Robinson+Cole

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Also admitted in Massachusetts

May 16, 2018

***Via Hand Delivery***

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Docket No. 479 – Application Of Tarpon Towers II, LLC and Cellco Partnership d/b/a Verizon Wireless For A Certificate Of Environmental Compatibility And Public Need For The Construction, Maintenance And Operation Of A Wireless Telecommunications Facility At 380 Horace Street, Bridgeport, Connecticut**

**Development and Management Plan Submission**

Dear Ms. Bachman:

Enclosed please find fifteen (15) copies of the following:

1. Final Development and Management ("D&M") Plans prepared by Hudson Design Group LLC for the approved telecommunications facility at 380 Horace Street in Bridgeport, Connecticut incorporating the Council's conditions of approval. Also enclosed are four (4) full size (24" x 36") sets of D&M plans.[1]

2. Tower and Foundation Design drawings from Engineered Endeavors.

[1] Please note that since the close of the Docket No. 479 public hearing, T-Mobile has committed to share the approved Horace Street tower. T-Mobile's equipment and antennas are, therefore, included on the enclosed D&M Plans. T-Mobile understands, however, that it is require to receive Siting Council approval of a separate Tower Share application prior to installing its equipment at the facility.

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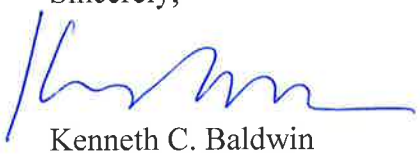
3. A May 15, 2018 letter from Boris Fayman, PE, Senior Engineer with Engineered Endeavors regarding design and reliability of a 90-foot monopole as required by Condition 2. c) of the Council's March 29, 2018 Decision and Order.

Together, this information constitutes the final D&M Plan submission for the approved telecommunications facility at 380 Horace Street in Bridgeport.

We respectfully request that this information be reviewed and this matter be placed on the next available Siting Council agenda for approval. Please feel free to contact me if you have any questions or require additional information. Thank you.

Sincerely,



Kenneth C. Baldwin

KCB/kmd
Enclosures
Copy to:
Keith Coppins
Brett Buggeln

## PROJECT SUMMARY

| | |
|---|---|
| SCOPE OF WORK: | TARPON TOWERS II, LLC IS PROPOSING TO INSTALL THE FOLLOWING IMPROVEMENTS:<br><br>90 FOOT TOWER<br>62.5'x40' FENCED COMPOUND<br>POWER, TELCO AND GAS UTILITIES<br><br>VERIZON EQUIPMENT ON CONCRETE PADS<br>TWELVE (12) VERIZON ANTENNAS, SIX (9) RADIOS (RRH) WITH ASSOCIATED CABLING AND APPURTENANCES.<br><br>T-MOBILE EQUIPMENT CABINETS WITH GENERATOR ON 10'x20' CONCRETE PAD, NINE (9) T-MOBILE ANTENNAS, ONE (1) DISH ANTENNA AND NINE (9) RRHs WITH ASSOCIATED CABLING AND APPURTENANCES. |
| SITE ADDRESS: | 380 HORACE STREET<br>BRIDGEPORT, CT 06610 |
| LATITUDE:<br>LONGITUDE: | 41° 12' 15.63" N 41.204342 N<br>73° 10' 35.62" W 73.176561 W |
| PROPERTY OWNER: | MDL REALTY, LLC.<br>380 HORACE STREET<br>BRIDGEPORT, CT 06610 |
| TAX MAP#: | 62/2050/39/Y |
| POWER COMPANY:<br>TELEPHONE COMPANY: | UNITED ILLUMINATION<br>FRONTIER COMMUNICATIONS |
| TOWER OWNER/APPLICANT: | TARPON TOWERS II, LLC<br>1001 3RD AVENUE WEST, SUITE 420<br>BRADENTON, FL 34205 |
| APPLICANT: | CELLCO PARTNERSHIP D/B/A/<br>VERIZON WIRELESS<br>20 ALEXANDER DRIVE<br>WALLINGFORD, CT 06492 |
| CO LOCATER: | T-MOBILE<br>35 GRIFFIN ROAD SOUTH<br>BLOOMFIELD, CT 06002 |
| PROJECT ENGINEERING: | DOUG ROBERTS, AIA.<br>HUDSON DESIGN GROUP, LLC.<br>110 WASHINGTON AVENUE<br>FOURTH FLOOR<br>NORTH HAVEN, CT 06473 |
| LEGAL/ REGULATORY COUNSEL: | KENNETH C. BALDWIN, Esq.<br>ROBINSON + COLE, LLP.<br>280 TRUMBULL STREET<br>HARTFORD, CT 06103 |

TARPON TOWERS

CELLCO PARTNERSHIP

d.b.a. verizon

WIRELESS COMMUNICATIONS FACILITY

T-Mobile

# DEVELOPMENT & MANAGEMENT PLAN - DOCKET NO. 479
# SITE NUMBER: CT1221
# SITE NAME: BRIDGEPORT EAST

| DRAWING INDEX | | REV |
|---|---|---|
| T-1 | TITLE SHEET | 2 |
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| A-3 | EQUIPMENT DETAILS | 2 |
| A-4 | ANTENNA PLAN | 2 |
| A-5 | SITE DETAILS | 2 |
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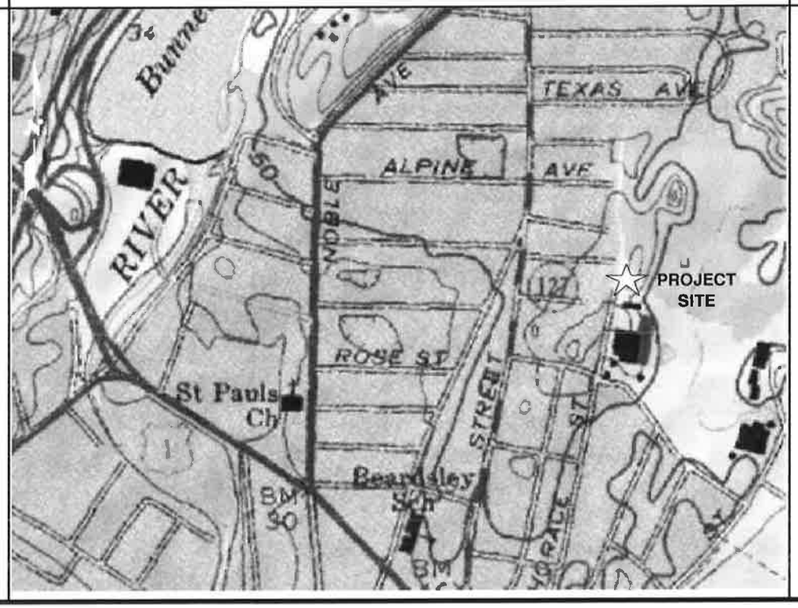
| EN-1 | ENVIRONMENTAL NOTES | 2 |
| E-1 | ELECTRICAL /TELEPHONE RISER DIAGRAM AND NOTES | 2 |

### VICINITY MAP SCALE: 1"=500'




### GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF TARPON TOWERS II. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.
2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.


TARPON TOWERS
TARPON TOWERS II, LLC
1001 3rd AVENUE WEST, SUITE 420
BRADENTON, FL 34205

HDG HUDSON Design Group LLC
45 BEECHWOOD DRIVE
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TEL: (978) 557-5553
FAX: (978) 336-5586


STATE OF CONNECTICUT
DEREK J. CREASEY
LICENSED
PROFESSIONAL ENGINEER

CHECKED BY: DJR

APPROVED BY: DJC

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
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| 2 | 05/02/18 | REVISED PER COMMENTS | KAM |
| 1 | 04/26/18 | REVISED PER COMMENTS | KAM |
| 0 | 04/20/18 | ISSUED FOR REVIEW | KAM |

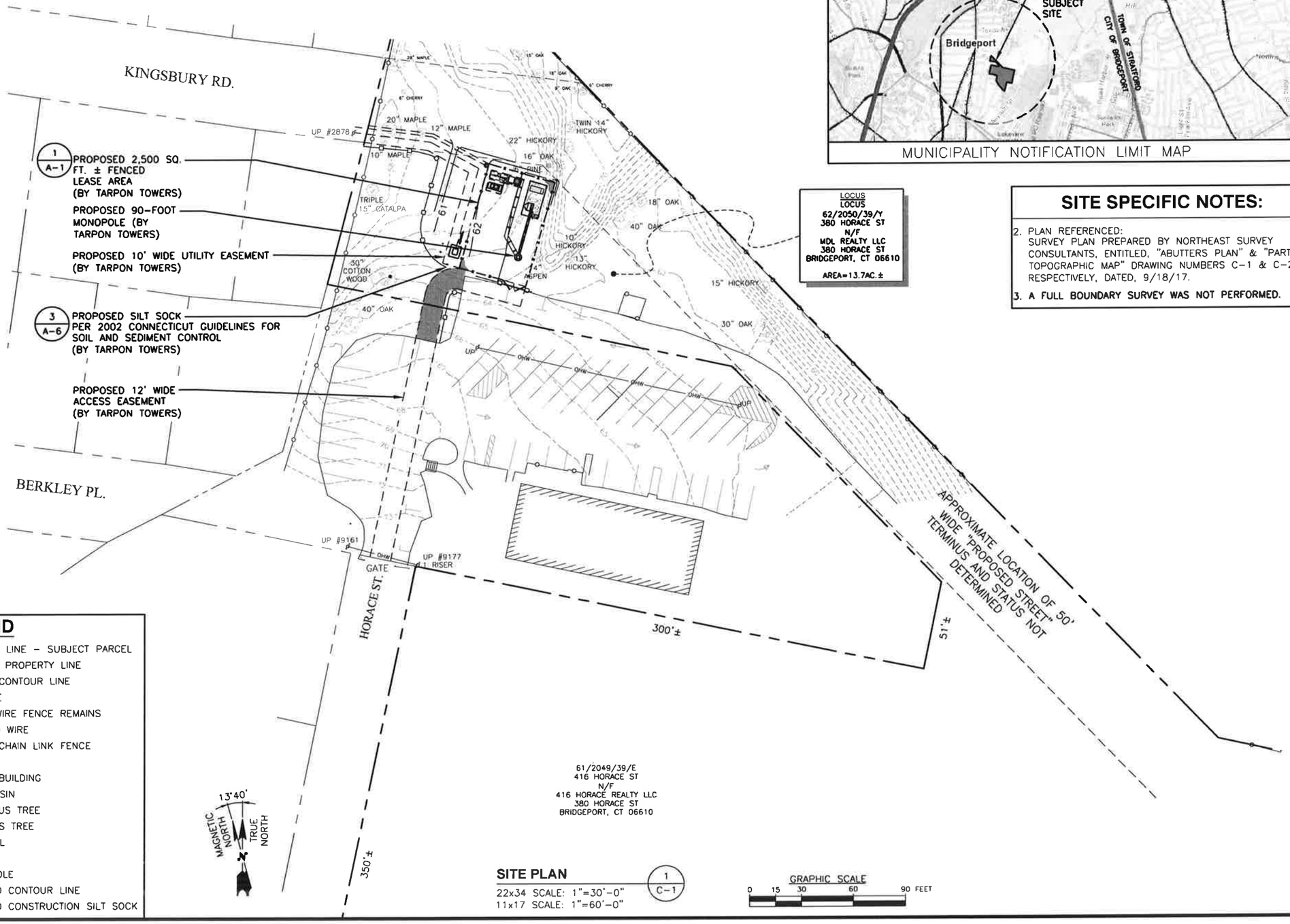
SITE NAME:
BRIDGEPORT EAST

SITE NUMBER:
CT1221

SITE ADDRESS:
380 HORACE STREET
BRIDGEPORT, CT 06610

SHEET TITLE
TITLE SHEET

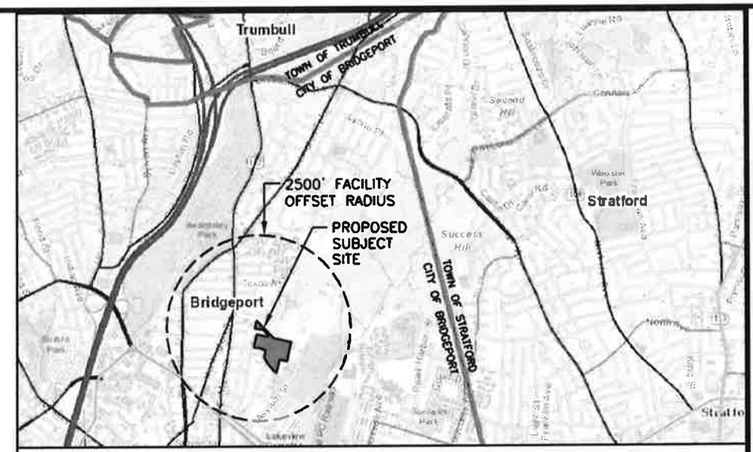
SHEET NUMBER
T-1




## LEGEND

- PROPERTY LINE – SUBJECT PARCEL
- ABUTTERS PROPERTY LINE
- EXISTING CONTOUR LINE
- TREE LINE
- BARBED WIRE FENCE REMAINS
- OHW — OVERHEAD WIRE
- EXISTING CHAIN LINK FENCE
- EXISTING BUILDING
- CB — CATCH BASIN
- CONIFEROUS TREE
- DECIDUOUS TREE
- STONEWALL
- WELL
- UTILITY POLE
- 1086 — PROPOSED CONTOUR LINE
- PROPOSED CONSTRUCTION SILT SOCK

**SITE PLAN** (1 / C-1)
22x34 SCALE: 1"=30'-0"
11x17 SCALE: 1"=60'-0"




MUNICIPALITY NOTIFICATION LIMIT MAP

## SITE SPECIFIC NOTES:

2. PLAN REFERENCED: SURVEY PLAN PREPARED BY NORTHEAST SURVEY CONSULTANTS, ENTITLED, "ABUTTERS PLAN" & "PARTIAL TOPOGRAPHIC MAP" DRAWING NUMBERS C-1 & C-2 RESPECTIVELY, DATED, 9/18/17.
3. A FULL BOUNDARY SURVEY WAS NOT PERFORMED.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STATE OF CONNECTICUT · DEREK J. CREASER · No. 27055 · LICENSED PROFESSIONAL ENGINEER

