | ft | Pier Steel Area (Single Bar): | 1.56 | $in^2$ |
| Unit Weight of Concrete: | 150.0 | pcf | # of Pier Rebar: | 26 | |
| Unit Weight of Soil Above Water Table: | 123.0 | pcf | Pier Steel $F_y$: | 60000 | psi |
| Unit Weight of Water: | 62.4 | pcf | Pier Cage Diameter: | 52.0 | in |
| Unit Weight of Soil Below Water Table: | 65.0 | pcf | Rebar Strain Limit: | 0.008 | |
| Friction Angle of Uplift: | 15.0 | Degrees | Steel Elastic Modulus: | 29000 | ksi |
| Ultimate Coefficient of Shear Friction: | 0.3 | | Tie Rebar Size #: | 4 | |
| Ultimate Compressive Bearing Pressure: | 12000.0 | psf | Tie Steel Area (Single Bar): | 0.20 | $in^2$ |
| Ultimate Passive Pressure on Pad Face: | 4000.0 | psf | Tie Spacing: | 12 | in |
| $\phi_{Soil\ and\ Concrete\ Weight}$: | 0.9 | | Tie Steel $F_y$: | 60000 | psi |
| $\phi_{Soil}$: | 0.75 | | | 0 | |

**Overturning Moment Usage**

| | | |
|---|---|---|
| Design OTM: | 3056.5 | k-ft |
| OTM Resistance: | 3428.9 | k-ft |
| Design OTM / OTM Resistance: | 0.89 | Result: OK |

**Soil Bearing Pressure Usage**

| | | |
|---|---|---|
| Unfactored Total Weight (Foundation, Soil, Tower): | 360.6 | k |
| Net Bearing Pressure: | 8887 | psf |
| Factored Nominal Bearing Pressure: | 9000 | psf |
| Net Bearing Pressure/Factored Nominal Bearing Pressure: | 0.99 | Result: OK |
| Load Direction Controling Design Bearing Pressure: | Diagonal to Pad Edge | |

**Sliding Factor of Safety**

| | | |
|---|---|---|
| Total Factored Sliding Resistance: | 217.5 | k |
| Sliding Design / Sliding Resistance: | 0.12 | Result: OK |

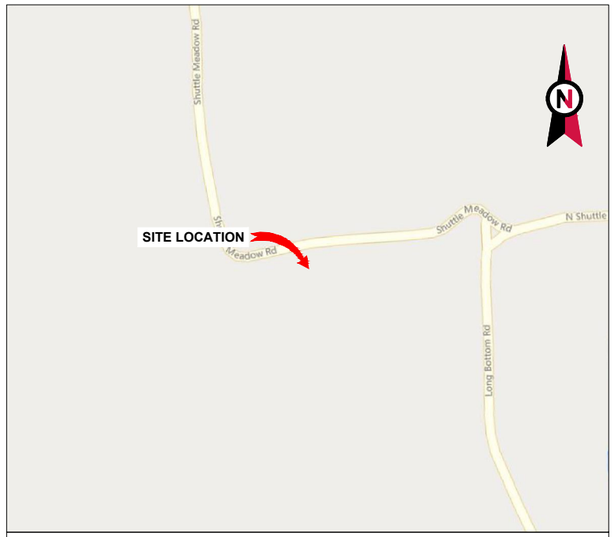
**One Way Shear, Flexual Capacity, and Punching Shear**

| | | |
|---|---|---|
| Factored One Way Shear ($V_u$): | 284.7 | k |
| One Way Shear Capacity ($\phi V_c$): | 583.7 | k - ACI11.3.1.1 |
| $V_u$ / $\phi V_c$: | 0.49 | Result: OK |
| Load Direction Controling Shear Capacity: | Parallel to Pad Edge | |
| Lower Steel Pad Factored Moment ($M_u$): | 1919.9 | k-ft |
| Lower Steel Pad Moment Capacity ($\phi M_n$): | 6934.8 | k-ft - ACI10.3 |
| $M_u$ / $\phi M_n$: | 0.28 | Result: OK |
| Load Direction Controling Flexural Capacity: | Diagonal to Pad Edge | |
| Upper Steel Pad Factored Moment ($M_u$): | 449.4 | k-ft |
| Upper Steel Pad Moment Capacity ($\phi M_n$): | 1581.8 | k-ft |
| $M_u$ / $\phi M_n$: | 0.28 | Result: OK |
| Lower Pad Flexural Reinforcement Ratio: | 0.0064 | OK - Minimum Reinforcement Ratio Met - ACI10.5.1 |
| Upper Pad Flexural Reinforcement Ratio: | 0.0016 | OK - Minimum Reinforcement Ratio Met - ACI10.5.1 |
| Lower Pad Reinforcement Spacing: | 6 | in - Pad Reinforcing Spacing OK - ACI7.12.2.2 & 10.5.4 |
| Upper Pad Reinforcement Spacing: | 6 | in - Pad Reinforcing Spacing OK - ACI7.12.2.2 & 10.5.4 |
| Factored Punching Shear ($V_u$): | 23.2 | k |
| Nominal Punching Shear Capacity ($\phi_c V_n$): | 1519.7 | k - ACI11.12.2.1 |
| $V_u$ / $\phi V_c$: | 0.02 | Result: OK |
| Factored Moment in Pier ($M_u$): | 2975.7 | k-ft |
| Pier Moment Capacity ($\phi M_n$): | 4642.4 | k-ft |
| $M_u$ / $\phi M_n$: | 0.64 | Result: OK |
| Punching Shear Flexural Pier Transfer Capacity ($\phi_c V_n$): | 2912.8 | k-ft |
| Punching Shear Flexural Pier Transfter $V_u$ / $\phi V_c$: | 0.42 | Result: OK |
| Lower Steel Flexural Pier Transfer Capacity ($\phi M_n$): | 5858.6 | k-ft |
| Lower Steel Flexural Pier Transfter $M_u$ / $\phi M_n$: | 0.30 | Result: OK |
| Factored Shear in Pier ($V_u$): | 26.9 | k |
| Pier Shear Capacity ($\phi V_n$): | 234.4 | k |
| $V_u$ / $\phi V_c$: | 0.11 | Result: OK |
| Pier Shear Reinforcement Ratio: | 0.0007 | No Ties Necessary for Shear - ACI11.5.6. |
| Factored Tension in Pier ($T_u$): | 0.0 | k |
| Pier Tension Capacity ($\phi T_n$): | 2190.2 | k |
| $T_u$ / $\phi T_n$: | 0.00 | Result: OK |
| Factored Compression in Pier ($P_u$): | 51.8 | k |
| Pier Compression Capacity ($\phi P_n$): | 3695.4 | k - ACI10.3.6.2 |
| $P_u$ / $\phi P_n$: | 0.01 | Result: OK |
| Pier Compression Reinforcement Ratio: | 0.014 | OK - Reinforcement Ratio Met - ACI10.9.1 & 10.8.4 |
| $M_u/\phi_B M_n + T_u/\phi_T T_n$: | 0.64 | Result: OK |

CENTERLINE

# EXHIBIT D

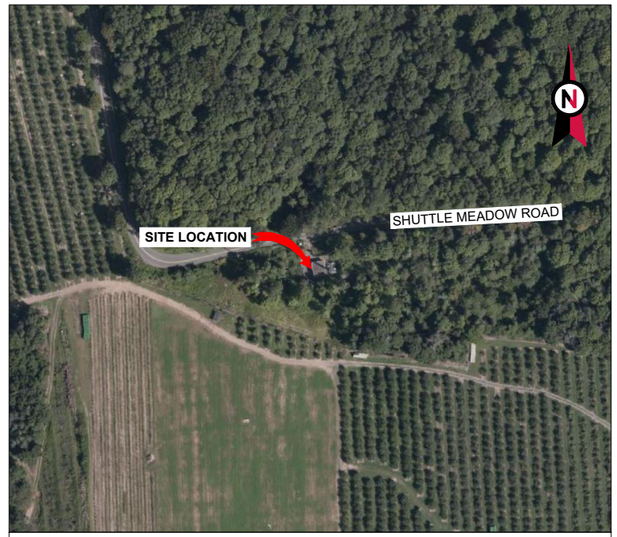
## Construction Drawings




VICINITY MAP

AMERICAN TOWER®

ATC SITE NAME: STTN - SOUTHINGTON
ATC SITE NUMBER: 302475
VERIZON SITE NAME: SOUTHINGTON 3 CT - A
VERIZON MDG NUMBER:5000382897
SITE ADDRESS: 80 SHUTTLE MEADOW ROAD
SOUTHINGTON, CT 06489




LOCATION MAP

BIRD WATCH SITE:
PLEASE CONTACT BIRD.WATCH@AMERICANTOWER.COM OR AMERICAN TOWER NOC AT 877-518-6937 FOR ASSISTANCE

# VERIZON
# ANTENNA AMENDMENT DRAWINGS

## COMPLIANCE CODE

ALL WORK SHALL BE PERFORMED AND MATERIALS INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNMENT AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES.

1. 2022 CONNECTICUT STATE BUILDING CODE,
   INCORPORATING THE 2021 IBC
2. 2020 NATIONAL ELECTRICAL CODE - NFPA 70
3. LOCAL BUILDING CODE
4. CITY/COUNTY ORDINANCES

## UTILITY COMPANIES

POWER COMPANY: EVERSOURCE
PHONE: (877) 659-6326

TELEPHONE COMPANY: FRONTIER COMMUNICATIONS
PHONE: (800) 376-6843

811 Know what's below. Call before you dig.

## PROJECT SUMMARY

SITE ADDRESS:

80 SHUTTLE MEADOW ROAD

SOUTHINGTON, CT 06489

COUNTY: HARTFORD

GEOGRAPHIC COORDINATES:

LATITUDE: 41.63858333

LONGITUDE: -72.8411

GROUND ELEVATION: 489' AMSL

## PROJECT TEAM

TOWER OWNER:

AMERICAN TOWER
10 PRESIDENTIAL WAY
WOBURN, MA 01801

APPLICANT:

VERIZON WIRELESS

ENGINEER:

COLLIERS ENGINEERING &
DESIGN CT, P.C. D/B/A
MASER CONSULTING
135 NEW ROAD
MADISON, CT 06443

PROJECT #:
21904166A

PROPERTY OWNER:

JOHN N ROGERS
80 SHUTTLE MEADOW ROAD
SOUTHINGTON, CT 06489

## PROJECT DESCRIPTION

THE PROPOSED PROJECT INCLUDES MODIFYING GROUND BASED AND TOWER MOUNTED EQUIPMENT AS INDICATED PER BELOW:

REMOVE (6) ANTENNA(s)

INSTALL (6) ANTENNA(s) AND (3) RRH(s)

EXISTING (6) ANTENNA(s), (3) RRH(s), (1) OVP(s) AND (2) HYBRID CABLE(s) TO REMAIN

## PROJECT NOTES

1. THE FACILITY IS UNMANNED.
2. A TECHNICIAN WILL VISIT THE SITE APPROXIMATELY ONCE A MONTH FOR ROUTINE INSPECTION AND MAINTENANCE.
3. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT LAND DISTURBANCE OR EFFECT OF STORM WATER DRAINAGE.
4. NO SANITARY SEWER, POTABLE WATER OR TRASH DISPOSAL IS REQUIRED.
5. HANDICAP ACCESS IS NOT REQUIRED.
6. THE PROJECT DEPICTED IN THESE PLANS QUALIFIES AS AN ELIGIBLE FACILITIES REQUEST ENTITLED TO EXPEDITED REVIEW UNDER 47 U.S.C. § 1455(A) AS A MODIFICATION OF AN EXISTING WIRELESS TOWER THAT INVOLVES THE COLLOCATION, REMOVAL, AND/OR REPLACEMENT OF TRANSMISSION EQUIPMENT THAT IS NOT A SUBSTANTIAL CHANGE UNDER CFR § 1.61000 (B)(7).