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SITE NUMBER:
CT1221

SITE ADDRESS:
380 HORACE STREET
BRIDGEPORT, CT 06610

SHEET TITLE
PARTIAL SITE PLAN

SHEET NUMBER
C-1

## LEGEND

- PROPERTY LINE – SUBJECT PARCEL
- ABUTTERS PROPERTY LINE
- EXISTING CONTOUR LINE
- TREE LINE
- BARBED WIRE FENCE REMAINS
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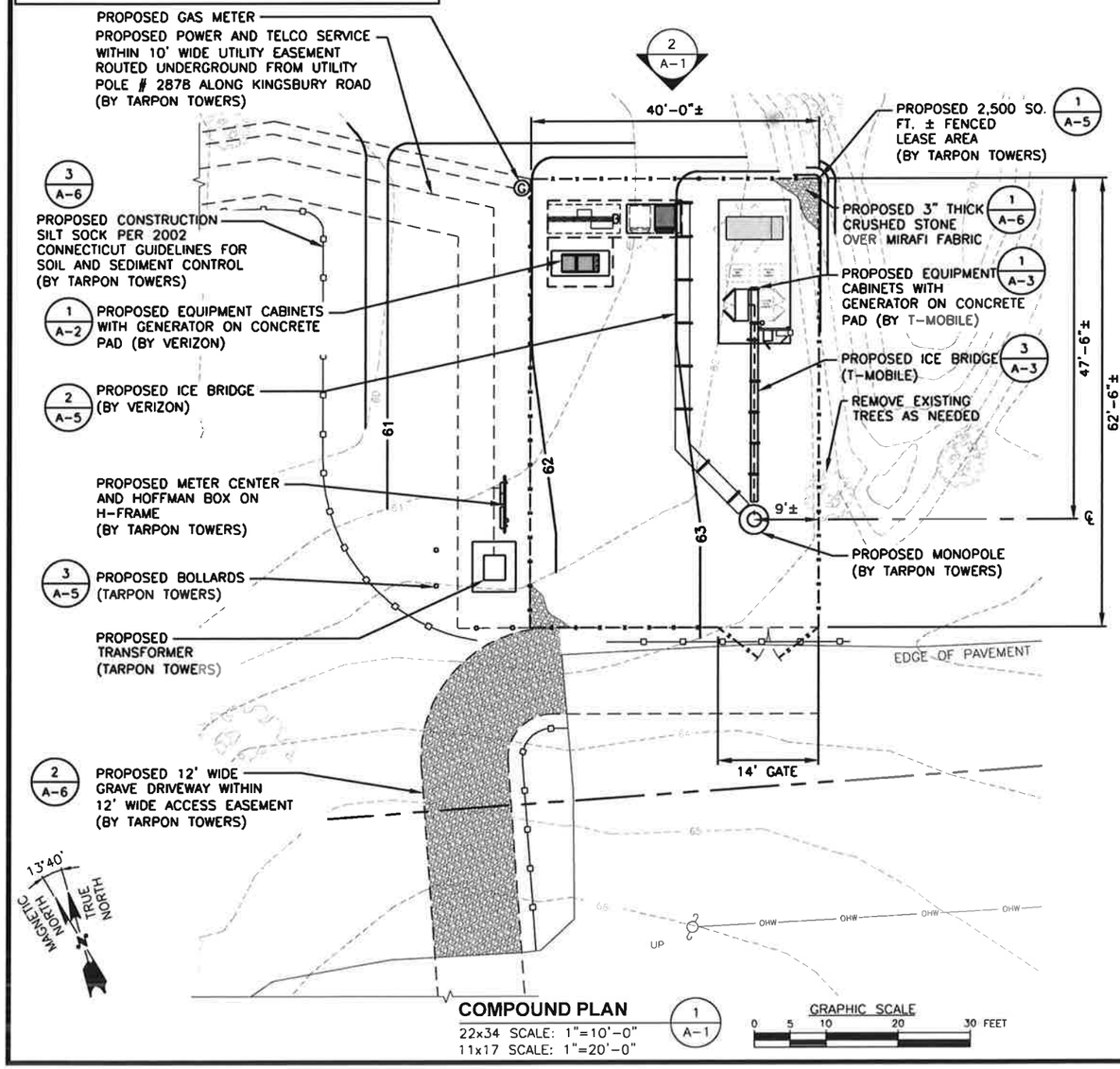
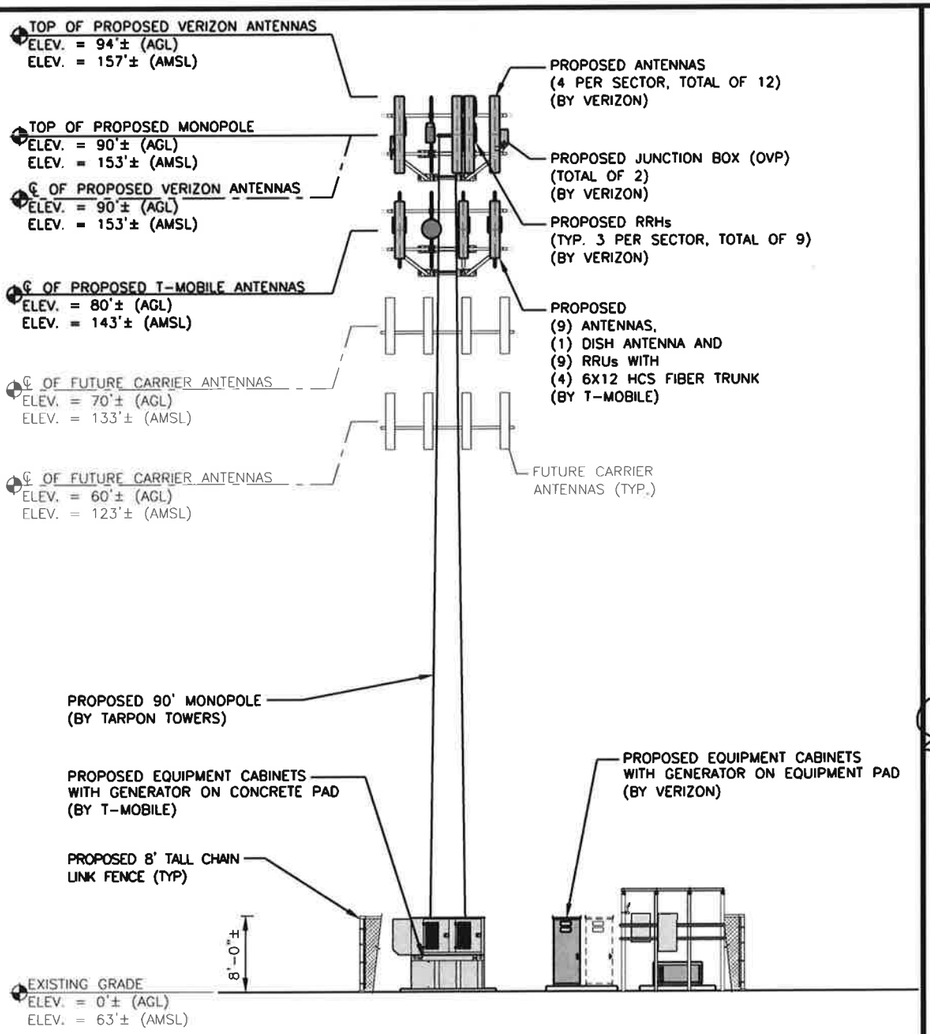



**COMPOUND PLAN** (1 / A-1)
22x34 SCALE: 1"=10'-0"
11x17 SCALE: 1"=20'-0"

GRAPHIC SCALE 0 5 10 20 30 FEET




**EAST ELEVATION** (2 / A-1)
22x34 SCALE: 1/8"=1'-0"
11x17 SCALE: 1/16"=1'-0"

GRAPHIC SCALE 0 4 8 16 24 FEET

**TOWER NOTES:**

1.) TOWER ELEVATION IS SHOWN FOR REFERENCE ONLY. CONTRACTOR SHALL REFER TO TOWER MANUFACTURER DRAWINGS FOR COMPLETE INSTALLATION AND BILL OF MATERIAL INFORMATION.
2.) TOWER MINIMUM DESIGN SPECIFICATIONS SHALL BE IN ACCORDANCE WITH ANSI/TIA/EIA 222-G "STRUCTURAL STANDARDS FOR SUPPORTING STRUCTURES AND ANTENNAS, REVISION G" AND GOVERNING FEDERAL, STATE, AND LOCAL CODE REQUIREMENTS
3.) TOWER MANUFACTURER SHALL BE RESPONSIBLE FOR DESIGN AND STRUCTURAL COMPONENTS OF THE TOWER.
4.) FINAL UTILITY CONNECTIONS SHALL BE COORDINATED WITH THE LOCAL UTILITIES.


TARPON TOWERS

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STATE OF CONNECTICUT
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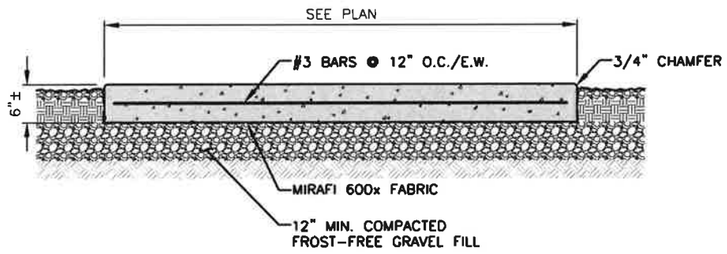
BRIDGEPORT, CT 06610

SHEET TITLE
COMPOUND PLAN AND ELEVATION

SHEET NUMBER
A-1

FOUNDATION NOTES & CONCRETE SPECIFICATIONS:

1. FOUNDATION AREA SHALL BE EXCAVATED TO THE DEPTH AND DIMENSIONS SHOWN ON THE PLANS. EXISTING LEDGE AND ALL OTHER EXISTING UNSUITABLE MATERIAL SHALL BE REMOVED AND LEGALLY DISPOSED OF OFF-SITE. THE SUBGRADE SHALL BE ROLLED WITH A 1-TON, VIBRATORY, WALK-BEHIND ROLLER AT A SPEED OF LESS THAN 2 FPS, 6 PASSES MINIMUM, TO PROVIDE UNYIELDING SURFACE.
2. UNDERCUT SOFT OR "WEAVING" AREAS A MINIMUM OF 12 INCHES DEEP. BACKFILL UNDERCUT AREA WITH FILL MEETING THE SPECIFICATIONS OF STRUCTURAL FILL.
3. CONCRETE TO HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH (f'c)=4000 psi. CONCRETE TO BE AIR ENTRAINED, DESIRED AIR CONTENT TO BE 6% (PLUS OR MINUS 2%)
4. REINFORCING BAR TO BE ASTM A615 GRADE 60.
5. WELDED WIRE FABRIC TO CONFORM TO THE REQUIREMENTS OF ASTM A185. WIRES FOR FABRIC TO CONFORM TO THE REQUIREMENTS OF ASTM A82.
6. ALL REINFORCING TO HAVE MINIMUM CONCRETE COVER PER ACI SPECIFICATIONS.
7. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO LATEST EDITION OF ACI 318 AND APPLICABLE STATE BUILDING CODE.




**CONCRETE PAD DETAIL** (6 / A-2)
22x34 SCALE: N.T.S

COOPER LIGHTING NFFLD NIGHT FALCON
NFFLD-A25-E-UNV-66-S-BK
SLIPFITTER MOUNT AND VANDAL SHIELD

MOUNT PER MANUFACTURER'S SPECIFICATIONS.

**LED FLOOD LIGHT DETAIL** (5 / A-2)
SCALE: N.T.S

INTERMATIC WP1220C

| | |
|---|---|
| TYPE: | DOUBLE GANG |
| HINGE: | VERTICAL |
| INSERT: | WP217 |
| DEPTH: | 2-1/4" |
| COLOR: | CLEAR |

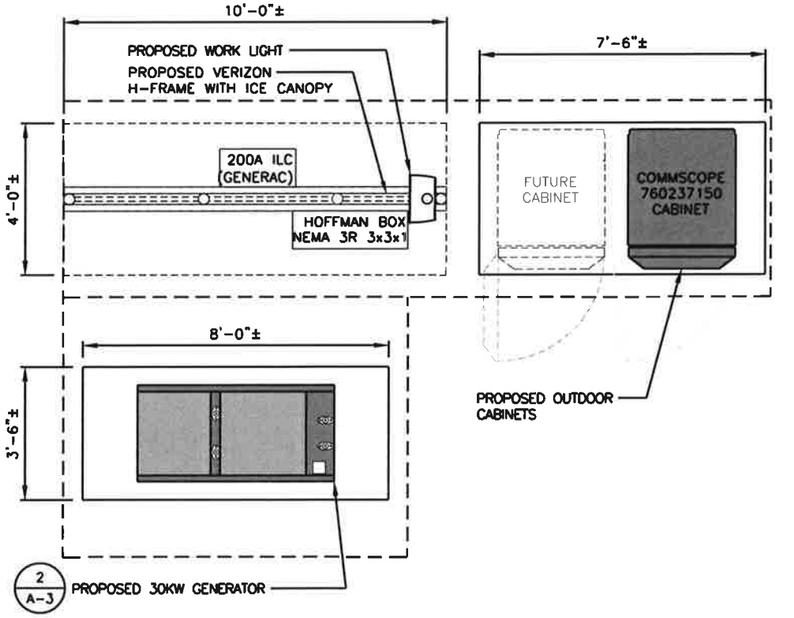
OR APPROVED EQUIVALENT

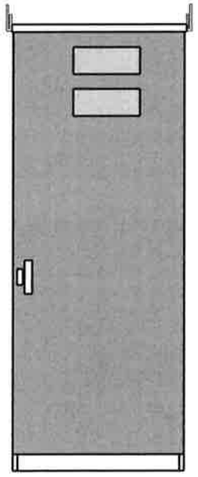

INTERMATIC FF6H

| | |
|---|---|
| TIME CYCLE: | 6 HOURS |
| SWITCH: | SPST |
| HOLD: | NO |

OR APPROVED EQUIVALENT

**SWITCH DETAIL** (4 / A-2)
SCALE: N.T.S

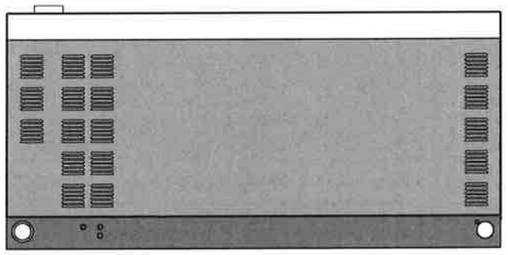


SPECIFICATIONS:
MANUFACTURER: COMMSCOPE
PART NO.: 760237150
SIZE: 86"x33"x44"

NOTE:
ANCHOR CABINET TO CONCRETE PAD PER MANUFACTURERS RECOMMENDATIONS

**EQUIPMENT CABINET DETAIL** (2 / A-2)
SCALE: N.T.S



SPECIFICATIONS:
MANUFACTURER: GENERAC
PART NO.: RG030
SIZE: 62.2"x30.6"x36.6"
WEIGHT: 895 LBS.

NOTE:
ANCHOR CABINET TO CONCRETE PAD PER MANUFACTURERS RECOMMENDATIONS

**GENERATOR DETAIL** (3 / A-2)
SCALE: N.T.S


**VERIZON EQUIPMENT PLAN** (1 / A-2)
22x34 SCALE: 1/2"=1'-0"
11x17 SCALE: 1/4"=1'-0"

GRAPHIC SCALE
0 1 2 4 6 FEET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SUBMITTALS

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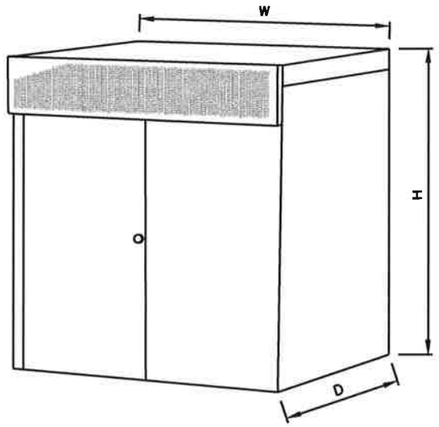
BRIDGEPORT, CT 06610

SHEET TITLE
EQUIPMENT DETAILS

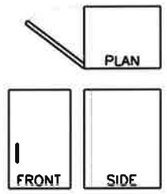
SHEET NUMBER
A-2

| CABINET DIMENSIONS | |
|---|---|
| MODEL # | RBS 6102 |
| MANUF. | ERICSSON |
| WIDTH | 51.2" |
| DEPTH | 27.6" |
| HEIGHT | 57.1" |
| WEIGHT (W/O BACKUP BATTERIES) | 728 LBS |
| CABINET CAN BE MOUNTED DIRECTLY TO SITE GROUND (INSTALL PER MANUFACTURER'S INSTALLATION GUIDELINES) | |



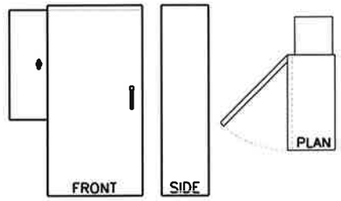

**T-MOBILE**
**PROPOSED 6102 EQUIPMENT CABINET** (8 / A-3)
SCALE: N.T.S

| RAC DIMENSIONS | |
|---|---|
| MODEL # | RAC24 |
| MANUF. | PURCELL |
| WIDTH | 15" |
| DEPTH | 18.5" |
| HEIGHT | 24" |
| WEIGHT | 35 LBS |
| NOTE: 1. INSTALL CABINET ANCHORS AND FLOOR MOUNT KIT ANCHORS PER MANUFACTURER'S INSTALLATION GUIDELINES | |

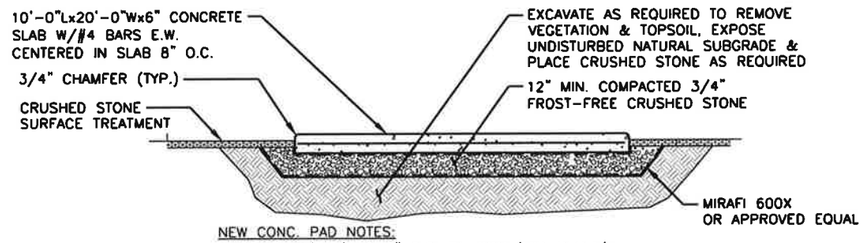



**T-MOBILE**
**REMOTE ACCESS CABINET (RAC)** (7 / A-3)
SCALE: N.T.S

| PPC DIMENSIONS | |
|---|---|
| MODEL # | 3799340400 |
| MANUF. | DELTA |
| WIDTH | 20" |
| DEPTH | 10" |
| HEIGHT | 40" |
| WEIGHT | 75 LBS |
| NOTE: INSTALL CABINET ANCHORS PER MANUFACTURER'S INSTALLATION GUIDELINES | |

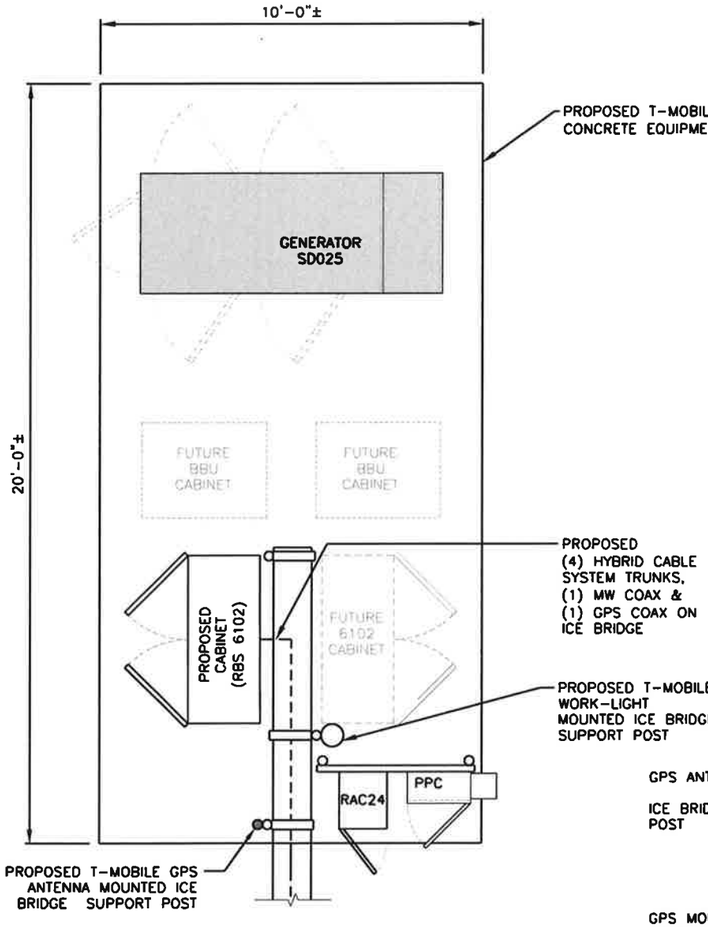



**T-MOBILE**
**POWER PROTECTION CABINET (PPC)** (6 / A-3)
SCALE: N.T.S

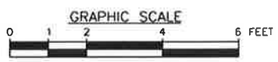


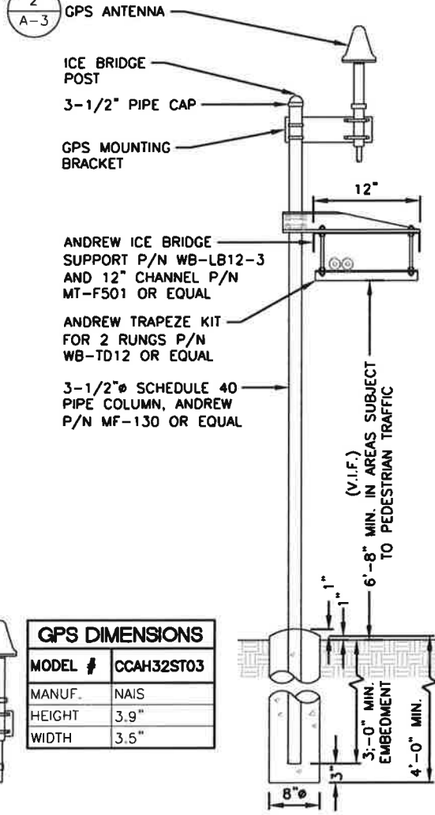

NEW CONC. PAD NOTES:
- REINF. W/ #4's @ 8" O.C. EA. WAY (MID-DEPTH).
- REINF. SHALL BE ASTM A615-GRADE 60. SECURE IN PLACE.
- REINFORCEMENT IN EQUIPMENT SLAB TO BE WELDED AND BONDED TO GROUND RING

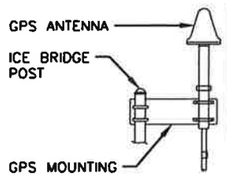
**T-MOBILE**
**CONCRETE PAD DETAIL** (5 / A-3)
SCALE: N.T.S




**T-MOBILE**
**EQUIPMENT PLAN** (1 / A-3)
22x34 SCALE: 1/2"=1'-0"
11x17 SCALE: 1/4"=1'-0"

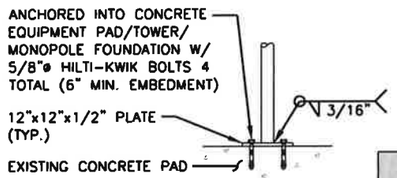




| GPS DIMENSIONS | |
|---|---|
| MODEL # | CCAH32ST03 |
| MANUF. | NAIS |
| HEIGHT | 3.9" |
| WIDTH | 3.5" |

**T-MOBILE**
**GPS ANTENNA MOUNTING DETAIL** (2 / A-3)
SCALE: N.T.S

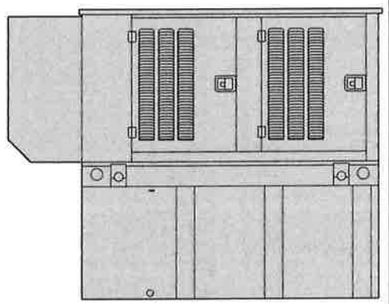
**T-MOBILE**
**COAX ICE BRIDGE DETAIL** (3 / A-3)
SCALE: N.T.S




NOTE:
ALL STEEL IS GALVANIZED. ALL BOLTS TO BE FURNISHED W/ WASHERS AND NUTS.

SPECIFICATIONS:
MANUFACTURER: GENERAC
PART NO.: SD025
SIZE: 92.9"x37.4"x82.7"
WEIGHT: 3042 LB.

NOTE:
ANCHOR CABINET TO STEEL DUNNAGE OR GRATING PER MANUFACTURERS RECOMMENDATIONS



**T-MOBILE**
**GENERATOR DETAIL** (4 / A-3)
SCALE: N.T.S


TARPON TOWERS
TARPON TOWERS II, LLC
1001 3rd AVENUE WEST, SUITE 420
BRADENTON, FL 34205

HUDSON Design Group LLC
45 BEECHWOOD DRIVE
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586


STATE OF CONNECTICUT
DEREK J. CREASER
No. 28...
LICENSED PROFESSIONAL ENGINEER

CHECKED BY: DJR

APPROVED BY: DJC

SUBMITTALS

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| 2 | 05/02/18 | REVISED PER COMMENTS | KAM |
| 1 | 04/26/18 | REVISED PER COMMENTS | KAM |
| 0 | 04/20/18 | ISSUED FOR REVIEW | KAM |

SITE NAME:
BRIDGEPORT EAST

SITE NUMBER:
CT1221

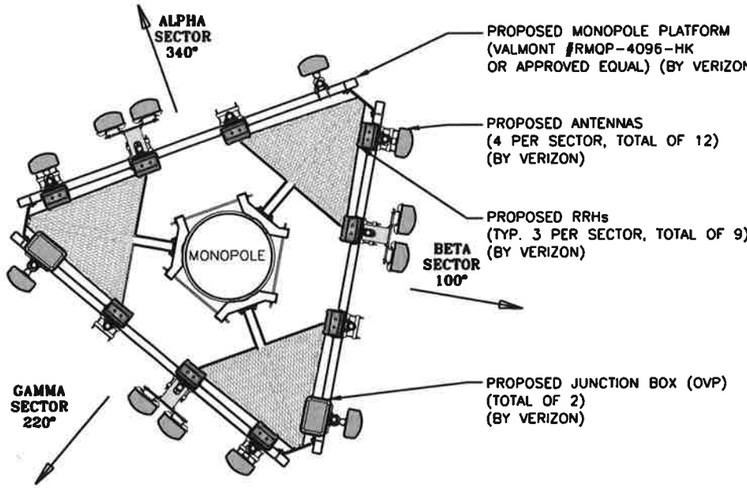
SITE ADDRESS:
380 HORACE STREET
BRIDGEPORT, CT 06610

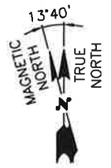
SHEET TITLE
EQUIPMENT DETAILS

SHEET NUMBER
A-3

NOTE:

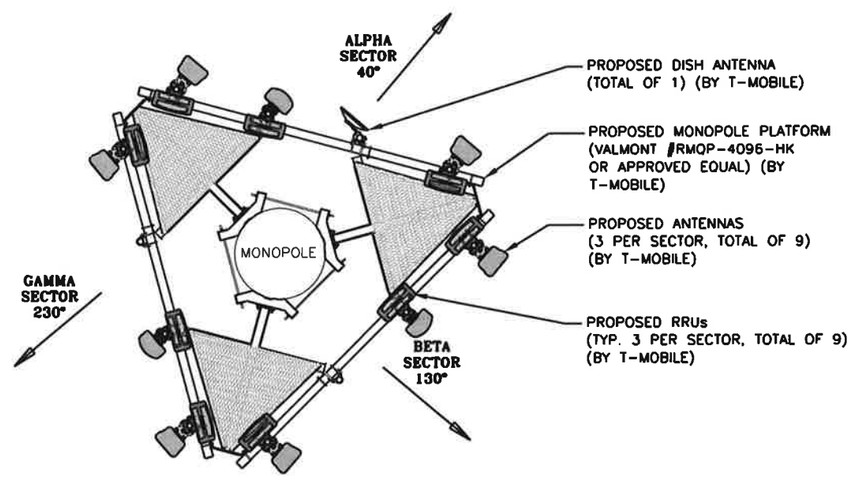
1. VERIFY AZIMUTHS W/ RF ENGINEER.