## PROJECT LOCATION DIRECTIONS

FROM HARTFORD : I-84 W TOWARD WATERBURY11.9 MI4.SLIGHT RIGHT AT CT-72 W (SIGNS FOR BRISTOL/CT-72 W/PLAINVILLE)0.6 MI5.TAKE EXIT 2 TOWARD CT-372/NEW BRITAIN AVE/PLAINVILLE0.3 MI6.TURN RIGHT AT CT-372/NEW BRITAIN AVE0.5 MI7.TURN RIGHT AT CROOKED ST0.4 MI8.TURN RIGHT AT WHITE OAK AVE0.1 MI9.TURN LEFT AT LEDGE RD1.3 MI10.CONTINUE ON SHUTTLE MEADOW RD

## SHEET INDEX

| SHEET NO: | DESCRIPTION: | REV: | DATE: | BY: |
|---|---|---|---|---|
| G-001 | TITLE SHEET | 0 | 05/13/24 | DRP |
| G-002 | GENERAL NOTES | 0 | 05/13/24 | DRP |
| C-101 | DETAILED SITE PLAN | 0 | 05/13/24 | DRP |
| C-201 | TOWER ELEVATION | 0 | 05/13/24 | DRP |
| C-401 | ANTENNA INFORMATION & SCHEDULE | 0 | 05/13/24 | DRP |
| C-501 | CONSTRUCTION DETAILS | 0 | 05/13/24 | DRP |
| E-501 | GROUNDING DETAILS | 0 | 05/13/24 | DRP |
| R-601 | SUPPLEMENTAL | | | |
| R-602 | SUPPLEMENTAL | | | |
| R-603 | SUPPLEMENTAL | | | |
| R-604 | SUPPLEMENTAL | | | |
| R-605 | SUPPLEMENTAL | | | |

AMERICAN TOWER®

Colliers Engineering & Design
www.colliersengineering.com
Doing Business as MASER CONSULTING
MADISON
135 New Road
Madison, CT 06443
Phone: 860.395.0055
COLLIERS ENGINEERING & DESIGN CT, P.C.
DOING BUSINESS AS MASER CONSULTING



| REV. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| A | PRELIM | MJB | 07/23/21 |
| 0 | ISSUED FOR CONSTRUCTION | DRP | 05/13/24 |

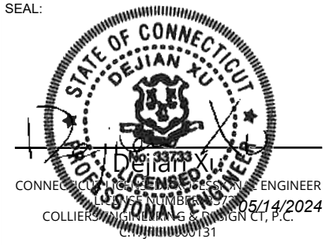
ATC SITE NUMBER:
302475

ATC SITE NAME:
STTN - SOUTHINGTON

VERIZON SITE NAME:
SOUTHINGTON 3 CT - A

SITE ADDRESS:
80 SHUTTLE MEADOW ROAD
SOUTHINGTON, CT 06489

SEAL:




CONNECTICUT LICENSED PROFESSIONAL ENGINEER
LICENSE NUMBER: 33733
COLLIERS ENGINEERING & DESIGN CT, P.C.
C.A. #: 0000131

verizon

| | |
|---|---|
| DATE DRAWN: | 07/23/21 |
| ATC JOB NO: | 13703662_D1 |
| CUSTOMER ID: | SOUTHINGTON 3 CT - A |
| CUSTOMER #: | 5000382897 |

TITLE SHEET

| SHEET NUMBER: | REVISION: |
|---|---|
| G-001 | 0 |

## GENERAL CONSTRUCTION NOTES:

1. OWNER FURNISHED MATERIALS, VERIZON "THE COMPANY" WILL PROVIDE AND THE CONTRACTOR WILL INSTALL
   - A. BTS EQUIPMENT FRAME (PLATFORM) AND ICEBRIDGE SHELTER (GROUND BUILD/CO-LOCATE ONLY)
   - B. AC/TELCO INTERFACE BOX (PPC)
   - C. ICE BRIDGE (CABLE TRAY WITH COVER) (GROUND BUILD/CO-LOCATE ONLY, GC TO FURNISH AND INSTALL FOR ROOFTOP INSTALLATION)
   - D. TOWERS, MONOPOLES
   - E. TOWER LIGHTING
   - F. GENERATORS & LIQUID PROPANE TANK
   - G. ANTENNA STANDARD BRACKETS, FRAMES AND PIPES FOR MOUNTING
   - H. ANTENNAS (INSTALLED BY OTHERS)
   - I. TRANSMISSION LINE
   - J. TRANSMISSION LINE JUMPERS
   - K. TRANSMISSION LINE CONNECTORS WITH WEATHERPROOFING KITS
   - L. TRANSMISSION LINE GROUND KITS
   - M. HANGERS
   - N. HOISTING GRIPS
   - O. BTS EQUIPMENT
2. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL OTHER MATERIALS FOR THE COMPLETE INSTALLATION OF THE SITE INCLUDING, BUT NOT LIMITED TO, SUCH MATERIALS AS FENCING, STRUCTURAL STEEL SUPPORTING SUB-FRAME FOR PLATFORM, ROOFING LABOR AND MATERIALS, GROUNDING RINGS, GROUNDING WIRES, COPPER-CLAD OR XIT CHEMICAL GROUND ROD(S), BUSS BARS, TRANSFORMERS AND DISCONNECT SWITCHES WHERE APPLICABLE, TEMPORARY ELECTRICAL POWER, CONDUIT, LANDSCAPING COMPOUND STONE, CRANES, CORE DRILLING, SLEEPERS AND RUBBER MATTING, REBAR, CONCRETE CAISSONS, PADS AND/OR AUGER MOUNTS, MISCELLANEOUS FASTENERS, CABLE TRAYS, NON-STANDARD ANTENNA FRAMES AND ALL OTHER MATERIAL AND LABOR REQUIRED TO COMPLETE THE JOB ACCORDING TO THE DRAWINGS AND SPECIFICATIONS. IT IS THE POSITION OF VERIZON TO APPLY FOR PERMITTING AND CONTRACTOR RESPONSIBLE FOR PICKUP AND PAYMENT OF REQUIRED PERMITS.
3. ALL WORK SHALL CONFORM TO ALL CURRENT APPLICABLE FEDERAL, STATE, AND LOCAL CODES, INCLUDING ANSI/EIA/TIA-222, AND COMPLY WITH ATC CONSTRUCTION SPECIFICATIONS.
4. CONTRACTOR SHALL CONTACT LOCAL 811 FOR IDENTIFICATION OF UNDERGROUND UTILITIES PRIOR TO START OF CONSTRUCTION.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL REQUIRED INSPECTIONS.
6. ALL DIMENSIONS TO, OF, AND ON EXISTING BUILDINGS, DRAINAGE STRUCTURES, AND SITE IMPROVEMENTS SHALL BE VERIFIED IN FIELD BY CONTRACTOR WITH ALL DISCREPANCIES REPORTED TO THE ENGINEER.
7. DO NOT CHANGE SIZE OR SPACING OF STRUCTURAL ELEMENTS.
8. DETAILS SHOWN ARE TYPICAL; SIMILAR DETAILS APPLY TO SIMILAR CONDITIONS UNLESS OTHERWISE NOTED.
9. THESE DRAWINGS DO NOT INCLUDE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY WHICH SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
10. CONTRACTOR SHALL BRACE STRUCTURES UNTIL ALL STRUCTURAL ELEMENTS NEEDED FOR STABILITY ARE INSTALLED. THESE ELEMENTS ARE AS FOLLOWS: LATERAL BRACING, ANCHOR BOLTS, ETC.
11. CONTRACTOR SHALL DETERMINE EXACT LOCATION OF EXISTING UTILITIES, GROUNDS DRAINS, DRAIN PIPES, VENTS, ETC. BEFORE COMMENCING WORK.
12. INCORRECTLY FABRICATED, DAMAGED, OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS SHALL BE REPORTED TO THE VERIZON REP PRIOR TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH REMEDIAL ACTION SHALL REQUIRE WRITTEN APPROVAL BY THE VERIZON REP PRIOR TO PROCEEDING.
13. EACH CONTRACTOR SHALL COOPERATE WITH THE VERIZON REP, AND COORDINATE HIS WORK WITH THE WORK OF OTHERS.
14. CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED BY CONSTRUCTION OF THIS PROJECT TO MATCH EXISTING PRE-CONSTRUCTION CONDITIONS TO THE SATISFACTION OF THE VERIZON CONSTRUCTION MANAGER.
15. ALL CABLE/CONDUIT ENTRY/EXIT PORTS SHALL BE WEATHERPROOFED DURING INSTALLATION USING A SILICONE SEALANT.
16. WHERE EXISTING CONDITIONS DO NOT MATCH THOSE SHOWN IN THIS PLAN SET, CONTRACTOR SHALL NOTIFY THE VERIZON REP AND ENGINEER OF RECORD IMMEDIATELY.
17. CONTRACTOR SHALL ENSURE ALL SUBCONTRACTORS ARE PROVIDED WITH A COMPLETE AND CURRENT SET OF DRAWINGS AND SPECIFICATIONS FOR THIS PROJECT.
18. CONTRACTOR SHALL REMOVE ALL RUBBISH AND DEBRIS FROM THE SITE AT THE END OF EACH DAY.
19. CONTRACTOR SHALL COORDINATE WORK SCHEDULE WITH AMERICAN TOWER CORPORATION (ATC) AND TAKE PRECAUTIONS TO MINIMIZE IMPACT AND DISRUPTION OF OTHER OCCUPANTS OF THE FACILITY.
20. CONTRACTOR SHALL FURNISH VERIZON AND AMERICAN TOWER CORPORATION (ATC) WITH A PDF MARKED UP AS-BUILT SET OF DRAWINGS UPON COMPLETION OF WORK.
21. PRIOR TO SUBMISSION OF BID, CONTRACTOR SHALL COORDINATE WITH VERIZON REP TO DETERMINE WHAT, IF ANY, ITEMS WILL BE PROVIDED. ALL ITEMS NOT PROVIDED SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR. CONTRACTOR WILL INSTALL ALL ITEMS PROVIDED.
22. PRIOR TO SUBMISSION OF BID, CONTRACTOR SHALL COORDINATE WITH VERIZON REP TO DETERMINE IF ANY PERMITS WILL BE OBTAINED BY CONTRACTOR. ALL REQUIRED PERMITS NOT OBTAINED BY VERIZON MUST BE OBTAINED, AND PAID FOR, BY THE CONTRACTOR.
23. CONTRACTOR SHALL INSTALL ALL SITE SIGNAGE IN ACCORDANCE WITH VERIZON SPECIFICATIONS AND REQUIREMENTS.
24. CONTRACTOR SHALL SUBMIT ALL SHOP DRAWINGS TO VERIZON FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.
25. ALL EQUIPMENT SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS AND LOCATED ACCORDING TO VERIZON SPECIFICATIONS, AND AS SHOWN IN THESE PLANS.
26. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE PROJECT DESCRIBED HEREIN. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
27. CONTRACTOR SHALL NOTIFY VERIZON REP A MINIMUM OF 48 HOURS IN ADVANCE OF POURING CONCRETE OR BACKFILLING ANY UNDERGROUND UTILITIES, FOUNDATIONS OR SEALING ANY WALL, FLOOR OR ROOF PENETRATIONS FOR ENGINEERING REVIEW AND APPROVAL.
28. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SAFETY INCLUDING COMPLIANCE WITH ALL APPLICABLE OSHA STANDARDS AND RECOMMENDATIONS AND SHALL PROVIDE ALL NECESSARY SAFETY DEVICES INCLUDING PPE AND PPM AND CONSTRUCTION DEVICES SUCH AS WELDING AND FIRE PREVENTION, TEMPORARY SHORING, SCAFFOLDING, TRENCH BOXES/SLOPING, BARRIERS, ETC.
29. THE CONTRACTOR SHALL PROTECT AT HIS OWN EXPENSE, ALL EXISTING FACILITIES AND SUCH OF HIS NEW WORK LIABLE TO INJURY DURING THE CONSTRUCTION PERIOD. ANY DAMAGE CAUSED BY NEGLECT ON THE PART OF THIS CONTRACTOR OR HIS REPRESENTATIVES, OR BY THE ELEMENTS DUE TO NEGLECT ON THE PART OF THIS CONTRACTOR OR HIS REPRESENTATIVES, EITHER TO THE EXISTING WORK, OR TO HIS WORK OR THE WORK OF ANY OTHER CONTRACTOR, SHALL BE REPAIRED AT HIS EXPENSE TO THE OWNER'S SATISFACTION.
30. ALL WORK SHALL BE INSTALLED IN A FIRST CLASS, NEAT AND WORKMANLIKE MANNER BY MECHANICS SKILLED IN THE TRADE INVOLVED. THE QUALITY OF WORKMANSHIP SHALL BE SUBJECT TO THE APPROVAL OF THE VERIZON REP. ANY WORK FOUND BY THE VERIZON REP TO BE OF INFERIOR QUALITY AND/OR WORKMANSHIP SHALL BE REPLACED AND/OR REWORKED AT CONTRACTOR EXPENSE UNTIL APPROVAL IS OBTAINED.
31. IN ORDER TO ESTABLISH STANDARDS OF QUALITY AND PERFORMANCE, ALL TYPES OF MATERIALS LISTED HEREINAFTER BY MANUFACTURER'S NAMES AND/OR MANUFACTURER'S CATALOG NUMBER SHALL BE PROVIDED BY THESE MANUFACTURERS AS SPECIFIED.
32. VERIZON FURNISHED EQUIPMENT SHALL BE PICKED-UP AT THE VERIZON WAREHOUSE, NO LATER THAN 48HR AFTER BEING NOTIFIED INSURED, STORED, UNCRATE, PROTECTED AND INSTALLED BY THE CONTRACTOR WITH ALL APPURTENANCES REQUIRED TO PLACE THE EQUIPMENT IN OPERATION, READY FOR USE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE EQUIPMENT AFTER PICKING IT UP.
33. VERIZON OR HIS ARCHITECT/ENGINEER RESERVES THE RIGHT TO REJECT ANY EQUIPMENT OR MATERIALS WHICH, IN HIS OWN OPINION ARE NOT IN COMPLIANCE WITH THE CONTRACT DOCUMENTS, EITHER BEFORE OR AFTER INSTALLATION AND THE EQUIPMENT SHALL BE REPLACED WITH EQUIPMENT CONFORMING TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS BY THE CONTRACTOR AT NO COST TO VERIZON OR THEIR ARCHITECT/ENGINEER.

## SPECIAL CONSTRUCTION ANTENNA INSTALLATION NOTES:

1. WORK INCLUDED:
   - A. ANTENNA AND COAXIAL CABLES ARE FURNISHED BY VERIZON UNDER A SEPARATE CONTRACT. THE CONTRACTOR SHALL ASSIST ANTENNA INSTALLATION CONTRACTOR IN TERMS OD COORDINATION AND SITE ACCESS. ERECTION SUBCONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF PERSONNEL AND
   - B. INSTALL ANTENNA AS INDICATE ON DRAWINGS AND VERIZON SPECIFICATIONS.
   - C. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS
   - D. INSTALL FURNISHED GALVANIZED STEEL OR ALUMINUM WAVEGUIDE.
   - E. CONTRACTOR SHALL PROVIDE FOUR (4) SETS OF SWEEP TESTS USING ANRITZU-PACKARD 8713B RF SCALAR NETWORK ANALYZER. SUBMIT FREQUENCY DOMAIN REFLECTOMETER(FDR) TESTS RESULTS TO THE PROJECT MANAGER. SWEEP TESTS SHALL BE AS PER ATTACHED RFS "MINIMUM FIELD TESTING RECOMMENDED FOR ANTENNA AND HELIAX COAXIAL CABLE SYSTEMS" DATED 10/5/93. TESTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING SERVICE AND BE BOUND AND SUBMITTED WITHIN ONE WEEK OF WORK COMPLETION.
   - F. INSTALL COAXIAL CABLES AND TERMINATING BETWEEN ANTENNAS AND EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. WEATHERPROOF ALL CONNECTIONS BETWEEN THE ANTENNA AND EQUIPMENT PER MANUFACTURER'S REQUIREMENTS. TERMINATE ALL COAXIAL CABLE THREE (3) FEET IN EXCESS OF ENTRY PORT LOCATION UNLESS OTHERWISE STATED.
   - G. ANTENNA AND COAXIAL CABLE GROUNDING:
2. ALL EXTERIOR #6 GREED GROUND WIRE "DAISY CHAIN" CONNECTIONS ARE TO BE WEATHER SEALED WITH RFS CONNECTORS/SPLICE WEATHERPROOFING KIT #221213 OR EQUAL.
3. ALL COAXIAL CABLE GROUNDING KITS ARE TO BE INSTALLED ON STRAIGHT RUNS OF COAXIAL CABLE (NOT WITHIN BENDS)

**ALL DISCREPANCIES FROM WHAT IS SHOWN ON THESE CONSTRUCTION DRAWINGS SHALL BE COMMUNICATED TO ATC ENGINEERING IMMEDIATELY FOR CORRECTION OR RE-DESIGN. FAILURE TO COMMUNICATE DIRECTLY WITH ATC ENGINEERING OR ANY CHANGES FROM THE DESIGN CONDUCTED WITHOUT PRIOR APPROVAL FROM ATC ENGINEERING SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR.**

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COLLIERS ENGINEERING & DESIGN CT, P.C.
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| REV. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| A | PRELIM | MJB | 07/23/21 |
| 0 | ISSUED FOR CONSTRUCTION | DRP | 05/13/24 |
| | | | |
| | | | |
| | | | |

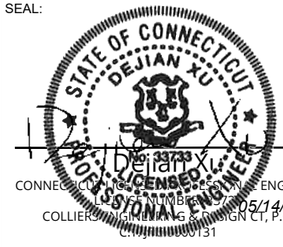
ATC SITE NUMBER:
302475

ATC SITE NAME:
STTN - SOUTHINGTON

VERIZON SITE NAME:
SOUTHINGTON 3 CT - A

SITE ADDRESS:
80 SHUTTLE MEADOW ROAD
SOUTHINGTON, CT 06489

SEAL:




CONNECTICUT LICENSED PROFESSIONAL ENGINEER
LICENSE NUMBER: 33733
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C.A. No. 0000131

verizon

| | |
|---|---|
| DATE DRAWN: | 07/23/21 |
| ATC JOB NO: | 13703662_D1 |
| CUSTOMER ID: | SOUTHINGTON 3 CT - A |
| CUSTOMER #: | 5000382897 |

GENERAL NOTES

| SHEET NUMBER: | REVISION: |
|---|---|
| G-002 | 0 |

SITE PLAN NOTES:

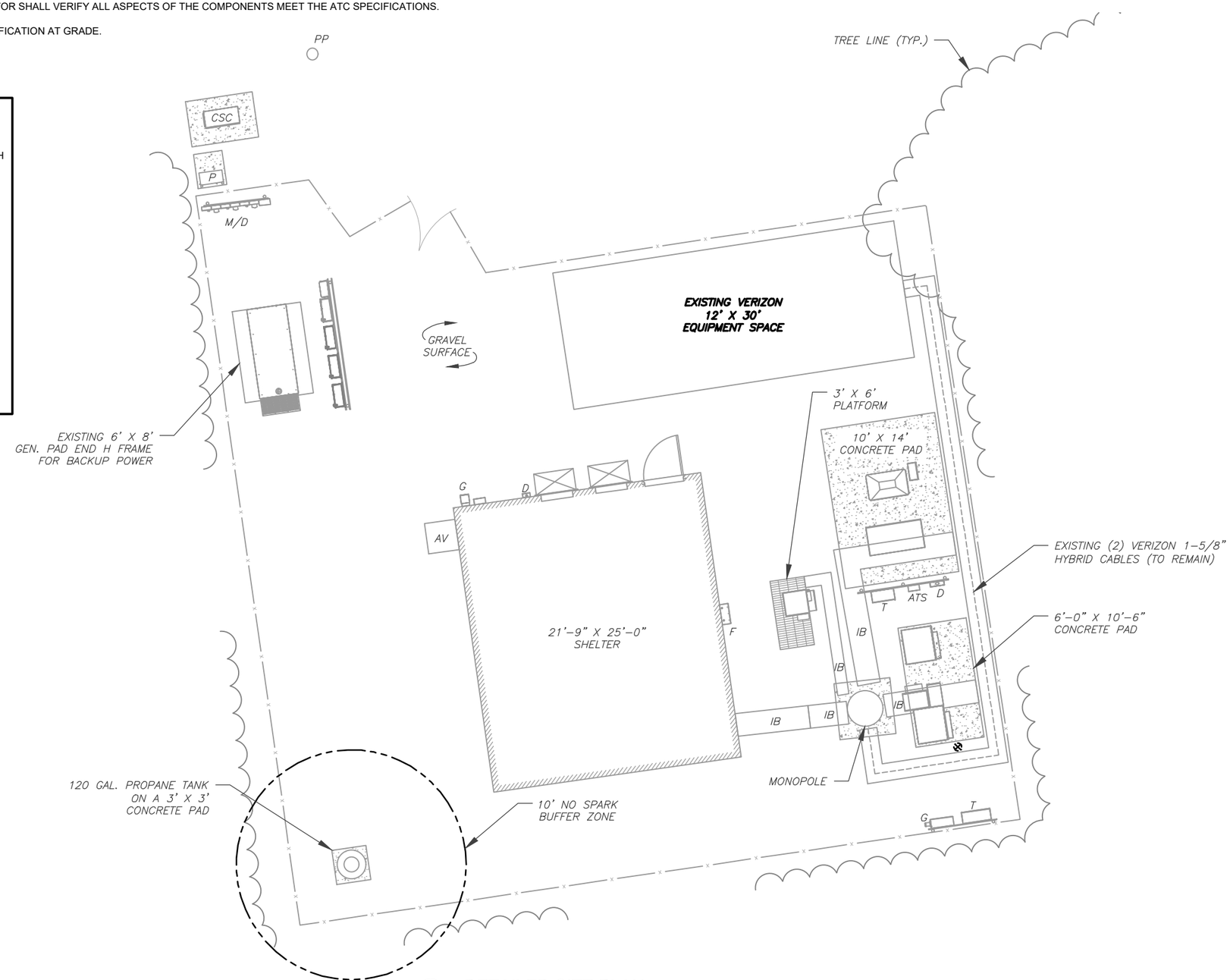
1. THIS SITE PLAN REPRESENTS THE BEST PRESENT KNOWLEDGE AVAILABLE TO THE ENGINEER AT THE TIME OF THIS DESIGN. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO CONSTRUCTION AND VERIFY ALL EXISTING CONDITIONS RELATED TO THE SCOPE OF WORK FOR THIS PROJECT.

2. ICE BRIDGE, CABLE LADDER, COAX PORT, AND COAX CABLE ARE SHOWN FOR REFERENCE ONLY. CONTRACTOR SHALL CONFIRM THE EXACT LOCATION OF ALL PROPOSED AND EXISTING EQUIPMENT AND STRUCTURES DEPICTED ON THIS PLAN. BEFORE UTILIZING EXISTING CABLE SUPPORTS, COAX PORTS, INSTALLING NEW PORTS OR ANY OTHER EQUIPMENT, CONTRACTOR SHALL VERIFY ALL ASPECTS OF THE COMPONENTS MEET THE ATC SPECIFICATIONS.

3. THIS PROJECT INCLUDES NO INSTALL OR MODIFICATION AT GRADE.

## LEGEND

| | |
|---|---|
| ⊗ | GROUNDING TEST WELL |
| ATS | AUTOMATIC TRANSFER SWITCH |
| B | BOLLARD |
| CSC | CELL SITE CABINET |
| D | DISCONNECT |
| E | ELECTRICAL |
| F | FIBER |
| GEN | GENERATOR |
| G | GENERATOR RECEPTACAL |
| HH, V | HAND HOLE, VAULT |
| IB | ICE BRIDGE |
| K | KENTROX BOX |
| LC | LIGHTING CONTROL |
| M | METER |
| PB | PULL BOX |
| PP | POWER POLE |
| T | TELCO |
| TRN | TRANSFORMER |
| ——x—— | CHAINLINK FENCE |




1 DETAILED SITE PLAN

GRAPHIC SCALE

10 0 5 10

( IN FEET )
1 UNIT = 10 FEET

N

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VERIZON SITE NAME:
SOUTHINGTON 3 CT - A

SITE ADDRESS:
80 SHUTTLE MEADOW ROAD
SOUTHINGTON, CT 06489

SEAL:

STATE OF CONNECTICUT · DEJIAN XU · REG. NO. 33733 · LICENSED PROFESSIONAL ENGINEER

CONNECTICUT LICENSED PROFESSIONAL ENGINEER
LICENSE NUMBER: PEC.0033733 05/14/2024
COLLIERS ENGINEERING & DESIGN CT, P.C.
CERTIFICATE NUMBER: PEC.0000131

verizon

| | |
|---|---|
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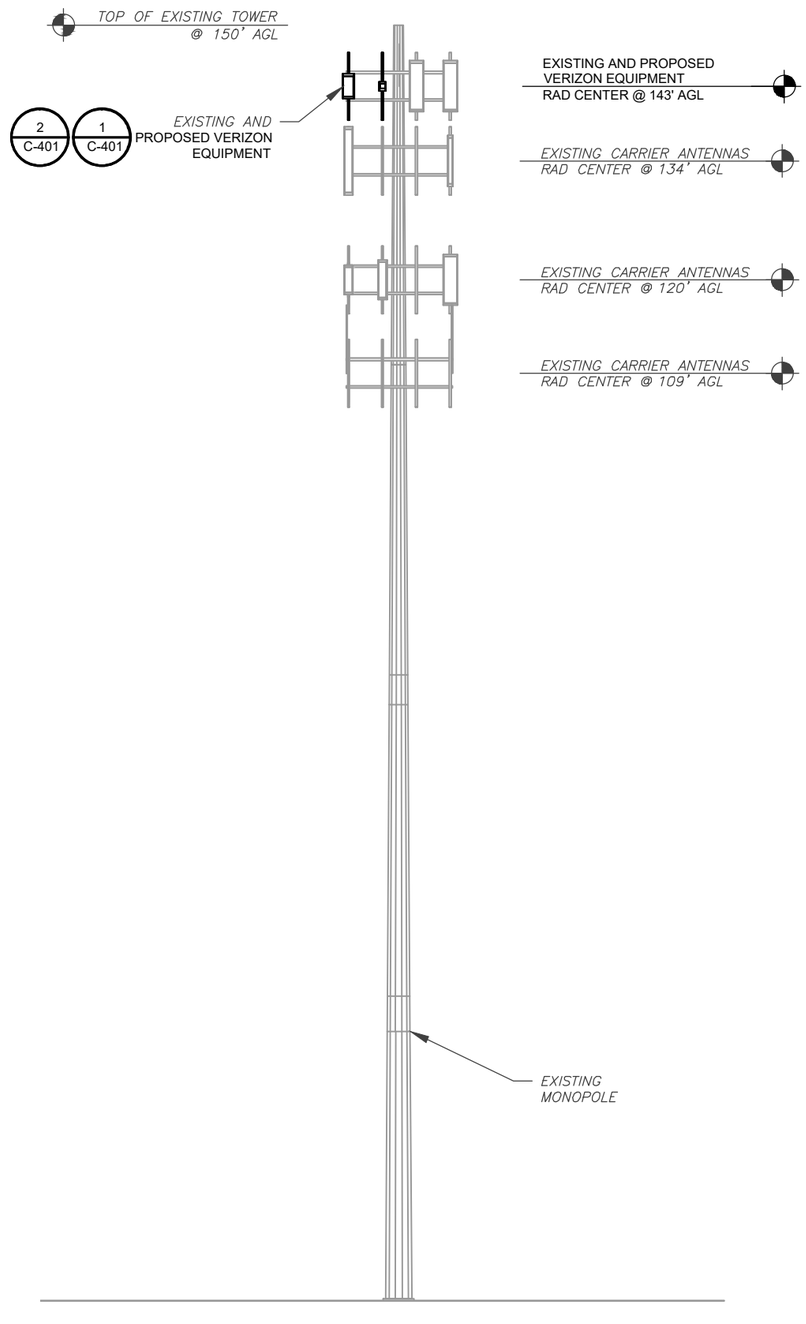
| CUSTOMER #: | 5000382897 |

DETAILED SITE PLAN

| SHEET NUMBER: | REVISION: |
|---|---|
| C-101 | 0 |




1 TOWER ELEVATION
SCALE: N.T.S.

PER MOUNT ANALYSIS COMPLETED BY COLLIERS ENGINEERING & DESIGN, DATED 12/28/23, THE EXISTING MOUNT CAN ADEQUATELY SUPPORT THE PROPOSED LOADING.