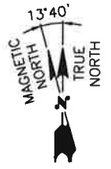



**ANTENNA PLAN (BY VERIZON)** 1 / A-4

SCALE: N.T.S




**ANTENNA PLAN (T-MOBILE)** 2 / A-4

SCALE: N.T.S

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STATE OF CONNECTICUT
DEREK J. CREASER
No. 28[illegible]
LICENSED PROFESSIONAL ENGINEER

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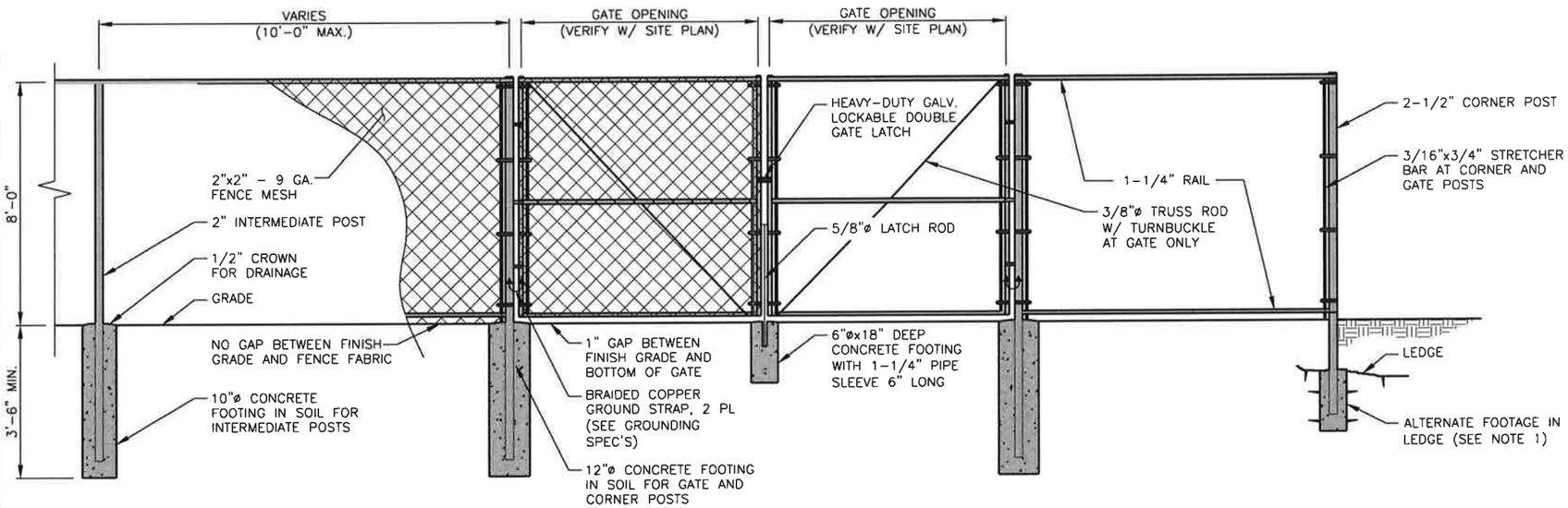
SHEET TITLE
ANTENNA PLAN

SHEET NUMBER
A-4

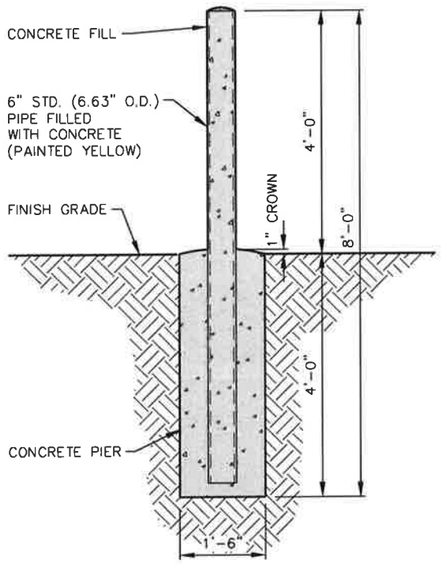
## FENCE NOTES

1. ALTERNATE FOOTINGS FOR ALL FENCE POSTS IN LEDGE: IF LEDGE IS ENCOUNTERED AT GRADE, OR AT A DEPTH SHALLOWER THAN 3'-6", CORE DRILL AN 8" DIA HOLE 18" INTO THE LEDGE. CENTER POST IN THE HOLE AND FILL WITH CONCRETE OR GROUT. IF LEDGE IS BELOW FINISH GRADE, COAT BACKFILLED SECTION OF POST WITH COAL TAR, AND BACKFILL WITH WELL-DRAINING GRAVEL.

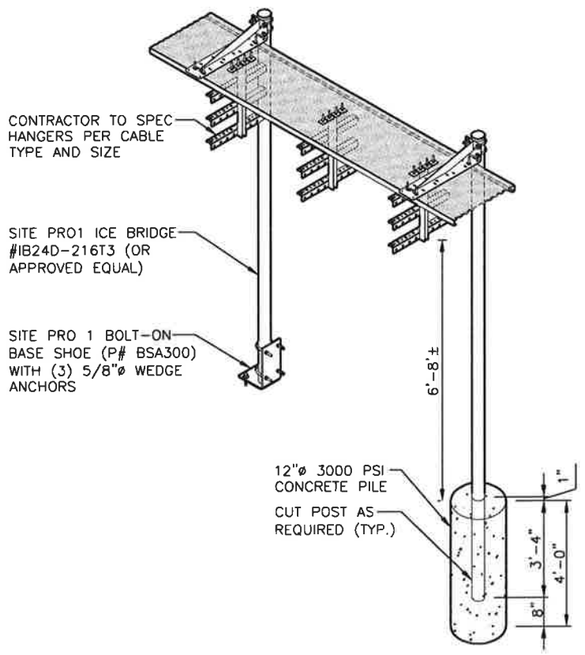
2. ATTACH EACH GATE WITH 1-1/2 PAIR OF NON-LIFT-OFF TYPE, MALLEABLE IRON OR FORGING, PIN-TYPE HINGES. ASSEMBLIES SHALL ALLOW FOR 180° OF GATE TRAVEL.



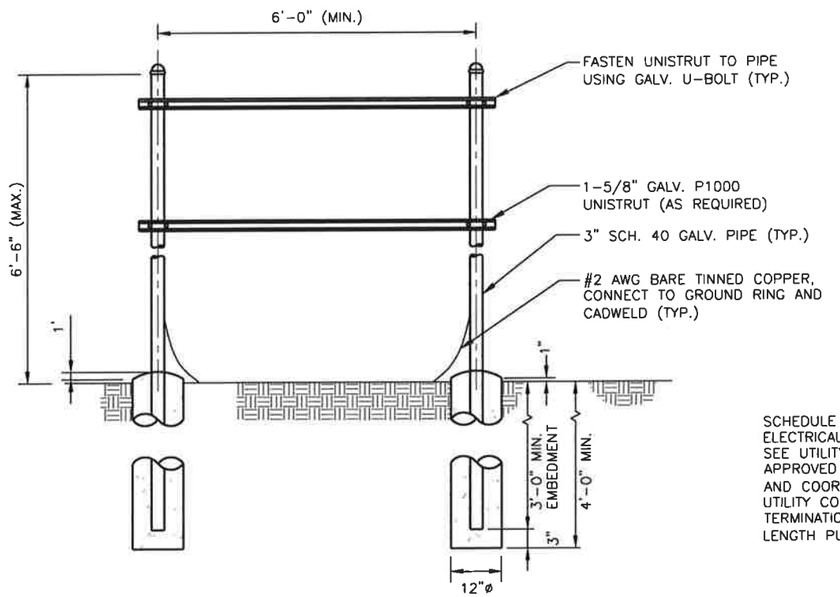

**CHAINLINK FENCE DETAIL** (1 / A-5)
SCALE: N.T.S



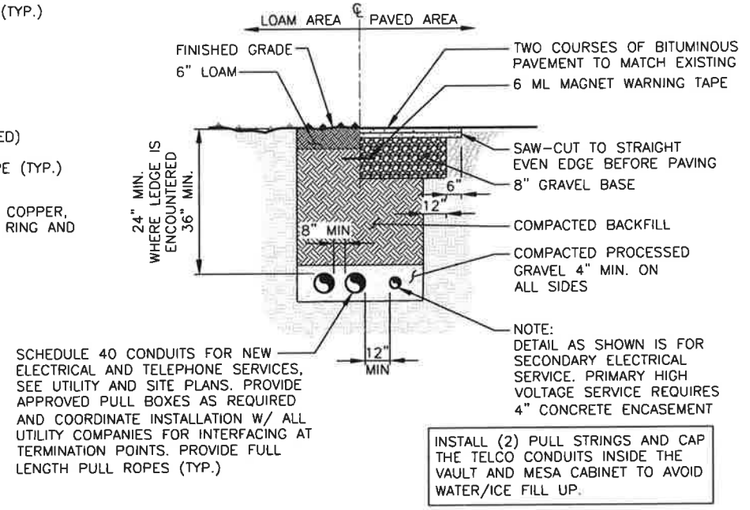

**BOLLARD DETAILS** (3 / A-5)
22x34 SCALE: 1/2"=1'-0"
11x17 SCALE: 1/4"=1'-0"




VERIZON
**CABLE BRIDGE DETAIL** (2 / A-5)
22x34 SCALE: N.T.S




**TYPICAL H-FRAME DETAIL** (4 / A-5)
SCALE: N.T.S




SCHEDULE 40 CONDUITS FOR NEW ELECTRICAL AND TELEPHONE SERVICES, SEE UTILITY AND SITE PLANS. PROVIDE APPROVED PULL BOXES AS REQUIRED AND COORDINATE INSTALLATION W/ ALL UTILITY COMPANIES FOR INTERFACING AT TERMINATION POINTS. PROVIDE FULL LENGTH PULL ROPES (TYP.)

INSTALL (2) PULL STRINGS AND CAP THE TELCO CONDUITS INSIDE THE VAULT AND MESA CABINET TO AVOID WATER/ICE FILL UP.

**BURIED CONDUIT DETAIL** (5 / A-5)
SCALE: N.T.S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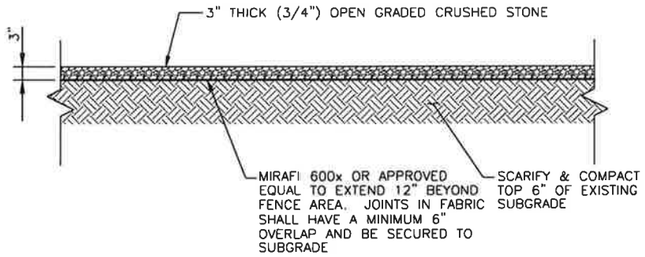
SHEET TITLE
SITE DETAILS

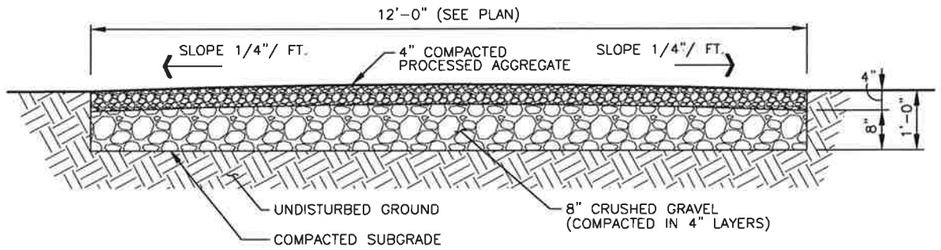
SHEET NUMBER
A-5



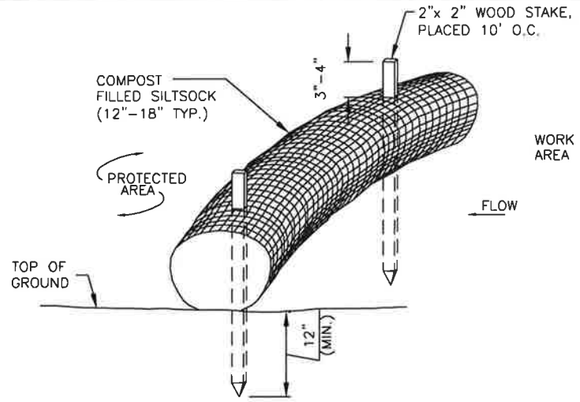

**COMPOUND SURFACE DETAIL** 1 / A-6
22x34 SCALE: 1"=1'-0"
11x17 SCALE: 1/2"=1'-0"

| CRUSHED GRAVEL | |
|---|---|
| SIEVE | % PASSING BY WEIGHT |
| 5" | 100 |
| 3 1/2" | 90-100 |
| 1 1/2" | 55-95 |
| 1/4" | 25-60 |
| #10 | 15-45 |
| #40 | 5-25 |
| #100 | 0-10 |
| #200 | 0-5 |

| PROCESSED AGGREGATE | |
|---|---|
| SIEVE | % PASSING BY WEIGHT |
| 2 1/4" | 100 |
| 2" | 95-100 |
| 3/4" | 50-75 |
| 1/4" | 25-45 |
| #40 | 5-20 |
| #100 | 2-12 |




**GRAVEL ACCESS DRIVE** 2 / A-6
SCALE: N.T.S




NOTES:

1. SILTSOCK SHALL BE FILTREXX SILTSOXX, OR APPROVED EQUAL.
2. COMPOST MATERIAL SHALL BE DISPERSED ON SITE, AS DETERMINED BY THE ENGINEER.
3. SILTSOCK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS, AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. SEE SPECIFICATIONS FOR SOCK SIZE, AND COMPOST FILL, REQUIREMENTS.