TOWER NOTE:

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM WITH THE PROJECT MANAGER THAT THEY HAVE THE MOST RECENT VERSION OF THE STRUCTURAL ANALYSIS BEFORE COMMENCING WORK. EXISTING AND PROPOSED TOWER APPURTENANCES, MOUNTS, AND ANTENNAS ARE SHOWN BASED ON THE STRUCTURAL ANALYSIS.
2. WHERE APPLICABLE, ALL NEW ANTENNAS, EQUIPMENT, MOUNTS, CABLING, ETC. SHALL BE PAINTED/SOCKED TO MATCH EXISTING EQUIPMENT IN ACCORDANCE WITH FAA, JURISDICTION, AND/OR OTHER LOCAL REQUIREMENTS.
3. TOWER ELEVATIONS ARE MEASURED FROM TOP OF BASE PLATE TO MATCH STRUCTURAL ANALYSIS. ELEVATIONS DO NOT REFLECT TRUE ABOVE GROUND LEVEL (A.G.L.)
4. TOWER ELEVATION DEPICTION MAY NOT REFLECT ALL EQUIPMENT INCLUDED IN STRUCTURAL ANALYSIS. REFER TO STRUCTURAL ANALYSIS FOR FULL TOWER LOADING.

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VERIZON SITE NAME:
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SITE ADDRESS:
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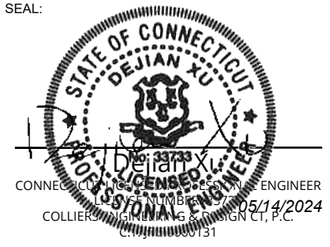
SOUTHINGTON, CT 06489

SEAL:




CONNECTICUT LICENSED PROFESSIONAL ENGINEER
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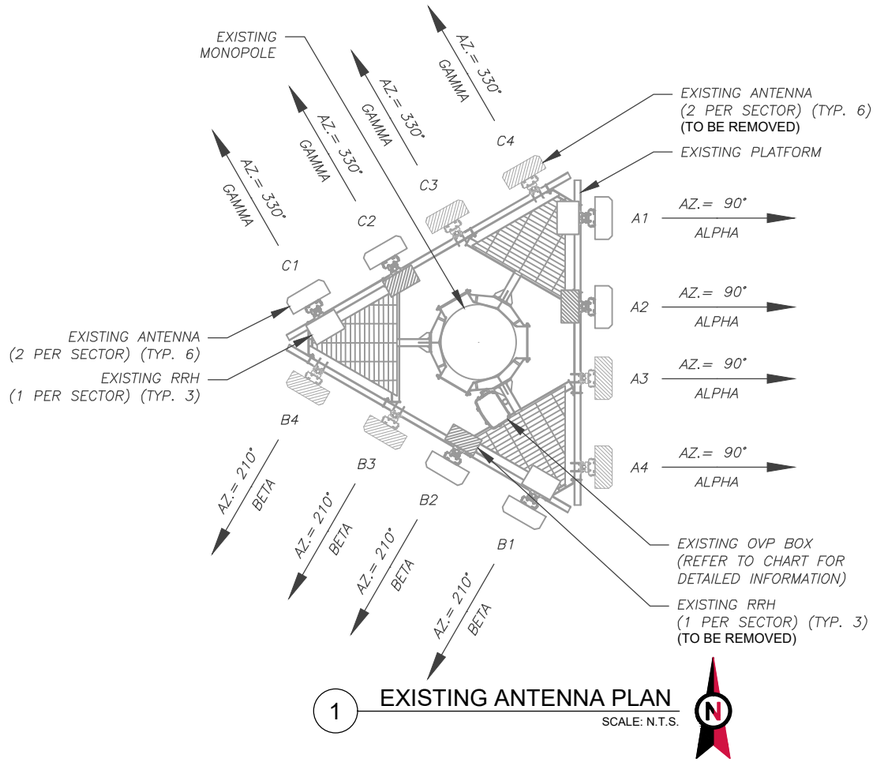
05/14/2024

verizon

| | |
|---|---|
| DATE DRAWN: | 07/23/21 |
| ATC JOB NO: | 13703662_D1 |
| CUSTOMER ID: | SOUTHINGTON 3 CT - A |
| CUSTOMER #: | 5000382897 |

TOWER ELEVATION

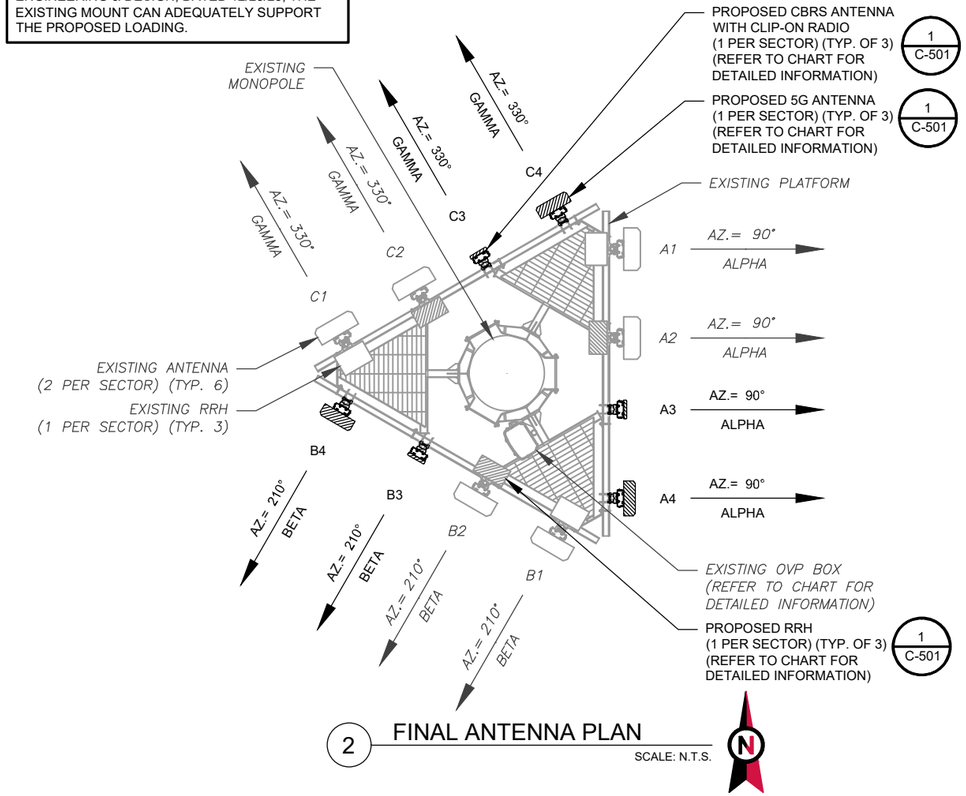
| SHEET NUMBER: | REVISION: |
|---|---|
| C-201 | 0 |




1 EXISTING ANTENNA PLAN

SCALE: N.T.S.

PER MOUNT ANALYSIS COMPLETED BY COLLIERS ENGINEERING & DESIGN, DATED 12/28/23, THE EXISTING MOUNT CAN ADEQUATELY SUPPORT THE PROPOSED LOADING.




2 FINAL ANTENNA PLAN

SCALE: N.T.S.

### EXISTING ANTENNA SCHEDULE

| LOCATION | | | ANTENNA SUMMARY | | | | | NON ANTENNA SUMMARY | |
|---|---|---|---|---|---|---|---|---|---|
| SECTOR | RAD | AZ | POS | ANTENNA | BAND | MECH/ELEC D-TILT | STATUS | ADDITIONAL TOWER MOUNTED EQUIPMENT | STATUS |
| ALPHA | 143' | 90° | A1 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/3 | RMN | B2/B66A RRH-BR049 | RMN |
| | | | A2 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/3 | RMN | B5/B13 RRH-BR04C | RMV |
| | | | A3 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/3 | RMV | – | – |
| | | | A4 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/3 | RMV | – | – |
| BETA | 143' | 210° | B1 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/6 | RMN | B2/B66A RRH-BR049 | RMN |
| | | | B2 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/6 | RMN | B5/B13 RRH-BR04C | RMV |
| | | | B3 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/6 | RMV | – | – |
| | | | B4 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/6 | RMV | – | – |
| GAMMA | 143' | 330° | C1 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/7 | RMN | B2/B66A RRH-BR049 | RMN |
| | | | C2 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/7 | RMN | B5/B13 RRH-BR04C | RMV |
| | | | C3 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/7 | RMV | – | – |
| | | | C4 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/7 | RMV | – | – |

### NOTES

1. CONFIRM WITH VERIZON REP FOR APPLICABLE UPDATES/REVISIONS AND MOST RECENT RFDS FOR NSN CONFIGURATION (CONFIG). GC TO CAP ALL UNUSED PORTS.
2. CONFIRM SPACING OF PROPOSED EQUIP DOES NOT CAUSE TOWER CONFLICTS NOR IMPEDE TOWER CLIMBING PEGS.

STATUS ABBREVIATIONS

RMV: TO BE REMOVED
*RMN*: TO REMAIN
REL: TO BE RELOCATED
ADD: TO BE ADDED

CABLE LENGTHS FOR JUMPERS

JUNCTION BOX TO RRU: 15'
RRU TO ANTENNA: 10'

### FINAL ANTENNA SCHEDULE

| LOCATION | | | ANTENNA SUMMARY | | | | | NON ANTENNA SUMMARY | |
|---|---|---|---|---|---|---|---|---|---|
| SECTOR | RAD | AZ | POS | ANTENNA | BAND | MECH/ELEC D-TILT | STATUS | ADDITIONAL TOWER MOUNTED EQUIPMENT | STATUS |
| ALPHA | 143' | 90° | A1 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/3 | RMN | B2/B66A RRH-BR049 | RMN |
| | | | A2 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/3 | RMN | RF4461D-13A | ADD |
| | | | A3 | XXDWMM-12.5-65-8T CBRS | CBRS | 0/8 | ADD | - | - |
| | | | A4 | MT6413-77A | 5G | 0/6 | ADD | - | - |
| BETA | 143' | 210° | B1 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/6 | RMN | B2/B66A RRH-BR049 | RMN |
| | | | B2 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/6 | RMN | RF4461D-13A | ADD |
| | | | B3 | XXDWMM-12.5-65-8T CBRS | CBRS | 0/8 | ADD | - | - |
| | | | B4 | MT6413-77A | 5G | 0/6 | ADD | - | - |
| GAMMA | 143' | 330° | C1 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/7 | RMN | B2/B66A RRH-BR049 | RMN |
| | | | C2 | NNHH-65B-R4 | LTE 700/850/1900 AWS | 0/7 | RMN | RF4461D-13A | ADD |
| | | | C3 | XXDWMM-12.5-65-8T CBRS | CBRS | 0/8 | ADD | - | - |
| | | | C4 | MT6413-77A | 5G | 0/6 | ADD | - | - |

| EXISTING FIBER DISTRIBUTION/OVP BOX | | EXISTING CABLING SUMMARY | | |
|---|---|---|---|---|
| MODEL NUMBER | STATUS | COAX | HYBRID | STATUS |
| RVZDC-6627-PF-48 | RMN | (0) | (2) 1-5/8" | RMN |

| FINAL FIBER DISTRIBUTION / OVP BOX | | FINAL CABLING SUMMARY | | |
|---|---|---|---|---|
| MODEL NUMBER | STATUS | COAX | HYBRID | STATUS |
| RVZDC-6627-PF-48 | RMN | (0) | (2) 1-5/8" | RMN |

3 EQUIPMENT SCHEDULES

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| A | PRELIM | MJB | 07/23/21 |
| 0 | ISSUED FOR CONSTRUCTION | DRP | 05/13/24 |
| | | | |
| | | | |
| | | | |

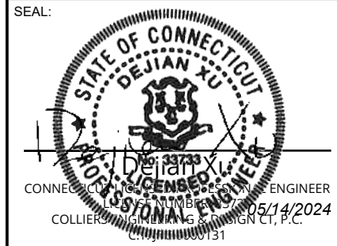
ATC SITE NUMBER:
302475

ATC SITE NAME:
STTN - SOUTHINGTON

VERIZON SITE NAME:
SOUTHINGTON 3 CT - A

SITE ADDRESS:
80 SHUTTLE MEADOW ROAD
SOUTHINGTON, CT 06489

SEAL:



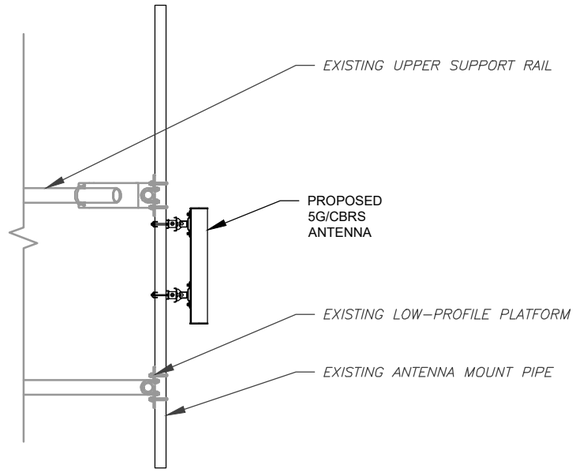

CONNECTICUT LICENSED PROFESSIONAL ENGINEER
LICENSE NUMBER: 33733 05/14/2024
COLLIERS ENGINEERING & DESIGN CT, P.C.
C.T. CERTIFICATE #0000131

verizon

| | |
|---|---|
| DATE DRAWN: | 07/23/21 |
| ATC JOB NO: | 13703662_D1 |
| CUSTOMER ID: | SOUTHINGTON 3 CT - A |
| CUSTOMER #: | 5000382897 |

ANTENNA INFORMATION & SCHEDULE

| SHEET NUMBER: | REVISION: |
|---|---|
| C-401 | 0 |




1 PROPOSED 5G/CBRS ANTENNA MOUNTING DETAIL - TYPICAL

SCALE: N.T.S.

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SOUTHINGTON, CT 06489

SEAL:

STATE OF CONNECTICUT · DEJIAN XU · No. 33733 · LICENSED PROFESSIONAL ENGINEER

Dejian Xu

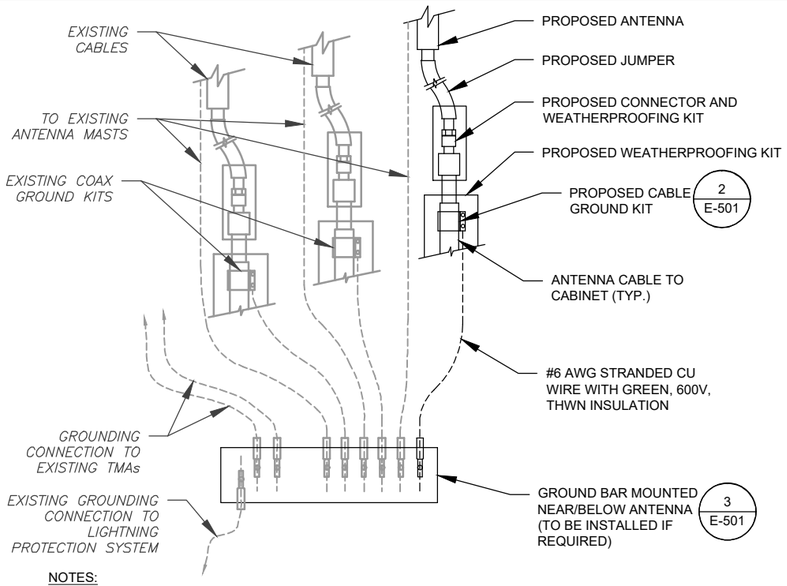
CONNECTICUT LICENSED PROFESSIONAL ENGINEER
COLLIERS ENGINEERING & DESIGN CT, P.C.
CERTIFICATE NUMBER: PEC.0033733 05/14/2024
CERTIFICATE OF AUTHORIZATION NUMBER: 0000131

verizon

| | |
|---|---|
| DATE DRAWN: | 07/23/21 |
| ATC JOB NO: | 13703662_D1 |
| CUSTOMER ID: | SOUTHINGTON 3 CT - A |
| CUSTOMER #: | 5000382897 |

CONSTRUCTION DETAILS

| SHEET NUMBER: | REVISION: |
|---|---|
| C-501 | 0 |

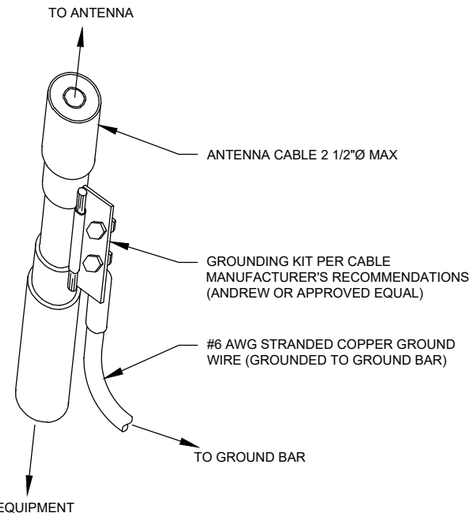



NOTES:

1. THIS DETAIL IS INTENDED TO SHOW THE GENERAL GROUNDING REQUIREMENTS. SLIGHT ADJUSTMENTS MAY BE REQUIRED BASED ON EXISTING SITE CONDITIONS. THE CONTRACTOR SHALL MAKE FIELD ADJUSTMENTS AS NEEDED AND INFORM THE CONSTRUCTION MANAGER OF ANY CONFLICTS.
2. SITE GROUNDING SHALL COMPLY WITH VERIZON GROUNDING STANDARDS, LATEST EDITION, AND COMPLY WITH VERIZON GROUNDING CHECKLIST, LATEST VERSION. WHEN NATIONAL AND LOCAL GROUNDING CODES ARE MORE STRINGENT THEY SHALL GOVERN.

## 1 TYPICAL ANTENNA GROUNDING DIAGRAM

SCALE: N.T.S.

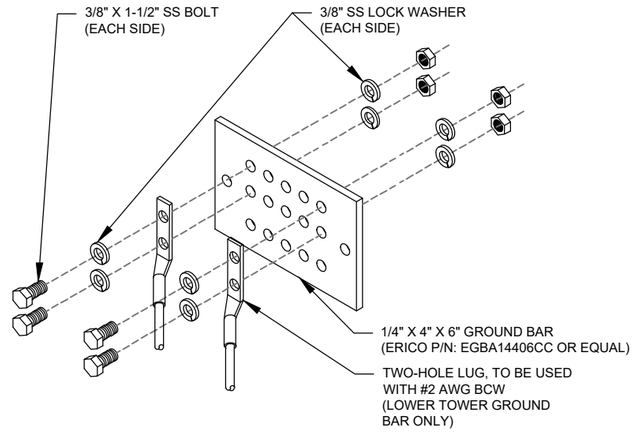



GROUND KIT NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR.
2. CONTRACTOR SHALL PROVIDE WEATHERPROOFING KIT (ANDREW PART NUMBER 221213) AND INSTALL/TAPE PER MANUFACTURER'S SPECIFICATIONS.

## 2 CABLE GROUND KIT CONNECTION DETAIL

SCALE: N.T.S.




GROUND BAR NOTES:

1. GROUND BAR KITS COME WITH ALL HARDWARE, NUTS, BOLTS, WASHERS, ETC. EXCEPT THE STRUCTURAL MOUNTING MEMBER(S).
2. GROUND BAR TO BE BONDED DIRECTLY TO TOWER.

## 3 TOWER GROUND BAR DETAIL

SCALE: N.T.S.



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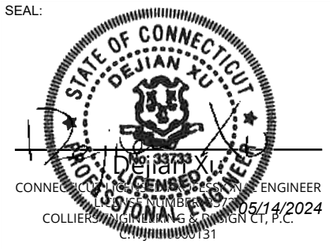


verizon

| | |
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| CUSTOMER ID: | SOUTHINGTON 3 CT - A |
| CUSTOMER #: | 5000382897 |

GROUNDING DETAILS

| SHEET NUMBER: | REVISION: |
|---|---|
| E-501 | 0 |

Colliers Engineering & Design,
Architecture, Landscape Architecture, Surveying, CT P.C.
1055 Washington Blvd
Stamford, CT 06901
203.324.0800
peter.albano@collierseng.com

# Antenna Mount Analysis Report and PMI Requirements

Mount ReAnalysis-VZW

SMART Tool Project #: 10216956
Colliers Engineering & Design Project #: 21781102 (Rev. 1)

December 28, 2023

***Site Information***

| | |
|---|---|
| *Site ID:* | *5000382897-VZW / SOUTHINGTON 3 CT - A* |
| *Site Name:* | *SOUTHINGTON 3 CT - A* |
| *Carrier Name:* | *Verizon Wireless* |
| *Address:* | *80 Shuttle Meadow Road*<br>*Southington, Connecticut 06489*<br>*Hartford County* |
| *Latitude:* | *41.63857500°* |
| *Longitude:* | *-72.84113056°* |

***Structure Information***

| | |
|---|---|
| *Tower Type:* | *150-Ft Monopole* |
| *Mount Type:* | *12.50-Ft Platform* |

**FUZE ID # 16560064**

## Analysis Results

Platform: **93.5% Pass***

***Antennas and equipment to be installed in compliance with PMI Requirements of this mount analysis.**

******Contractor PMI Requirements*:**
***Included at the end of this MA report***
***Available & Submitted via portal at https://pmi.vzwsmart.com***

***For additional questions and support, please reach out to:***
***pmisupport@colliersengineering.com***

Report Prepared By: Prasanna Dhakal

STATE OF CONNECTICUT · DEJIAN XU · No. 33733 · LICENSED PROFESSIONAL ENGINEER

*12/28/2023*



7. Structural Steel Grades have been assumed as follows, if applicable, unless otherwise noted in this analysis:
   - Channel, Solid Round, Angle, Plate — ASTM A36 (Gr. 36)
   - HSS (Rectangular) — ASTM 500 (Gr. B-46)
   - Pipe — ASTM A53 (Gr. B-35)
   - Threaded Rod — F1554 (Gr. 36)
   - Bolts — ASTM A325

**Discrepancies between in-field conditions and the assumptions listed above may render this analysis invalid unless explicitly approved by Colliers Engineering & Design.**

## Analysis Results:

| Component | Utilization % | Pass/Fail |
|---|---|---|
| *Cross Bracing* | *76.6%* | *Pass* |
| *Grating Support* | *13.9%* | *Pass* |
| *Support Rail* | *42.4%* | *Pass* |
| *Face Horizontal* | *24.5%* | *Pass* |
| *Standoff Horizontal* | *88.3%* | *Pass* |
| *End Plate* | *25.2%* | *Pass* |
| *Corner Plate* | *30.5%* | *Pass* |
| *Support Rail Corner Plate* | *77.4%* | *Pass* |
| *Mount Pipe* | *65.2%* | *Pass* |
| *Extended Standoff* | *87.3%* | *Pass* |
| *Mount Connection* | *93.5%* | *Pass* |
| **Structure Rating – *(Controlling Utilization of all Components)*** | **93.5%** | |

## Mount Connection Envelope Reactions:

| Connection Description | Elev. AGL (Ft) | Node Label | Envelope Wind Reactions | | | | Envelope Wind + Ice Reactions | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Axial (Lbs) | Lateral (Lbs) | Moment (K-Ft) | Torsion (K-Ft) | Axial (Lbs) | Lateral (Lbs) | Moment (K-Ft) | Torsion (K-Ft) |
| Sector B Standoff | 139 | N71 | 2274 | 2346 | 5.635 | 1.962 | 3107 | 647 | 6.370 | 0.526 |
| Sector C Standoff | 139 | N51 | 2319 | 2477 | 5.864 | 2.103 | 3335 | 687 | 6.644 | 0.568 |
| Sector A Standoff | 139 | N31 | 2275 | 2350 | 5.636 | 1.971 | 3112 | 648 | 6.378 | 0.529 |

Notes:
- Axial loads act along the axis of the tower
- Lateral reactions act perpendicular to the tower
- Moment loads introduce bending moment to the tower
- Torsion loads introduce twisting moment to the tower
- Batch solutions by individual load cases are included at the end of this document