**SILT SOCK DETAIL** 3 / A-6
SCALE: N.T.S

## GENERAL CONSTRUCTION SEQUENCE:

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

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

## EROSION CONTROL MEASURES:

1) DISTURBED AREAS SHALL BE KEPT TO THE MINIMUM AREA NECCESSARY TO CONSTRUCT THE ROADWAYS AND ASSOCIATED DRAINAGE FACILITIES.
2) HAY BALE BARRIERS AND SEDIMENT TRAPS SHALL BE INSTALLED AS REQUIRED. BARRIERS AND TRAPS ARE TO BE MAINTAINED AND CLEANED UNTIL ALL SLOPES HAVE A HEALTHY STAND OF GRASS.
3) BALED HAY AND MULCH SHALL BE MOWINGS OF ACCEPTABLE HERBACEOUS GROWTH, FREE FROM NOXIOUS WEEDS OR WOODY STEMS, AND SHALL BE DRY. NO SALT HAY SHALL BE USED.
4) FILL MATERIAL SHALL BE FREE FROM STUMPS, WOOD, ROOTS, ETC.
5) STOCKPILED MATERIALS SHALL BE PLACED IN AREAS SHOWN ON THE PLANS. STOCKPILES SHALL BE PROTECTED BY SILTATION FENCE AND SEEDED TO PREVENT EROSION. THESE MEASURES SHALL REMAIN UNTIL ALL MATERIAL HAS BEEN PLACED OR DISPOSED OFF SITE.
6) ALL DISTURBED AREAS SHALL BE LOAMED AND SEEDED. A MINIMUM OF 4 INCHES OF LOAM SHALL BE INSTALLED WITH NOT LESS THAN ONE POUND OF SEED PER 50 SQUARE YARDS OF AREA.
7) APPLICATION OF GRASS SEED, FERTILIZERS AND MULCH SHALL BE ACCOMPLISHED BY BROADCAST SEEDING OR HYDROSEEDING AT THE RATES OUTLINED BELOW:

LIMESTONE: 75-100 LBS./1,000 SQUARE FEET.
FERTILIZER: RATE RECOMMENDED BY MANUFACTURER.
MULCH: HAY MULCH APPROXIMATELY 3 TONS/ACRE UNLESS EROSION CONTROL MATTING IS USED.

| SEED MIX (SLOPES LESS THAN 4:1) | LBS./ACRE |
|---|---|
| CREEPING RED FESCUE | 20 |
| TALL FESCUE | 20 |
| REDTOP | 2 |
| | 42 |

| SLOPE MIX (SLOPES GREATER THAN 4:1) | LBS./ACRE |
|---|---|
| CREEPING RED FESCUE | 20 |
| TALL FESCUE | 20 |
| BIRDSFOOT TREEFOIL | 8 |
| | 48 |

TREATMENT SWALE PLANTING SPECIFICATIONS

| | | | |
|---|---|---|---|
| TALL FESCUE | 20 LBS/ACRE | OR | 0.45 LBS/10,000 SF |
| CREEPING RED FESCUE | 20 LBS/ACRE | OR | 0.45 LBS/10,000 SF |
| BIRDSFOOT TREFOIL | 8 LBS/ACRE | OR | 0.20 LBS/10,000 SF |

LIME AND FERTILIZER SHOULD BE APPLIED PRIOR TO OR AT TIME OF SEEDING AND INCORPORATED INTO THE SOIL. THE FOLLOWING RATES ARE RECOMMENDED:

| | | | |
|---|---|---|---|
| AGRICULTURAL LIMESTONE | 2 TONS/ACRE | OR | 100 LBS/1,000 SF |
| NITROGEN (N) | 50 LBS/ACRE | OR | 1.1 LBS/10,000 SF |
| PHOSPHATE (P205) | 100 LBS/ACRE | OR | 2.2 LBS/10,000 SF |
| POTASH (K20) | 100 LBS/ACRE | OR | 2.2 LBS/10,000 SF |

(THIS IS EQUIVALENT TO 500 LBS/ACRE OF 10-20-20 FERTILIZER OR 1,000 LBS/ACRE OF 5-10-10).

8) AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED THE TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED.
9) PAVED ROADWAYS MUST BE KEPT CLEAN AT ALL TIMES.
10) ALL CATCH BASIN INLETS WILL BE PROTECTED WITH LOW POINT SEDIMENTATION BARRIER.
11) ALL STORM DRAINAGE OUTLETS WILL BE STABILIZE AND CLEANED AS REQUIRED, BEFORE THE DISCHARGE POINTS BECOME OPERATIONAL.
12) ALL DEWATERING OPERATIONS MUST DISCHARGE DIRECTLY INTO A SEDIMENT FILTER AREA.
13) NO DISCHARGE SHALL BE DIRECTED TOWARDS ANY PROPOSED DITCHES, SWALES, OR PONDS UNTIL THEY HAVE BEEN PROPERLY STABILIZED.

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SHEET TITLE
SITE SURFACE COVER AND EROSION CONTROL DETAILS

SHEET NUMBER
A-6

## ENVIRONMENTAL NOTES

## VERNAL POOL PROTECTION PLAN

AS A RESULT OF THE PROPOSED DEVELOPMENT'S LOCATION IN THE VICINITY OF VERNAL POOL HABITAT, THE FOLLOWING BEST MANAGEMENT PRACTICES ("BMPS") ARE PROVIDED TO AVOID UNINTENTIONAL IMPACT OR INCIDENTAL MORTALITY TO VERNAL POOL HERPETOFAUNA (I.E., SPOTTED SALAMANDER, WOOD FROG, TURTLES, ETC.) DURING CONSTRUCTION ACTIVITIES. THIS PLAN INCLUDES ELEMENTS THAT WILL PROTECT HERPETOFAUNA SHOULD CONSTRUCTION ACTIVITIES OCCUR DURING PEAK AMPHIBIAN MOVEMENT PERIODS (EARLY SPRING BREEDING [MARCH 1ST TO MAY 15TH] AND LATE SUMMER DISPERSAL [JULY 15TH TO SEPTEMBER 15TH]).

IT IS OF THE UTMOST IMPORTANCE THAT THE CONTRACTOR COMPLIES WITH THE REQUIREMENT OF THIS VERNAL POOL PROTECTION PLAN. ALL-POINTS TECHNOLOGY CORPORATION, P.C. ("APT") WILL SERVE AS THE ENVIRONMENTAL MONITOR FOR THIS PROJECT TO ENSURE THAT THE VERNAL POOL PROTECTION PLAN MEASURES ARE IMPLEMENTED PROPERLY. THE CONTRACTOR SHALL CONTACT DEAN GUSTAFSON, SENIOR WETLAND SCIENTIST AT APT AT LEAST 5 BUSINESS DAYS PRIOR TO THE PRE-CONSTRUCTION MEETING. MR. GUSTAFSON CAN BE REACHED BY PHONE AT (860) 663-1697 EXT. 201 OR VIA EMAIL AT DGUSTAFSON@ALLPOINTSTECH.COM.

THE PROPOSED VERNAL POOL PROTECTION PROGRAM CONSISTS OF SEVERAL COMPONENTS INCLUDING: ISOLATION OF THE TOWER/COMPOUND PERIMETER; PERIODIC INSPECTION AND MAINTENANCE OF EROSION CONTROLS AND ISOLATION STRUCTURES; HERPETOFAUNA SWEEPS; EDUCATION OF ALL CONTRACTORS AND SUB-CONTRACTORS PRIOR TO INITIATION OF WORK ON THE SITE; PROTECTIVE MEASURES; AND, REPORTING. COMPLETE DETAILS OF THE RECOMMENDED BMPS ARE PROVIDED BELOW.

### 1. EROSION AND SEDIMENTATION CONTROLS

a. PLASTIC NETTING WITH LARGE MESH OPENINGS (> ¼") USED IN A VARIETY OF EROSION CONTROL PRODUCTS (I.E., EROSION CONTROL BLANKETS, FIBER ROLLS [WATTLES], REINFORCED SILT FENCE) HAS BEEN FOUND TO ENTANGLE WILDLIFE, INCLUDING REPTILES, AMPHIBIANS, BIRDS AND SMALL MAMMALS. NO PERMANENT EROSION CONTROL PRODUCTS OR REINFORCED SILT FENCE WILL BE USED ON THE PROJECT. TEMPORARY EROSION CONTROL PRODUCTS THAT WILL BE EXPOSED AT THE GROUND SURFACE REPRESENT A POTENTIAL FOR WILDLIFE ENTANGLEMENT WILL USE EITHER EROSION CONTROL BLANKETS AND FIBER ROLLS COMPOSED OF PROCESSED FIBERS MECHANICALLY BOUND TOGETHER TO FORM A CONTINUOUS MATRIX (NETLESS) OR NETTING WITH A MESH SIZE <¼" SUCH AS THAT TYPICALLY USED IN COMPOST FILTER SOCKS TO AVOID/MINIMIZE WILDLIFE ENTANGLEMENT.

b. INSTALLATION OF EROSION AND SEDIMENTATION CONTROLS, REQUIRED FOR EROSION CONTROL COMPLIANCE AND CREATION OF A BARRIER TO POSSIBLE MIGRATING/DISPERSING HERPETOFAUNA, SHALL BE PERFORMED BY THE CONTRACTOR FOLLOWING CLEARING ACTIVITIES AND PRIOR TO ANY EARTHWORK. THE ENVIRONMENTAL MONITOR WILL INSPECT THE WORK ZONE AREA PRIOR TO AND FOLLOWING EROSION CONTROL BARRIER INSTALLATION TO ENSURE THE AREA IS FREE OF HERPETOFAUNA AND SATISFACTORILY INSTALLED. THE INTENT OF THE BARRIER IS TO SEGREGATE THE MAJORITY OF THE WORK ZONE FROM MIGRATING/DISPERSING HERPETOFAUNA. OFTENTIMES COMPLETE ISOLATION OF A WORK ZONE IS NOT FEASIBLE DUE TO ACCESSIBILITY NEEDS AND LOCATIONS OF STAGING/MATERIAL STORAGE AREAS, ETC. IN THOSE CIRCUMSTANCES, THE BARRIERS WILL BE POSITIONED TO DEFLECT MIGRATING/DISPERSAL ROUTES AWAY FROM THE WORK ZONE TO MINIMIZE POTENTIAL ENCOUNTERS WITH HERPETOFAUNA.

c. IF A STAGING AREA FOR EQUIPMENT, VEHICLES OR CONSTRUCTION MATERIALS IS REQUIRED FOR THIS PROJECT, SUCH AREA(S) SHALL BE SURROUNDED BY SILT FENCE TO ISOLATE THE AREA FROM POSSIBLE MIGRATING HERPETOFAUNA.

d. ALL EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS OF COMPLETION OF WORK AND PERMANENT STABILIZATION OF SITE SOILS SO THAT HERPETOFAUNA MOVEMENTS BETWEEN UPLANDS AND WETLANDS ARE NOT RESTRICTED.

### 2. CONTRACTOR EDUCATION:

a. PRIOR TO WORK ON SITE AND INITIAL DEPLOYMENT/MOBILIZATION OF EQUIPMENT AND MATERIALS, THE CONTRACTOR SHALL ATTEND AN EDUCATIONAL SESSION AT THE PRE-CONSTRUCTION MEETING WITH THE ENVIRONMENTAL MONITOR. THIS ORIENTATION AND EDUCATIONAL SESSION WILL CONSIST OF INFORMATION SUCH AS, BUT NOT LIMITED TO: REPRESENTATIVE PHOTOGRAPHS OF TYPICAL HERPETOFAUNA THAT MAY BE ENCOUNTERED, RARE THAT COULD BE ENCOUNTERED (IF POSSIBLE), TYPICAL SPECIES BEHAVIOR, AND PROPER PROCEDURES TO PROTECT SUCH SPECIES IF THEY ARE ENCOUNTERED. THE MEETING WILL FURTHER EMPHASIZE THE NON-AGGRESSIVE NATURE OF THESE SPECIES, THE ABSENCE OF NEED TO DESTROY SUCH ANIMALS AND THE NEED TO FOLLOW PROTECTIVE MEASURES AS DESCRIBED IN SECTION 4 BELOW. THE CONTRACTOR WILL DESIGNATE ONE OF ITS WORKERS AS THE "PROJECT MONITOR", WHO WILL RECEIVE MORE INTENSE TRAINING ON THE IDENTIFICATION AND PROPER HANDLING OF HERPETOFAUNA.

b. THE CONTRACTOR WILL DESIGNATE A MEMBER OF ITS CREW AS THE PROJECT MONITOR TO BE RESPONSIBLE FOR THE DAILY "SWEEPS" FOR HERPETOFAUNA WITHIN THE WORK ZONE EACH MORNING, DURING ANY AND ALL TRANSPORTATION OF VEHICLES ALONG THE ACCESS DRIVE, AND FOR ANY GROUND DISTURBANCE WORK. THIS INDIVIDUAL WILL RECEIVE MORE INTENSE TRAINING FROM THE ENVIRONMENTAL MONITOR ON THE IDENTIFICATION AND PROTECTION OF HERPETOFAUNA IN ORDER TO PERFORM SWEEPS. ANY HERPETOFAUNA DISCOVERED WILL BE REPORTED TO THE ENVIRONMENTAL MONITOR, PHOTOGRAPHED IF POSSIBLE, AND RELOCATED OUTSIDE THE WORK ZONE IN THE GENERAL DIRECTION THE ANIMAL WAS ORIENTED.

c. THE ENVIRONMENTAL MONITOR WILL ALSO POST CAUTION SIGNS THROUGHOUT THE PROJECT SITE AND MAINTAIN THEM FOR THE DURATION OF CONSTRUCTION TO PROVIDE NOTICE OF THE ENVIRONMENTALLY SENSITIVE NATURE OF THE WORK AREA, THE POTENTIAL FOR ENCOUNTERING VARIOUS AMPHIBIANS AND REPTILES AND PRECAUTIONS TO BE TAKEN TO AVOID INJURY TO OR MORTALITY OF THESE ANIMALS.

d. THE CONTRACTOR WILL BE PROVIDED WITH THE ENVIRONMENTAL MONITOR'S CELL PHONE AND EMAIL CONTACT INFORMATION TO IMMEDIATELY REPORT ANY ENCOUNTERS WITH HERPETOFAUNA.

### 3. PETROLEUM MATERIALS STORAGE AND SPILL PREVENTION

a. CERTAIN PRECAUTIONS ARE NECESSARY TO STORE PETROLEUM MATERIALS, REFUEL AND CONTAIN AND PROPERLY CLEAN UP ANY INADVERTENT FUEL OR PETROLEUM (I.E., OIL, HYDRAULIC FLUID, ETC.) SPILL DUE TO THE PROJECT'S LOCATION IN PROXIMITY TO SENSITIVE WETLAND RESOURCES.

b. A SPILL CONTAINMENT KIT CONSISTING OF A SUFFICIENT SUPPLY OF ABSORBENT PADS AND ABSORBENT MATERIAL WILL BE MAINTAINED BY THE CONTRACTOR AT THE CONSTRUCTION SITE THROUGHOUT THE DURATION OF THE PROJECT. IN ADDITION, A WASTE DRUM WILL BE KEPT ON SITE TO CONTAIN ANY USED ABSORBENT PADS/MATERIAL FOR PROPER AND TIMELY DISPOSAL OFF SITE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL LAWS.

c. THE FOLLOWING PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING RESTRICTIONS AND SPILL RESPONSE PROCEDURES WILL BE ADHERED TO BY THE CONTRACTOR.

i. PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING

1. REFUELING OF VEHICLES OR MACHINERY SHALL TAKE PLACE ON AN IMPERVIOUS PAD WITH SECONDARY CONTAINMENT DESIGNED TO CONTAIN FUELS.

2. ANY REFUELING DRUMS/TANKS OR HAZARDOUS MATERIALS THAT MUST BE KEPT ON SITE SHALL BE STORED ON AN IMPERVIOUS SURFACE UTILIZING SECONDARY CONTAINMENT A MINIMUM OF 100 FEET FROM WETLANDS OR WATERCOURSES.

ii. INITIAL SPILL RESPONSE PROCEDURES

1. STOP OPERATIONS AND SHUT OFF EQUIPMENT.
2. REMOVE ANY SOURCES OF SPARK OR FLAME.
3. CONTAIN THE SOURCE OF THE SPILL.
4. DETERMINE THE APPROXIMATE VOLUME OF THE SPILL.
5. IDENTIFY THE LOCATION OF NATURAL FLOW PATHS TO PREVENT THE RELEASE OF THE SPILL TO 6. SENSITIVE NEARBY WATERWAYS OR WETLANDS.
6. ENSURE THAT FELLOW WORKERS ARE NOTIFIED OF THE SPILL.

iii. SPILL CLEAN UP & CONTAINMENT

1. OBTAIN SPILL RESPONSE MATERIALS FROM THE ON-SITE SPILL RESPONSE KIT. PLACE ABSORBENT MATERIALS DIRECTLY ON THE RELEASE AREA.
2. LIMIT THE SPREAD OF THE SPILL BY PLACING ABSORBENT MATERIALS AROUND THE PERIMETER OF THE SPILL.
3. ISOLATE AND ELIMINATE THE SPILL SOURCE.
4. CONTACT THE APPROPRIATE LOCAL, STATE AND/OR FEDERAL AGENCIES, AS NECESSARY.
5. CONTACT A DISPOSAL COMPANY TO PROPERLY DISPOSE OF CONTAMINATED MATERIALS.

iv. REPORTING

1. COMPLETE AN INCIDENT REPORT.
2. SUBMIT A COMPLETED INCIDENT REPORT TO THE CONNECTICUT SITING COUNCIL.

### 1. PROTECTIVE MEASURES

a. A THOROUGH COVER SEARCH OF THE CONSTRUCTION AREA WILL BE PERFORMED BY THE ENVIRONMENTAL MONITOR FOR HERPETOFAUNA PRIOR TO AND FOLLOWING INSTALLATION OF EROSION CONTROL MEASURES/SILT FENCING BARRIERS TO REMOVE ANY SPECIES FROM THE WORK ZONE PRIOR TO THE INITIATION OF CONSTRUCTION ACTIVITIES. ANY HERPETOFAUNA DISCOVERED WOULD BE RELOCATED OUTSIDE THE WORK ZONE IN THE GENERAL DIRECTION THE ANIMAL WAS ORIENTED. PERIODIC INSPECTIONS WILL BE PERFORMED BY THE ENVIRONMENTAL MONITOR THROUGHOUT THE DURATION OF CONSTRUCTION.

b. THE CONTRACTOR'S PROJECT MONITOR WILL INSPECT THE WORK AREA EACH MORNING AND ESCORT INITIAL VEHICLE ACCESS INTO THE SITE EACH MORNING ALONG THE ACCESS DRIVE TO VISUALLY INSPECT FOR ANY HERPETOFAUNA. ANY HERPETOFAUNA DISCOVERED WOULD BE RELOCATED OUTSIDE THE WORK ZONE IN THE GENERAL DIRECTION THE ANIMAL WAS ORIENTED.

c. ANY HERPETOFAUNA REQUIRING RELOCATION OUT OF THE WORK ZONE WILL BE CAPTURED WITH THE USE OF A NET OR CLEAN PLASTIC BAG THAT HAS BEEN MOISTENED WITH CLEAN WATER FOR CAREFUL HANDLING AND PLACEMENT OUT OF THE WORK ZONE IN THE GENERAL DIRECTION IT WAS OBSERVED HEADING.

d. ANY STORMWATER MANAGEMENT FEATURES, RUTS OR ARTIFICIAL DEPRESSIONS THAT COULD HOLD WATER CREATED INTENTIONALLY OR UNINTENTIONALLY BY SITE CLEARING/CONSTRUCTION ACTIVITIES WILL BE PROPERLY FILLED IN AND PERMANENTLY STABILIZED WITH VEGETATION TO AVOID THE CREATION OF VERNAL POOL "DECOY POOLS" THAT COULD INTERCEPT AMPHIBIANS MOVING TOWARD THE VERNAL POOLS. STORMWATER MANAGEMENT FEATURES SUCH AS LEVEL SPREADERS WILL BE CAREFULLY REVIEWED IN THE FIELD TO ENSURE THAT STANDING WATER DOES NOT ENDURE FOR MORE THAN A 24 HOUR PERIOD TO AVOID CREATION OF DECOY POOLS AND MAY BE SUBJECT TO FIELD DESIGN CHANGES. ANY SUCH PROPOSED DESIGN CHANGES WILL BE REVIEWED BY THE DESIGN ENGINEER TO ENSURE STORMWATER MANAGEMENT FUNCTIONS ARE MAINTAINED.

### 2. HERBICIDE AND PESTICIDE RESTRICTIONS

a. USE OF HERBICIDES AND PESTICIDES AT THE PROPOSED WIRELESS TELECOMMUNICATIONS FACILITY SHALL BE RESTRICTED.

### 6. REPORTING

a. DAILY INSPECTION REPORTS (BRIEF NARRATIVE AND APPLICABLE PHOTOS) WILL BE PREPARED BY THE ENVIRONMENTAL MONITOR DOCUMENTING EACH INSPECTION AND SUBMITTED TO TARPON TOWERS II, LLC FOR COMPLIANCE VERIFICATION. ANY NON-COMPLIANCE OBSERVATIONS OF EROSION CONTROL MEASURES OR EVIDENCE OF EROSION OR SEDIMENT RELEASE WILL BE IMMEDIATELY REPORTED TO THE CONTRACTOR AND TARPON TOWERS' CONSTRUCTION MANAGER AND INCLUDED IN THE REPORTS. TARPON TOWERS IS RESPONSIBLE FOR ANY NOTIFICATIONS TO THE CONNECTICUT SITING COUNCIL.

b. ANY OBSERVATIONS OF RARE SPECIES WILL BE REPORTED TO THE CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION NATURAL DIVERSITY DATA BASE.

c. FOLLOWING COMPLETION OF THE PROJECT, A SUMMARY REPORT WILL BE PREPARED BY THE ENVIRONMENTAL MONITOR DOCUMENTING COMPLIANCE WITH THE VERNAL POOL PROTECTION PLAN AND SUBMITTED TO TARPON TOWERS. TARPON TOWERS SHALL PROVIDE THE CONNECTICUT SITING COUNCIL WITH A COPY OF THE SUMMARY REPORT.

TARPON TOWERS
TARPON TOWERS II, LLC
1001 3rd AVENUE WEST, SUITE 420
BRADENTON, FL 34205

HUDSON Design Group LLC
45 BEECHWOOD DRIVE
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

DEREK J. CREASER
No. 23
LICENSED PROFESSIONAL ENGINEER
STATE OF CONNECTICUT

CHECKED BY: DJR

APPROVED BY: DJC

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
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| 2 | 05/02/18 | REVISED PER COMMENTS | KAM |
| 1 | 04/26/18 | REVISED PER COMMENTS | KAM |
| 0 | 04/20/18 | ISSUED FOR REVIEW | KAM |

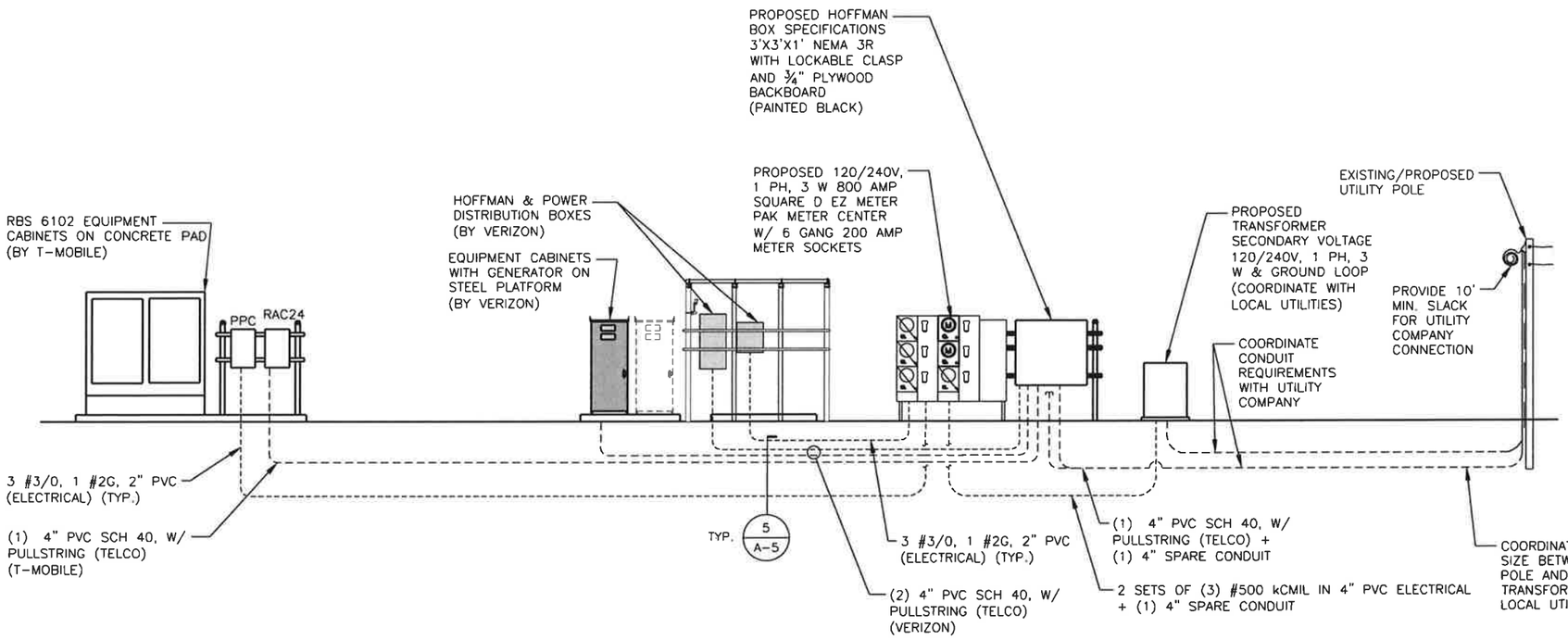
SITE NAME:
BRIDGEPORT EAST

SITE NUMBER:
CT1221

SITE ADDRESS:
380 HORACE STREET
BRIDGEPORT, CT 06610

SHEET TITLE
SITE SURFACE COVER AND EROSION CONTROL DETAILS

SHEET NUMBER
EN-1




**POWER & TELEPHONE RISER DIAGRAM** 1 E-1

SCALE: N.T.S

## ELECTRICAL NOTES

1. UTILITY SERVICES SHOWN ARE PROPOSED, THE ELECTRIC CONTRACTOR SHALL COORDINATE EXACT TELEPHONE AND ELECTRIC SERVICE CONNECTION POINTS, PULL BOXES, ROUTING AND ASSOCIATED REQUIREMENTS WITH LOCAL UTILITY COMPANIES.
2. VISIT SITE AND EXAMINE CONDITIONS UNDER WHICH WORK MUST BE PERFORMED. REPORT ADVERSE CONDITIONS IN WRITING TO LICENSEE. COMMENCEMENT OF WORK SHALL BE CONSTRUED AS COMPLETE ACCEPTANCE OF EXISTING CONDITIONS INCLUDING PREPARATORY WORK DONE BY OTHERS.
3. ALL EXISTING UNDERGROUND LINES ON SITE SHALL BE LOCATED PRIOR TO CONSTRUCTION.
4. GIVE NOTICES, FILE PLANS, OBTAIN PERMITS AND LICENSES, PAY FEES AND BACK CHARGES, AND OBTAIN NECESSARY APPROVALS FROM AUTHORITIES THAT HAVE JURISDICTION.
5. PERFORM WORK AS REQUIRED BY BOCA AND PER LOCAL LAWS.
6. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ALL CONDUIT ROUTING WITH LOCAL UTILITY COMPANIES AND FIELD CONSTRUCTION MANAGER.
7. ALL EXTERIOR WALL PENETRATIONS SHALL BE SILICONE SEALED.
8. MATERIAL AND EQUIPMENT SHALL BE UL, NEMA, ANSI, IEEE, ADA & CBM APPROVED FOR INTENDED SERVICE. INSTALLATION SHALL MEET REQUIREMENTS OF NATIONAL AND STATE ELECTRICAL CODE.
9. ALL ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING RATING NOT LESS THEN THE MAXIMUM SHORT CIRCUIT CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C..
10. ALL NEW WIRING SHALL BE TYPE THWN RATED 75°C., 600 VOLT. WET OR DRY LOCATIONS. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG SOLID COPPER.
11. ALL METALLIC CONDUITS SHALL BE PROVIDED WITH BONDING BUSHINGS.
12. ALL BROCHURES, OPERATING MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE TURNED OVER TO THE LICENSEE PROJECT MANAGER AT JOB COMPLETION.
13. PROVIDE THE OWNER WITH ONE SET OF COMPLETE ELECTRICAL "AS BUILT" DRAWINGS AT THE COMPLETION OF THE JOB.
14. GUARANTEE WORK IN WRITING FOR ONE YEAR FROM DATE OF FINAL ACCEPTANCE. REPAIR OR REPLACE DEFECTIVE MATERIALS OR INSTALLATION AT NO COST TO OWNER. CORRECT DAMAGE CAUSED IN MAKING NECESSARY REPAIRS AND REPLACEMENTS UNDER GUARANTEE AT NO COST TO OWNER.
15. CONTRACTOR SHALL CONTACT "DIG SAFE" (1-888-DIG-SAFE) PRIOR TO COMMENCEMENT OF WORK.