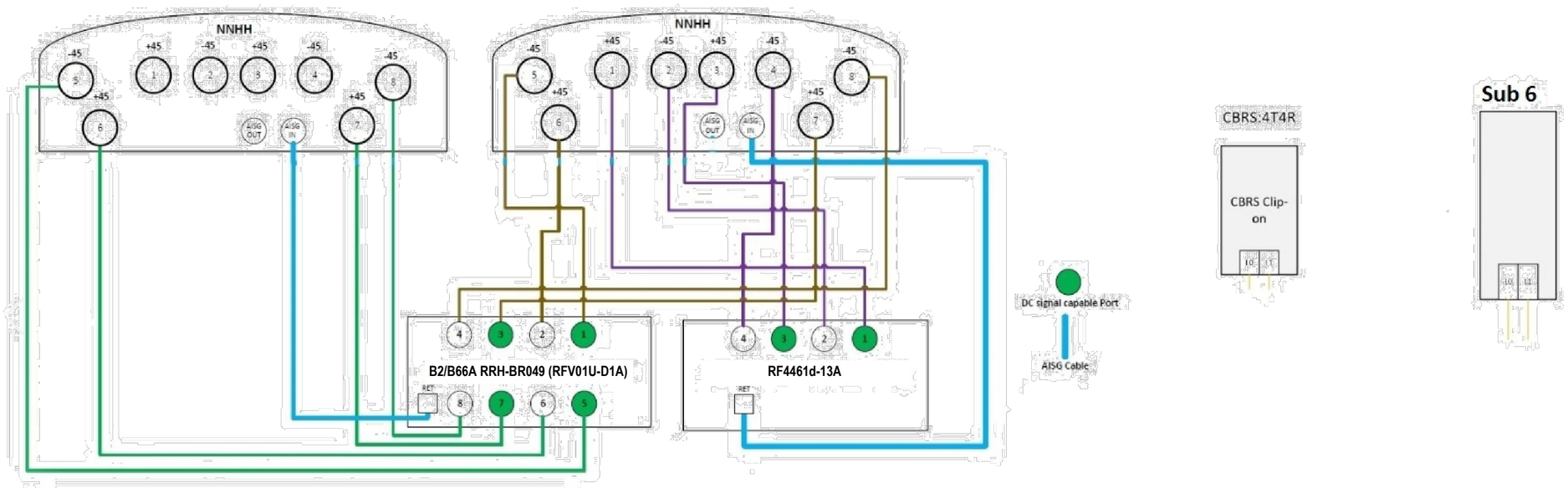
1 MOUNT ANALYSIS

NOTE: THIS SHEET WAS CREATED BY OTHERS AND PROVIDED AT THE REQUEST OF THE CUSTOMER WITHOUT EDIT. PLEASE REFERENCE THE MOUNT ANALYSIS REPORT FOR COMPLETE MOUNT ANALYSIS CALCULATIONS AND DETAILS. SUPPLEMENTAL PAGES INCLUDED IN THE CONSTRUCTION DRAWINGS ARE FOR REFERENCE ONLY. GENERAL CONTRACTOR IS TO VERIFY THEY HAVE THE MOST RECENT MOUNT ANALYSIS PRIOR TO CONSTRUCTION.

SUPPLEMENTAL

SHEET NUMBER: R-601

REVISION: -




NOTE: THIS SHEET WAS CREATED BY OTHERS AND PROVIDED AT THE REQUEST OF THE CUSTOMER WITHOUT EDIT.

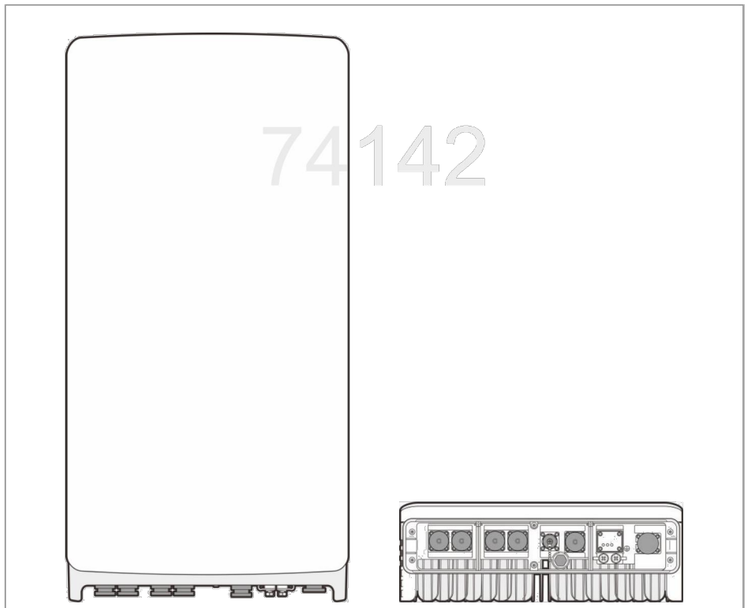
1 PLUMING DIAGRAM

SUPPLEMENTAL

| SHEET NUMBER: | REVISION: |
|---|---|
| R-602 | - |

SAMSUNG

*Figure 1. MT6413-77A Appearance*




# Specifications

The following table displays the main specifications of the MT6413-77A.

*Table 2. Specifications of the MT6413-77A*

| Item | | MT6413-77A |
|---|---|---|
| Air Technology | | 5G |
| Band/Duplex | | n77/TDD |
| OFR | | 3,700 to 3,980 MHz |
| IBW | | 200 MHz |
| OBW | | 200 MHz |
| Carrier Configuration | Ch. BW | NR 20/40/60/80/100 MHz |
| | Number of carriers (per unit) | 2CC |
| TRX Path Configuration | | 64T64R |
| Antenna Configuration | | 4V16H 192 AE (3 x 1 sub-array) |
| Conductive Power | | 320 W |
| MIMO Capacity | | DL 16L, UL 16RX (8L) |
| Function Split | | Opt. 7-2x |
| Optic Interface | | 20 km, 25 Gbps × 4 ports |
| Input Voltage | | -48 V DC (-36 to -58 V DC) |
| Power Consumption [a)] | | • 882 W @ 40 % room temp<br>• 1,260 W @ 100 % room temp<br>• 1,299 W @ 100 % all temp |
| Volume / Dimension (W x H x D) | | 41.1 L / 15.75 x 28.9 x 5.51 in. (400 x 734 x 140 mm) |
| Weight | | 57.32 lb (26 kg) or less (without a Bracket) |
| Operating Temperature [b)] | | -104 °F to +131 °F (-40 °C to +55 °C), (without solar load) |
| Cooling Scheme | | Natural Convection |
| Installation | | Pole, Wall |
| Operating Humidity [b)] | | 5% to 100% RH (non-condensing, not to exceed 30 g/m$^3$ absolute humidity) |
| Altitude | | Telcordia GR-63-CORE, Issue 5, Section 4.1.3 |
| Noise | | Telcordia GR-487-CORE, Issue 5, Section 3.34 (45 dBA) |
| Ingress Protection Rating | | IEC 60529 (IP65) |
| Salt Fog / Salt Spray | | Telcordia GR-487-CORE, Issue 5, Section 3.40.1 |
| Wind Resistance | | Telcordia GR-487-CORE, Issue 5, Section 3.36 |
| Earthquake | | Telcordia GR-63-CORE, Issue 5, Section 4.4.1 (Zone 4) |
| Vibration | | Telcordia GR-63-CORE, Issue 5, Section 4.4.4 / 4.4.5 |
| EMC | | FCC Title 47 CFR Part 15 Subpart B |




| Item | MT6413-77A |
|---|---|
| Safety | UL 62368-1 |
| RF | FCC Title 47, CFR Part 27 |

1) These values are predictive of simulation. When development is completed, measurement data can change by +/- 10%.

2) Temperature and humidity are measured 1.5 m above the floor and 400 mm from the equipment's front panel.

SUPPLEMENTAL

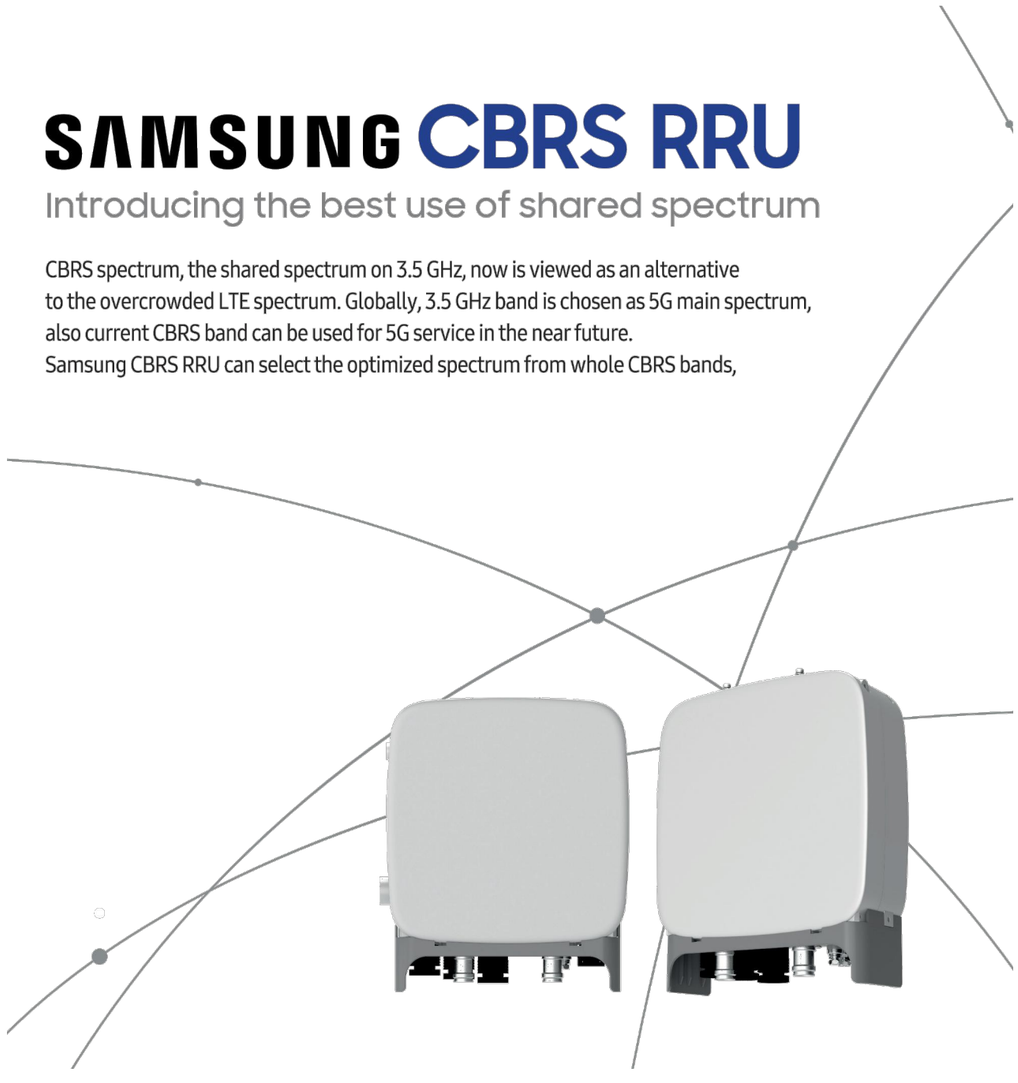
SHEET NUMBER: R-603

REVISION: -

# SAMSUNG CBRS RRU

## Introducing the best use of shared spectrum

CBRS spectrum, the shared spectrum on 3.5 GHz, now is viewed as an alternative to the overcrowded LTE spectrum. Globally, 3.5 GHz band is chosen as 5G main spectrum, also current CBRS band can be used for 5G service in the near future.
Samsung CBRS RRU can select the optimized spectrum from whole CBRS bands,



## Technical Specifications

| Item | Specification |
|---|---|
| Tech | LTE/5G NR ready (Support eCPRI) |
| Band | Band48 (3.5 GHz) |
| Frequency Band | 3550 ~ 3700 MHz |
| RF Power | Total 20 W = 43 dBm (4 x 5 W) |
| IBW/OBW | 150 MHz / 80 MHz |
| Installation | Pole/Wall/Tower (Back to back, Side by side) |
| Weight/Size | RRH : 8.5 x 12 x 4.2 inches (7.0L), 17.6 lbs<br>Antenna : 8.7 x 12.3 x 1.3 inches (2.3L), 3.3 lbs<br>AC/DC : 4.1 x 11.5x 3.3 inches (2.6L), 5.5 lbs<br>RRH + antenna : 8.7 x 12.3 x 5.5 inches (9.6L)<br>RRH + AC/DC : 11.2 x 12.1 x 4.2 inches (9.3L)<br>RRH + antenna + AC/DC : 11.3 x 12.3 x 5.5 inches (12.5L) |



SUPPLEMENTAL

SHEET NUMBER: R-604

REVISION: -

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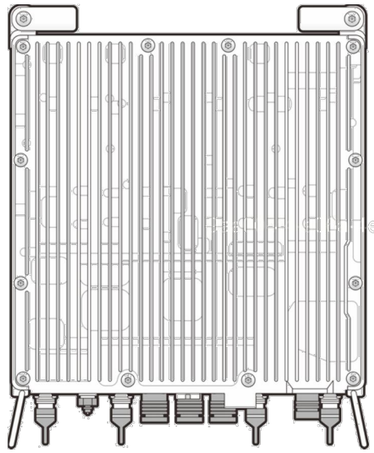
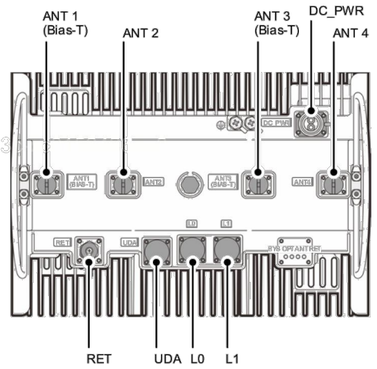


[Front View]




[Bottom View]

| Item | | RF4461d-13A |
|---|---|---|
| | Local regulation | • B13: FCC 47 CFR 27.53 c), f)<br>• B5: FCC 47 CFR 22.917 |
| | Operator's request | • (851~861.5MHz) -69dBm /30kHz per path<br>• (896 ~901MHz) -69 dBm/100 kHz per path |
| Function Split | | • DL/UL Option 7-2x Cat.A<br>• DL/UL Option 8 |
| Compression | | Not support |
| Optic Interface | | 20km, 10Gbps x 2 port , Duplex (Option: Bi-di) |
| Input voltage | | DC -48 V ( -38 V to -57 V DC) |
| Power Consumption [a)] | | • 650 W @ 40 % data load, room temp<br>• 1,165 W @ 100 % data load, room temp<br>• 1,230 W @ 100 % data load, all temp |
| Volume / Dimension (W x H x D) | | • 37.5 L/380 × 380 × 260 mm (14.96 x 14.96 x10.24 inch)<br>• Excluding connector, partial extrusion, flange |
| Weight | | 35.9 kg (79.15 lb) or less (excluding bracket) |
| Operating Temperature [b)] | | -40 to +55 °C (-40 to +131 °F) (without solar load) |
| Cooling scheme | | Natural convection |
| Installation | | Pole, wall, tower, side-by-side, back to back |
| Misc. Feature | | Spectrum analyzer (TX / RX), PIM detection and cancellation |
| Operating Humidity [b)] | | 5% to 100% Condensing, not to exceed 30g/m3 absolute humidity |
| Altitude | | Telcordia GR-63-CORE, Issue 5, Section 4.1.3 |
| Noise | | Telcordia GR-487-CORE, Issue 5, Section 3.34 (45 dBA) |
| Ingress Protection Rating | | IEC 60529 (IP65) |
| Salt Fog / Salt Spray | | Telcordia GR-487-CORE, Issue 5, Section 3.38.1 |
| Wind Resistance | | Telcordia GR-487-CORE Issue5, Section 3.36 |
| Earthquake | | Telcordia Earthquake Risk Zone4+ (Telcordia GR-63-CORE) |
| Vibration | | Telcordia GR-63-CORE, Issue 5, Section 4.4.4 / 4.4.5 |
| EMC | | FCC Title 47 CFR Part 15 |
| Safety | | UL 62368-1, 2nd Edition |
| RF | | FCC Title 47 CFR Part 2, 22, 24, 27 |

SUPPLEMENTAL

SHEET NUMBER: R-605

REVISION: -

CENTERLINE

# EXHIBIT E

## Power Density/RF Emissions Report

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# Non-Ionizing Electromagnetic Radiation (NIER) Study

*Site Number:*
302475

*Site Name:*
Sttn Southington

*Location:*
Southington, Connecticut

*Tenants:*
AT&T Mobility, T-Mobile, L3arris Technologies, INC., & Verizon Wireless

*Prepared For:*

American Tower, Inc.
Woburn, Massachusetts

June 20th, 2024

93978 P-431801

Prepared By:

Adam Carlson MS, CBRE, CPI
Program Manager RF Design & Service
Tower Engineering Professionals

Approved By:


06/20/24

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# Contents

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# Non-Ionizing Electromagnetic Radiation (NIER) Study

302475 Sttn Southington
Southington, Connecticut

## INTRODUCTION

Tower Engineering Professionals RF Design & Services Division (TEP-RF) of Raleigh, North Carolina, has been retained by American Tower, Inc. (ATC), of Woburn, Massachusetts to evaluate the RF emissions compared to the Maximum Permissible Exposure (MPE) limit for facilities at this location. This evaluation uses compliance standards as outlined in Federal Communications Commission (FCC) document OET-65.

## SITE AND FACILITY CONSIDERATIONS

Site 302475 Sttn Southington is located at 80 Shuttle Medow Rd. in Southington, Connecticut at coordinates 41.638602, -72.841137. The support structure is a 150' monopole. An aerial view of the tower can be found in Appendix 1, Site Photos. The tenants are AT&T Mobility (AT&T), T-Mobile (T-Mobile), L3arris Technologies, Inc. (L3arris), & Verizon Wireless (VZW). A table listing all antennae and effective radiated power (ERP) levels that were used in this study may be found in Appendix 2, Antenna Inventory.

## POWER DENSITY CALCULATIONS

Power densities were calculated based on FCC MPE limits for both General Population/Uncontrolled and Occupational/Controlled environments.

For the purpose of this study, a radius of 100' from the base of the tower with a height of 6' above ground level was used, beyond 100' the MPE levels become *di minimus*. This study utilized FCC recognized and accepted software programs using the maximum ERP levels for the antenna models provided by ATC. Diagrams depicting the predicted spatial average power density level at any specific location may be found in Appendix 3, MPE Limit Study. A discussion regarding the FCC limits may be found in Appendix 4, Information Pertaining to MPE Studies. Study methodology describing Non-ionizing Radiation Prediction Models used in this study may be found in Appendix 5, MPE Standards Methodology.

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All data used in this study was collected from one or more of the following sources:

- ATC furnished data and does not include other unidentified communication facilities.
- Load List at 302475 Sttn - Southington.RF NIER Study 6/05/24.
- 302475_14519507_Application received 06/05/24.
- FCC databases.
- Carrier standard configurations.
- Empirical data collected by TEP.

## SITE MITIGATION & CONTROL

In order to comply with FCC, tenant, & ATC requirements, TEP recommends the placement of signage at the base of the tower and all compound access points to alert workers of potential exposure to RF fields while working on or near the antennae.

TEP recommends that all personnel working on this tower be trained in RF safety procedures and carry a personal RF monitor at all times.

## COMPLIANCE DETERMINATION

This installation ***IS*** in compliance with current FCC MPE limits as described in FCC OET-65.

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# APPENDIX 1 Site Photos


Aerial View of Site

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# Appendix 2.1 Antenna Inventory

## 302475 Sttn Southington

### Antenna Inventory

| Antenna # | Carrier | Antenna Manufacturer | Antenna Model | Frequency Band (MHz) | Azmiuth (°) | Effective Radiated Power (W) | Radiation Center (ft) |
|---|---|---|---|---|---|---|---|
| 1 | AT&T | Powerwave | 7770 | 1900 | 020 | 5782 | 153.6 |
| 2 | AT&T | Powerwave | 7770 | 1900 | 140 | 5782 | 153.6 |
| 3 | AT&T | Powerwave | 7770 | 1900 | 258 | 5782 | 153.6 |
| 4 | AT&T | Quintel | QS66512-3 | 1900 | 020 | 34144 | 153.3 |
| 5 | AT&T | Quintel | QS66512-3 | 1900 | 137 | 34144 | 153.3 |
| 6 | AT&T | KMW | AM-X-CD-16-65 | 700/800 | 020 | 10307 | 153 |
| 7 | AT&T | KMW | AM-X-CD-16-65 | 700/800 | 143 | 10307 | 153 |
| 8 | AT&T | Andrew | SBNH-1D6565C | 700/800 | 258 | 12415 | 153 |
| 9 | AT&T | Scala | 80010966 | 700/800/1800 | 019 | 35720 | 153 |
| 10 | AT&T | Scala | 80010966 | 700/800/1800 | 139 | 35720 | 153 |
| 11 | AT&T | Quintel | QS66512-3 | 1900 | 021 | 34144 | 153 |
| 12 | AT&T | Quintel | QS66512-3 | 1900 | 141 | 34144 | 153 |
| 13 | AT&T | Quintel | QS66512-3 | 1900 | 269 | 34144 | 153 |
| 14 | AT&T | Scala | 80010966 | 700/800/1800 | 021 | 35720 | 153 |
| 15 | AT&T | Scala | 80010966 | 700/800/1800 | 141 | 35720 | 153 |
| 16 | AT&T | Powerwave | 7770 | 1900 | 021 | 5782 | 153 |
| 17 | AT&T | Powerwave | 7770 | 1900 | 141 | 5782 | 153 |
| 18 | AT&T | Powerwave | 7770 | 1900 | 269 | 5782 | 153 |
| 19 | AT&T | KMW | AM-X-CD-16-65 | 700/800 | 021 | 10307 | 153 |
| 20 | AT&T | KMW | AM-X-CD-16-65 | 700/800 | 141 | 10307 | 153 |
| 21 | AT&T | Andrew | SBNH-1D6565C | 700/800 | 269 | 12415 | 153 |
| 22 | AT&T | Scala | 80010966 | 700/800/1800 | 269 | 35720 | 153 |
| 23 | AT&T | Scala | 80010966 | 700/800/1800 | 260 | 35720 | 153 |
| 24 | Verizon | Commscope | NNHH-65B-R4 | 700/800/1900/2100 | 090 | 24400 | 143 |
| 25 | Verizon | Commscope | NNHH-65B-R4 | 700/800/1900/2100 | 210 | 24400 | 143 |
| 26 | Verizon | Commscope | NNHH-65B-R4 | 700/800/1900/2100 | 330 | 24400 | 143 |
| 27 | Verizon | Commscope | NNHH-65B-R4 | 700/800/1900/2100 | 090 | 24400 | 143 |
| 28 | Verizon | Commscope | NNHH-65B-R4 | 700/800/1900/2100 | 210 | 24400 | 143 |
| 29 | Verizon | Commscope | NNHH-65B-R4 | 700/800/1900/2100 | 330 | 24400 | 143 |

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# Appendix 2.2 Antenna Inventory

| 302475 Sttn Southington | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna Inventory | | | | | | | |
| Antenna # | Carrier | Antenna Manufacturer | Antenna Model | Frequency Band (MHz) | Azmiuth (°) | Effective Radiated Power (W) | Radiation Center (ft) |
| 30 | Verizon | Samsung | MT6407 | 3700/3800/3900 | 090 | 91430 | 143 |
| 31 | Verizon | Samsung | MT6407 | 3700/3800/3900 | 210 | 91430 | 143 |
| 32 | Verizon | Samsung | MT6407 | 3700/3800/3900 | 330 | 91430 | 143 |
| 33 | Verizon | Samsung | Outdoor CBRS | 3500/3600 | 090 | 91430 | 143 |
| 34 | Verizon | Samsung | Outdoor CBRS | 3500/3600 | 210 | 91430 | 143 |
| 35 | Verizon | Samsung | Outdoor CBRS | 3500/3600 | 330 | 91430 | 143 |
| 36 | T-Mobile | Generic | Generic | 600/1900/2100 | 060 | 10543 | 131.1 |
| 37 | T-Mobile | Generic | Generic | 600/1900/2100 | 190 | 10543 | 131.1 |
| 38 | T-Mobile | Generic | Generic | 600/1900/2100 | 300 | 10543 | 131.1 |
| 39 | T-Mobile | RFS | APXVAARR24 | 600/1900/2100 | 060 | 44801 | 130 |
| 40 | T-Mobile | RFS | APXVAARR24 | 600/1900/2100 | 190 | 44801 | 130 |
| 41 | T-Mobile | RFS | APXVAARR24 | 600/1900/2100 | 300 | 44801 | 130 |
| 42 | L3HARRIS | dB Systems | 5100A | 900 | 024 | 10543 | 111.2 |
| 43 | L3HARRIS | dB Systems | 5100A-D | 1000 | 117 | 10543 | 111.1 |
| 44 | L3HARRIS | dB Systems | 5100A-D | 1000 | 119 | 10543 | 111.1 |
| 45 | L3HARRIS | dB Systems | 5100A-D | 1000 | 296 | 10543 | 111.1 |
| 46 | L3HARRIS | dB Systems | 5100A-D | 1000 | 299 | 10543 | 111.1 |
| 47 | L3HARRIS | dB Systems | 5100A-D | 1000 | 000 | 10543 | 104 |
| 48 | L3HARRIS | dB Systems | 5100A-D | 1000 | 000 | 10543 | 104 |
| 49 | L3HARRIS | dB Systems | 5100A-D | 1000 | 000 | 10543 | 104 |
| 50 | L3HARRIS | dB Systems | 5100A-D | 1000 | 000 | 10543 | 104 |
| 51 | L3HARRIS | dB Systems | 5100A | 900 | 000 | 10543 | 104 |
| 52 | L3HARRIS | Vertex RSI | 101 V VPD | 1000 | 000 | 10543 | 104 |