TARPON TOWERS
TARPON TOWERS II, LLC
1001 3rd AVENUE WEST, SUITE 420
BRADENTON, FL 34205

HUDSON Design Group LLC
45 BEECHWOOD DRIVE
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

STATE OF CONNECTICUT
DEREK J. CREASER
No. 29
LICENSED PROFESSIONAL ENGINEER

CHECKED BY: DJR

APPROVED BY: DJC

SUBMITTALS

| REV. | DATE | DESCRIPTION | BY |
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SITE NAME:
BRIDGEPORT EAST

SITE NUMBER:
CT1221

SITE ADDRESS:
380 HORACE STREET
BRIDGEPORT, CT 06610

SHEET TITLE
ELECTRICAL/ TELEPHONE RISER DIAGRAM AND NOTES

SHEET NUMBER
E-1

# 90' 3C MONOPOLE W/ 53' FALL ZONE
# TARPON TOWERS II, LLC
# BRIDGEPORT CT1221
# FAIRFIELD COUNTY, CT

## TABLE OF CONTENTS



## SYMBOL LEGEND

| | |
|---|---|
| AGL = ABOVE GROUND LEVEL | LW = LOCK WASHER |
| BC = BOLT CIRCLE | OC = ON CENTER |
| CL = CENTERLINE | OD = OUTSIDE DIAMETER |
| ELEV = ELEVATION | (P) = PROPOSED |
| (E) = EXISTING | TBD = TO BE DETERMINED |
| FV = FIELD VERIFY | TOS = TOP OF STEEL |
| FW = FLAT WASHER | TYP = TYPICAL |
| HN = HEX NUT | NTS = NOT TO SCALE |

### DESIGN NOTES

1. MONOPOLE IS DESIGNED IN ACCORDANCE WITH TIA-222G FOR 100 MPH BASIC WIND AND 50 MPH WITH 0.75" ICE.
   TOWER STRUCTURE CLASS- II
   EXPOSURE - C
   TOPOGRAPHIC CATEGORY - 1 WITH CREST HEIGHT OF 0.00 ft.
2. MAX FALL ZONE RADIUS - 53 FT.

### COATING NOTES

1. ALL APPLICABLE MATERIALS SHALL BE HOT DIPPED GALVANIZED PER ASTM A123. ALL HARDWARE SHALL BE HOT DIPPED GALVANIZED PER ASTM A153, UNLESS OTHERWISE NOTED.

### STRUCTURE NOTES

1. EE WILL NOT HONOR ANY BACKCHARGES WHICH HAVE NOT RECEIVED PRIOR WRITTEN AUTHORIZATION. CONTACT EE AT (440) 970.5004

2. THE INSTALLER SHALL THOROUGHLY REVIEW EE's STRUCTURAL ASSEMBLY & ERECTION PROCEDURES PRIOR TO INITIATING THE INSTALLATION OF THE STRUCTURE.

3. THE ORIENTATION OF THE STRUCTURE SHALL BE VERIFIED PRIOR TO INSTALLATION.

4. FOR MULTIPLE SECTION MONOPOLES:
   - 4.1. FOR PROPER SECTION TO SECTION ALIGNMENT A 2" HORIZONTAL WELD BEAD AND A MARK ARE POSITIONED ON EACH SECTION AT EACH SPLICE. THE 2" HORIZONTAL WELD BEAD ARE ON THE MATCHING CORNERS. THE MARK NUMBER IS ON THE ADJACENT FLAT. THE CORNERS WITH WELD BEADS SHALL BE ALIGNED FROM TOP TO BOTTOM OF THE STRUCTURE / MARK NUMBERS SHALL BE MATCHED FOR EACH SIDE & THE DISTANCE BETWEEN TWO WELD BEADS SHOULD BE 18" (±4").
   - 4.2. ALL SECTIONS OF THE STRUCTURE SHALL BE JACKED TOGETHER WITH A MINIMUM JACKING FORCE OF 10,000 lbf APPLIED TO EACH SIDE. FOR MAXIMUM RECOMMENDED JACKING FORCE, SPLICE LENGTH TOLERANCE AND AIR GAP BETWEEN SECTIONS REFER TO EE's STRUCTURE ASSEMBLY & ERECTION PROCEDURES.
   - 4.3. 1" FIELD ASSEMBLY JACKING NUTS FOR JACKING SECTIONS TOGETHER ARE LOCATED ON OPPOSING SECTION FLATS ABOVE AND BELOW THE SPLICES. ALL JACKING EQUIPMENT SHALL BE SUPPLIED BY THE INSTALLER.
   - 4.4. ALL LONGITUDINAL SEAM WELDS WITHIN THE SLIP-JOINT AREA IN THE FEMALE SECTION SHALL BE 100% PENETRATION.

5. ALL BOLTED CONNECTIONS WITH A325 HIGH-STRENGTH BOLTS SHALL BE ASSEMBLED IN ACCORDANCE WITH SPECIFICATIONS FOR STRUCTURAL JOINTSUSING A325 OR A490 BOLTS. HIGH STRENGTH BOLTS SHALL BE INSTALLED TO SNUG-TIGHT CONDITION PER ASTM A325/A490 AND THEN PRE-TENSION AS REQUIRED. TURN-OF-NUT METHOD IS RECOMMENDED BUT IS NOT LIMITED TO.

6. SHIMS WILL BE SUPPLIED BY EE, IF REQUIRED.

7. STRUCTURE BASE PLATE SHALL HAVE FULL PENETRATION WELD TO SHAFT.

8. ANCHOR RODS SHALL BE TIGHTENED AFTER THE MONOPOLE IS PLUMB. BOTH TOP & BOTTOM NUT SHALL BE TIGHTENED. FOR DETAIL OF ANCHOR ROD INSTALLATION INSTRUCTIONS, REFER TO EE's STRUCTURE ASSEMBLY & ERECTION PROCEDURES.

9. MATERIALS
   - 9.1. STRUCTURAL STEEL - REFER TO DRAWING.
   - 9.2. BOLTS
     - 9.2.1. STRUCTURAL STEEL: A325 HIGH STRENGTH BOLTS UNLESS OTHERWISE NOTED.
     - 9.2.2. ANCHOR RODS: A615-GR75 UNLESS OTHERWISE NOTED.

10. WELDING
    - 10.1. ALL WELDING SHALL MEET AWS LATEST D.1.1 EDITION

11. ASSEMBLY MARKING PROCEDURE
    - 11.1. EACH INDIVIDUAL ASSEMBLY SHALL HAVE A METAL TAG WELDED TO IT WHICH WILL BE ENGRAVED WITH THE ASSEMBLY MARK NO. AS SHOWN IN THE MATERIAL BLOCK. (MINIMUM OF 5/8" HIGH LETTERS).

### BILL OF MATERIALS 18308-P01

| Item | Part Number | Qty | Description | Weight Per | Wt Per Row |
|---|---|---|---|---|---|
| | 18308-P01 | | 90' 3C MONOPOLE W/ 53' FALL ZONE | 16532.50 | 16532.50 |
| 1 | 18308-P01-GS01 | 1 | SECTION ASSY. (5/16" A572-GR65 POLY-18) | 4861.06 | 4861.06 |
| 2 | 18308-P01-GS02 | 1 | SECTION ASSY. (7/16" A572-GR65 POLY-18) | 11246.00 | 11246.00 |
| 3 | K10062 | 1 | BUSS BAR | 7.50 | 7.50 |
| 4 | K10333 | 1 | 7'-0" LIGHTNING ROD | 28.60 | 28.60 |
| 5 | 18308-P01-P36-01 | 1 | COVER PLATE | 39.92 | 39.92 |
| 6 | DBI-90 | 1 | 90'-0" SAFETY CLIMB KIT | 24.75 | 24.75 |
| 7 | 10000-A01-A394-01 | 65 | 5/8" dia.x 7" LG. BUTTON HEAD STEP BOLT w/(1) H.N. & (1) SQUARE NUT EACH | 1.08 | 70.20 |
| 8 | K11499 | 9 | 6" x 18" HANDHOLE COVER PLATE & BOLTS | 10.48 | 94.32 |
| 9 | K11497 | 5 | 10" x 30" ACCESS PORT COVER PLATE & BOLTS | 31.39 | 156.95 |
| 10 | A-BX-A325-G-1.00X3.00 | 2 | 1" DIA X 3" HEX BOLT (A325) w/ (1) HHN (A194-2H) & (2) FW (F436) - GALVANIZED FINISH | 1.60 | 3.20 |
| 11 | 18308-P01-ABT | 1 | FOR ANCHOR BOLTS REFER TO DWG. 18308-P01-ABT | | |
| 12 | HD-INS-MONOPOLE | 1 | STRUCTURE ASSEMBLY AND ERECTION PROCEDURE | | |
| 13 | 18308-P01-CNT | 1 | GALVANIZED FINISH | | |

STAMP


05-15-2018


ENGINEERED ENDEAVORS
*The Experienced Point of View*
15175 Kinsman Road * Burton, OH 44062
Ph: (440) 970-5004
www.engend.com


**FOR APPROVAL**



REVISION HISTORY

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| 0 | 5/15/18 | TS | ISSUED FOR APPROVAL |
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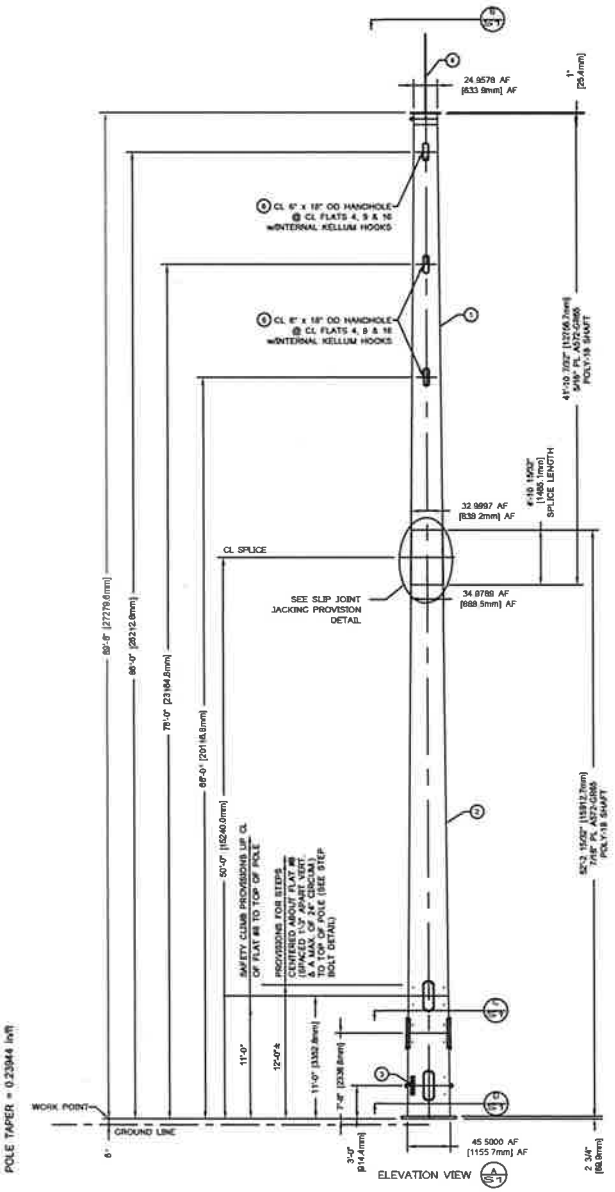
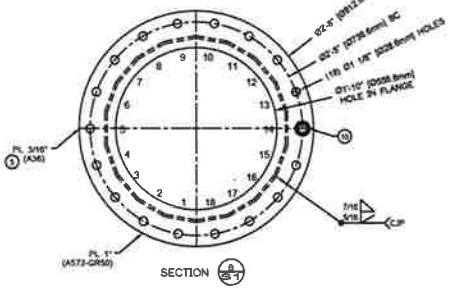
90' 3C MONOPOLE W/ 53' FALL ZONE
TARPON TOWERS II, LLC
BRIDGEPORT CT1221
FAIRFIELD COUNTY, CT

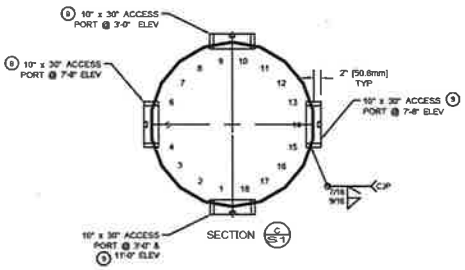
BILL OF MATERIALS & NOTES

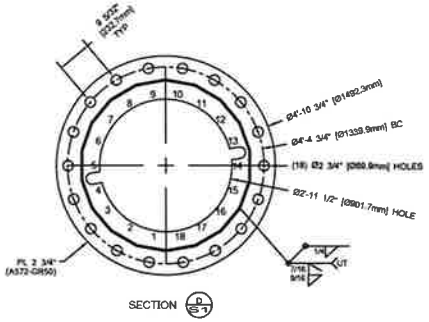
| DRAWN BY | CREATED | PROJECT NUMBER |
|---|---|---|
| TS | 5/8/18 | 18308 |

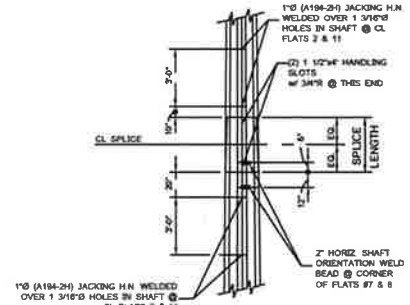
DRAWING NUMBER
18308-P01-T1



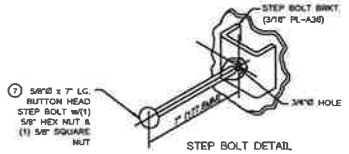



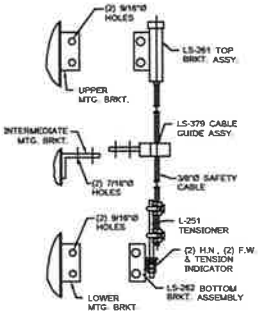




SLIP JOINT JACKING PROVISION DETAIL

NOTE: FOR REQUIRED TOLERANCES AT SLIP JOINTS AND REQD. JACKING FORCES SEE 'STRUCTURE ASSEMBLY AND ERECTION PROCEDURES'.