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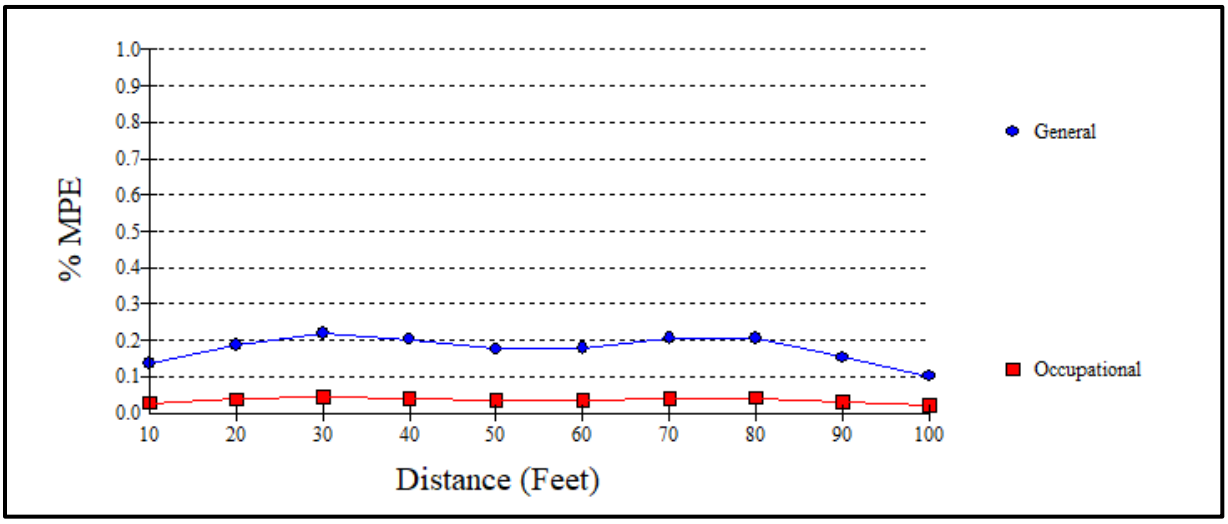
# Appendix 3.1 MPE Limit Study




| | |
|---|---|
| Maximum Power Density (@30'): | 0.0014 mW/cm² |
| General Population MPE (@30'): | 0.2186% |
| Occupational MPE (@30'): | 0.0437% |

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# Appendix 3.2 MPE Limit Study

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# Appendix 4 Information Pertaining to MPE Studies

In 1985, the FCC first adopted guidelines to be used for evaluating human exposure to RF emissions. The FCC revised and updated these guidelines on August 1, 1996, as a result of a rule-making proceeding initiated in 1993. The new guidelines incorporate limits for Maximum Permissible Exposure (MPE) in terms of electric and magnetic field strength and power density for transmitters operating at frequencies between 300 kHz and 100 GHz.

The FCC's MPE limits are based on exposure limits recommended by the National Council on Radiation Protection and Measurements (NCRP), and, over a wide range of frequencies, the exposure limits were developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI) to replace the 1982 ANSI guidelines. Limits for localized absorption are based on recommendations of both ANSI/IEEE and NCRP.

The FCC's limits, and the NCRP and ANSI/IEEE limits on which they are based, are derived from exposure criteria quantified in terms of specific absorption rate (SAR). The basis for these limits is a whole-body averaged SAR threshold level of 4 watts per kilogram (4 W/kg), as averaged over the entire mass of the body, above which expert organizations have determined that potentially hazardous exposures may occur. The MPE limits are derived by incorporating safety factors that lead, in some cases, to limits that are more conservative than the limits originally adopted by the FCC in 1985. Where more conservative limits exist, they do not arise from a fundamental change in the RF safety criteria for whole-body averaged SAR, but from a precautionary desire to protect subgroups of the general population who, potentially, may be more at risk.

The FCC exposure limits are also based on data showing that the human body absorbs RF energy at some frequencies more efficiently than at others. The most restrictive limits occur in the frequency range of 30-300 MHz where whole-body absorption of RF energy by human beings is most efficient. At other frequencies, whole-body absorption is less efficient, and consequently, the MPE limits are less restrictive.

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MPE limits are defined in terms of power density (units of milliwatts per centimeter squared: $mW/cm^2$), electric field strength (units of volts per meter: V/m) and magnetic field strength (units of amperes per meter: A/m). The far-field of a transmitting antenna is where the electric field vector (E), the magnetic field vector (H), and the direction of propagation can be considered to be all mutually orthogonal ("plane-wave" conditions).

**Occupational/controlled exposure** limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**General population/uncontrolled exposure** limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment-related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area. Additional details can be found in FCC OET 65.

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# Appendix 5 MPE Standards Methodology

This study predicts RF field strength and power density levels that emanate from communications system antennae. It considers all transmitter power levels (less filter and line losses) delivered to each active transmitting antenna at the communications site. Calculations are performed to determine power density and MPE levels for each antenna as well as composite levels from all antennas. The calculated levels are based on where a human (Observer) would be standing at various locations at the site. The point of interest where the MPE level is predicted is based on the height of the Observer.

Compliance with the FCC limits on RF emissions are determined by spatially averaging a person's exposure over the projected area of an adult human body, that is approximately six-feet or two-meters, as defined in the ANSI/IEEE C95.1 standard. The MPE limits are specified as time-averaged exposure limits. This means that exposure is averaged over an identifiable time interval. It is 30 minutes for the general population/uncontrolled RF environment and 6 minutes for the occupational/controlled RF environment. However, in the case of the general public, time averaging should not be applied because the general public is typically not aware of RF exposure, and they do not have control of their exposure time. Therefore, it should be assumed that any RF exposure to the general public will be continuous.

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The FCC's limits for exposure at different frequencies are shown in the following Tables.

| Limits for Occupational/Controlled Exposure | | | | |
|---|---|---|---|---|
| **Frequency Range (MHz)** | **Electric Field Strength (E) (V/m)** | **Magnetic Field Strength (H) (A/m)** | **Power Density (S) ($mW/cm^2$)** | **Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)** |
| 0.3 - 3.0 | 614 | 1.63 | 100* | 6 |
| 3.0 - 30 | 1842/f | 4.89/f | $900/F^2$ | 6 |
| 30 - 300 | 61.4 | 0.163 | 1.0 | 6 |
| 300 - 1500 | -- | -- | f/300 | 6 |
| 1500 - 100,000 | -- | -- | 5 | 6 |

f = frequency

* = Plane-wave equivalent power density

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Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

| Limits for General Population/Uncontrolled Exposure | | | | |
|---|---|---|---|---|
| **Frequency Range (MHz)** | **Electric Field Strength (E) (V/m)** | **Magnetic Field Strength (H) (A/m)** | **Power Density (S) ($mW/cm^2$)** | **Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)** |
| 0.3 - 1.34 | 614 | 1.63 | 100* | 30 |
| 1.34 - 30 | 824/f | 2.19/f | $180/F^2$ | 30 |
| 30 -300 | 27.5 | 0.073 | 0.2 | 30 |
| 300 -1500 | -- | -- | f/1500 | 30 |
| 1500 -100,000 | -- | -- | 1.0 | 30 |

f = frequency

* = Plane-wave equivalent power density

General population/uncontrolled exposures apply in situations in which the general public may be exposed or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

It is important to understand that these limits apply cumulatively to all sources of RF emissions affecting a given area. For example, if several different communications system antennas occupy a shared facility such as a tower or rooftop, then the total exposure from all systems at the facility must be within compliance of the FCC guidelines.

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The field strength emanating from an antenna can be estimated based on the characteristics of an antenna radiating in free space. There are basically two field areas associated with a radiating antenna. When close to the antenna, the region is known as the Near Field. Within this region, the characteristics of the RF fields are very complex, and the wave front is extremely curved. As you move further from the antenna, the wave front has less curvature and becomes planar. The wave front still has a curvature, but it appears to occupy a flat plane in space (plane-wave radiation). This region is known as the Far Field.

Two models are utilized to predict Near and Far field power densities. They are based on the formulae in FCC OET 65.

**Cylindrical Model (Near Field Predictions)**

Spatially averaged plane-wave equivalent power densities parallel to the antenna may be estimated by dividing the antenna input power by the surface area of an imaginary cylinder surrounding the length of the radiating antenna. While the actual power density will vary along the height of the antenna, the average value along its length will closely follow the relation given by the following equation:

$$S = P \div 2\pi RL$$

Where:

S = Power Density

P = Total Power into antenna

R = Distance from the antenna

L = Antenna aperture length

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For directional-type antennas, power densities can be estimated by dividing the input power by that portion of a cylindrical surface area corresponding to the angular beam width of the antenna. For example, for the case of a 120-degree azimuthal beam width, the surface area should correspond to 1/3 that of a full cylinder. This would increase the power density near the antenna by a factor of three over that for a purely omni-directional antenna. Mathematically, this can be represented by the following formula:

$$S = (180 / \theta_{BW}) P \div \pi RL$$

Where:

S = Power Density

$\theta_{BW}$ = Beam width of antenna in degrees (3 dB half-power point)

P = Total Power into antenna

R = Distance from the antenna

L = Antenna aperture length

If the antenna is a 360-degree omni-directional antenna, this formula would be equivalent to the previous formula.

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**Spherical Model (Far Field Predictions)**

Spatially averaged plane-wave power densities in the Far Field of an antenna may be estimated by considering the additional factors of antenna gain and reflective waves that would contribute to exposure.

The radiation pattern of an antenna has developed in the Far Field region and the power gain needs to be considered in exposure predictions. Also, if the vertical radiation pattern of the antenna is considered, the exposure predictions would most likely be reduced significantly at ground level, resulting in a more realistic estimate of the actual exposure levels.

Additionally, to model a truly "worst case" prediction of exposure levels at or near a surface, such as at ground-level or on a rooftop, reflection off the surface of antenna radiation power can be assumed, resulting in a potential four-fold increase in power density.

These additional factors are considered, and the Far Field prediction model is determined by the following equation:

$$S = EIRP \times Rc \div 4\pi R^2$$

Where:

S = Power Density

EIRP = Effective Radiated Power from antenna

Rc = Reflection Coefficient (2.56)

R = Distance from the antenna

The EIRP includes the antenna gain. If the antenna pattern is considered, the antenna gain is relative based on the horizontal and vertical pattern gain values at that particular location in space, on a rooftop or on the ground. However, it is recommended that the antenna radiation pattern characteristics not be considered to provide a conservative "worst case" prediction. This is the equation is utilized for the Far Field exposure predictions herein.

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# EXHIBIT F

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CENTERLINE COMMUNICATIONS LLC
12579 SAGEWOOD DRIVE
VENICE FL 34293

**1 LBS** **1 OF 1**

**SHIP TO:**
AMERICAN TOWER CORP
10 PRESIDENTIAL WAY
**WOBURN MA 01801-1053**

**MA 018 9-04**

**UPS GROUND**
TRACKING #: 1Z 9Y4 503 03 1495 8150

BILLING: P/P

Reference # 1: 13703662 LAND/TOWER OWNER CC

CS 24.5.00. MACNV50 29.0A 07/2024*

TM

**Subject:** UPS Delivery Notification, Tracking Number 1Z9Y45030314958150
**Date:** Monday, July 22, 2024 at 12:34:22 PM Eastern Daylight Time
**From:** UPS <pkginfo@ups.com>
**To:** Cullen Morgan <CMORGAN@CLINELLC.COM>

## Hello, your package has been delivered.

**Delivery Date:** Monday, 07/22/2024
**Delivery Time:** 12:32 PM

## CENTERLINE SITE ACQUISITION

| | |
|---|---|
| **Tracking Number:** | 1Z9Y45030314958150 |
| **Ship To:** | AMERICAN TOWER CORP<br>10 PRESIDENTIAL WAY<br>WOBURN, MA 018011053<br>US |
| **Number of Packages:** | 1 |
| **UPS Service:** | UPS Ground |
| **Package Weight:** | 0.8 LBS |
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PAUL CHAPLINSKY & JEFFREY POOLER
TOWN OF SOUTHINGTON
196 N MAIN STREET
**SOUTHINGTON CT 06489-2514**

**CT 067 9-06**

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CS 24.5.00. MACNV50 29.0A 07/2024*

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|---|---|
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| **Ship To:** | TOWN OF SOUTHINGTON<br>196 N MAIN STREET<br>SOUTHINGTON, CT 064892514<br>US |
| **Number of Packages:** | 1 |
| **UPS Service:** | UPS Ground |
| **Package Weight:** | 0.8 LBS |
| **Reference Number:** | 13703662 TOWN CC |

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