STEP BOLT DETAIL




6 SAFETY CLIMB ATTACHMENT DETAILS
(LOCATED ALONG CL OF FLAT #8)

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05-15-2018

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**FOR APPROVAL**



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90' 3C MONOPOLE W/ 53' FALL ZONE
TARPON TOWERS II, LLC
BRIDGEPORT CT1221
FAIRFIELD COUNTY, CT

ELEVATION VIEW & DETAILS

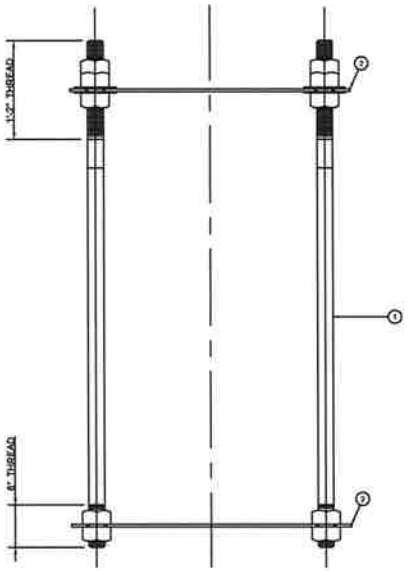
| DRAWN BY | CREATED | PROJECT NUMBER |
|---|---|---|
| TS | 5/8/18 | 18308 |

DRAWING NUMBER
18308-P01-S1

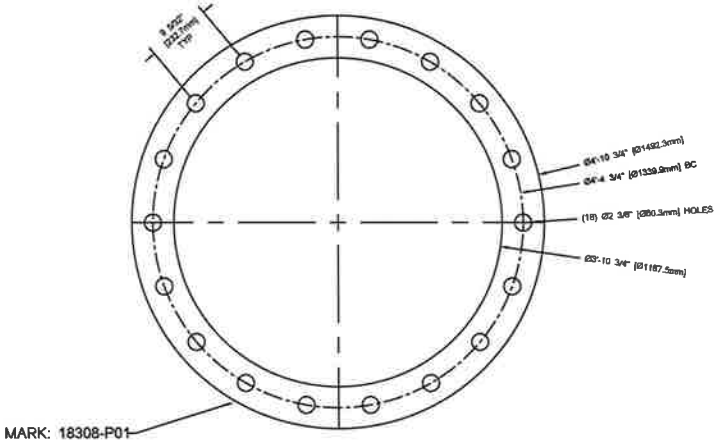
| BILL OF MATERIALS | | | | 18308-P01-TS | |
|---|---|---|---|---|---|
| Item | Part Number | Qty | Description | Weight Per | Wt Per Row |
| 1 | 2.25-A86.0-5DE | 18 | 2 1/4" x 6'-0" LG (A615-GR75) ANCHOR ROD w/ (5) HEX NUTS (A194-GR2H) & (2) FLAT WASHERS (F436) | 99.80 | 1796.40 |
| 2 | 18-52.75-2.25 | 2 | TOP & BOTTOM SETTING TEMPLATE | 97.06 | 194.12 |
| | | | UNCAGED ANCHOR RODS & TEMPLATE WEIGHT | | 1990.52 |

TOTAL OF (1) ASSEMBLY REQ'D PER STRUCTURE

PROJECTION OF 12" ABOVE CONCRETE, ENTIRE BOLT AND ALL NUTS & WASHERS GALVANIZED PER ASTM A153.




ANCHOR BOLT CAGE ASSEMBLY (A ABT)




TOP & BOTTTOM PLATE (MIN 3/8" THICK. A36) (B ABT) (2)

STAMP


05-15-2018


ENGINEERED ENDEAVORS
*The Experienced Point of View*
15175 Kinsman Road * Burton, OH 44062
Ph: (440) 970-5004
www.engend.com


**FOR APPROVAL**



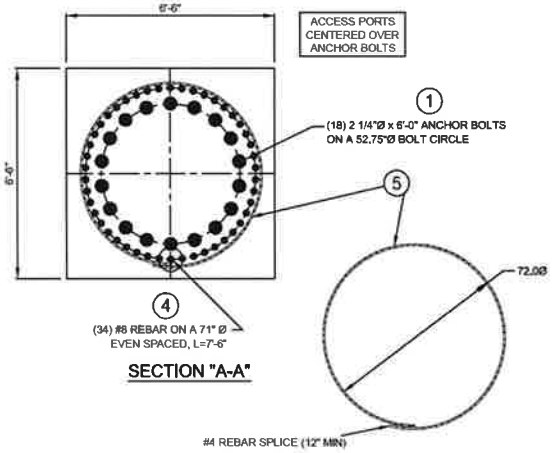
REVISION HISTORY

| REV. # | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 5/15/18 | TS | ISSUED FOR APPROVAL |

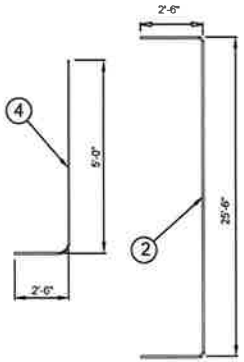
# 90' 3C MONOPOLE W/ 53' FALL ZONE
## TARPON TOWERS II, LLC
## BRIDGEPORT CT1221
## FAIRFIELD COUNTY, CT
## ANCHOR BOLTS & TEMPLATES

| DRAWN BY | CREATED | PROJECT NUMBER |
|---|---|---|
| TS | 5/8/18 | 18308 |

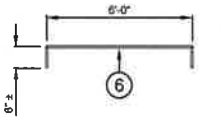
DRAWING NUMBER
18308-P01-ABT

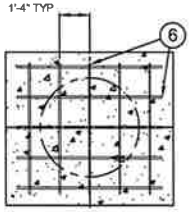



SECTION "A-A"




| FOUNDATION LOADING (w/OLF) | |
|---|---|
| MOMENT | 1867 kip-ft |
| SHEAR | 25.6 kips |
| AXIAL | 31.1 kips |



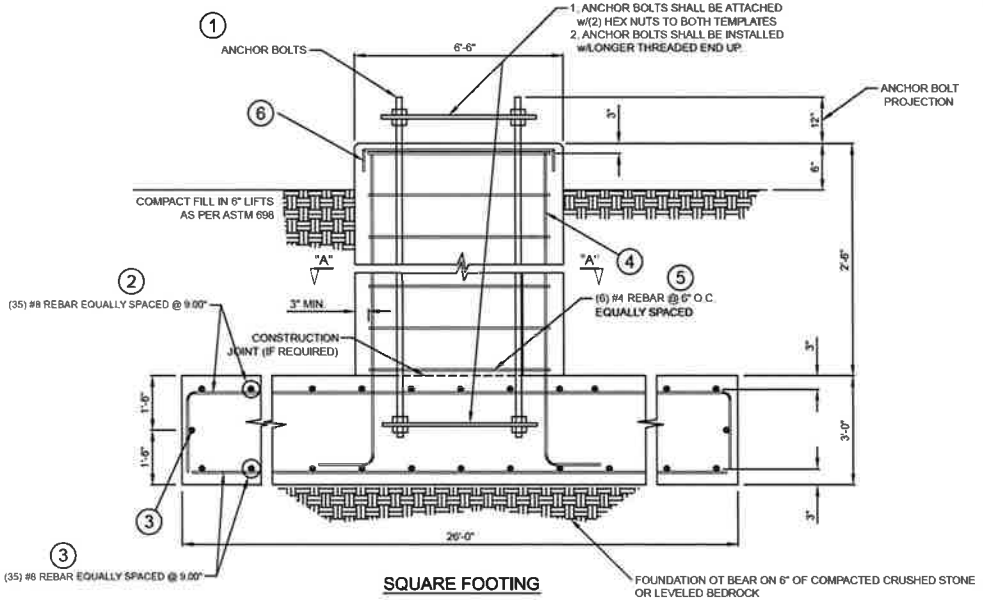




INSTALL 2" BELOW TOP OF CONCRETE

## MATERIAL LIST

| ITEM | QTY. | DESCRIPTION |
|---|---|---|
| 1 | 18 | 2 1/4"Ø x 6'-0" (A615-GR.75) ANCHOR BOLTS |
| 2 | 70 | #8 REBAR x 30'-6" (ASTM A615-GR.60) |
| 3 | 74 | #8 REBAR x 25'-6" (ASTM A615-GR.60) |
| 4 | 34 | #8 REBAR x 7'-6" (ASTM A615-GR.60) |
| 5 | 6 | #4 REBAR x 20'-6" (ASTM A615-GR.60) |
| 6 | 10 | #4 REBAR x 7'-0" (ASTM A615-GR.60) |
| | | |

| | |
|---|---|
| VOL. CONCRETE @ 4000 psi (TYPE II CEMENT) | 79.0 $yd^3$ |
| STEEL (ASTM A615-GR.60) | 11,700 lbs |




SQUARE FOOTING
(N.T.S.)

## GENERAL NOTES:

1. FOUNDATION DESIGN IS BASED ON THE FOLLOWING: EEI JOB# 18308-P01
SOIL REPORT BY WELTY GEOTECHNICAL, P.C., DATED 4/09/2018
2. FOUNDATION EMBEDMENT IS SHOWN FROM THE GROUND LEVEL AT THE TIME OF SOIL INVESTIGATION AS DEPICTED IN THE SOIL REPORT. SHOULD THE ACTUAL SOIL CONDITIONS DIFFER FROM THOSE IN THE REPORT, THE GEOTECHNICAL ENGINEER AND FOUNDATION DESIGNER SHOULD BE NOTIFIED IN ORDER TO RE-EVALUATE THE FOUNDATION DESIGN
3. SOIL REPORT SHOULD BE CONSULTED PRIOR TO CONSTRUCTION. CONCRETE REINFORCEMENT TO INCLUDE SEISMIC HOOKS.
4. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES.
5. SPECIAL INSPECTION IS REQUIRED IN ACCORDANCE WITH 2015 IBC AND CONN BUILDING CODE.
   5.1. SOIL.
      5.1.a. FOUNDATION EXCAVATION SHALL BE INSPECTED PRIOR TO INSTALLATION OF REINFORCEMENT.
      5.1.b. VERIFY DEPTH AND DIAMETER OF THE EXCAVATION.
      5.1.c. VERIFY ACTUAL SOIL CONDITIONS AGAINST THE GEOTECHNICAL REPORT.
   5.2. REINFORCING STEEL.
      5.2.a. VERIFY GRADE, LENGTH, DIAMETER, AND QUANTITY OF REBARS AND COMPLIANCE WITH THE DRAWINGS.
      5.2.b. VERIFY GRADE, LENGTH, DIAMETER, AND QUANTITY OF ANCHOR BOLTS AND BOLT PATTERN ON THE TEMPLATES.
   5.3. CONCRETE.
      5.3.a. VERIFY STRENGTH, SLUMP, AIR, TEMPERATURE OF CONCRETE, AND DESIGN MIX.
6. REINFORCING STEEL.
   6.1. REINFORCING STEEL SHALL CONFORM TO ASTM A615-07, Fy=60 ksi.
   6.2. ALL REINFORCEMENT SHALL BE ASSEMBLED USING STEEL WIRE. WELDING IS NOT PERMITTED.
   6.3. MINIMUM SPLICE LENGTH FOR LONGITUDINAL BARS: No. 6 BARS AND SMALLER - 44 x Øbar; No. 7 BARS AND LARGER 55 x Øbar.
   6.4. HORIZONTAL STIRRUPS SHALL BE STAGGERED ALONG THE REBAR CAGE WITH NO MORE THAN 50% OF SPLICES IN ONE PLACE.
7. CONCRETE.
   7.1. MIX DESIGN AND CONSTRUCTION PROCEDURE SHALL BE IN COMPLIANCE WITH ACI 318-05, ACI 336.3R-93, AND ALL APPLICABLE STATE AND LOCAL CODES.
   7.2. MINIMUM COMPRESSIVE STRENGTH - 4000 psi AT 28 DAYS, AND TYPE II CEMENT SHALL BE USED UNLESS STATED OTHERWISE.
   7.3. SLUMP: DRILLED PIER - 7" (±1"), MAT FOUNDATION - 3" (±1").
   7.4. CONCRETE SHALL BE DEPOSITED AS NEARLY AS PRACTICAL IN ITS FINAL POSITION TO AVOID SEGREGATION DUE TO REHANDLING OR FLOWING.
   7.5. CONCRETE SHALL BE THOROUGHLY CONSOLIDATED BY ALL SUITABLE MEANS DURING PLACEMENT AND SHALL BE THOROUGHLY WORKED AROUND REINFORCEMENT AND EMBEDDED FIXTURES AND INTO CORNERS OF FORMS.
8. ANCHOR BOLT INSTALLATION. ANCHOR BOLT ORIENTATION SHALL BE VERIFIED WITH THE SITE PLANS AND MONOPOLE DRAWING FOR PROPER ACCESS PORT ORIENTATION AND ANCHOR BOLT ALIGNMENT PRIOR TO CONCRETE PLACEMENT.


05-15-2018

ENGINEERED ENDEAVORS
The Experienced Point of View
15175 Kinsman Road * Burton, OH 44062
Ph. (440)970-5004, * www.engend.com

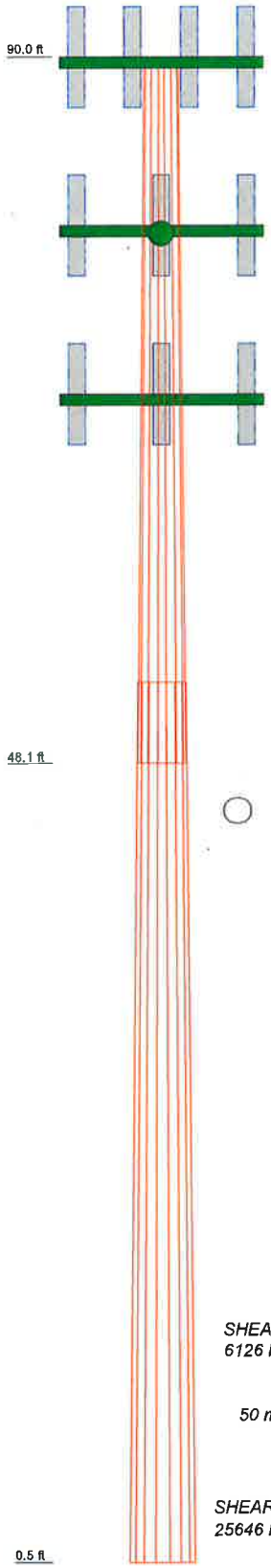
| REV | DESCRIPTION | DATE | DWN | CHK |
|---|---|---|---|---|
| 2 | REVISED MONOPOLE HEIGHT TO 90 ft. FOR CONSTRUCTION | 5/14/2018 | BF | |
| 1 | REVISED FOR CONSTRUCTION | 5/8/2018 | BF | |
| 0 | FOR CONSTRUCTION | 5/1/2018 | BF | |

Tarpon Towers
90-ft Monopole
CT 1221 / Bridgeport
Bridgeport, CT

| | | |
|---|---|---|
| SCALE: N.T.S. | PROJECT NO. | 18308 |
| SHEET 1 of 1 | DRAWING NO. | 18308S-120.0 |

| Section | 1 | 2 |
|---|---|---|
| Length (ft) | 41.94 | 52.44 |
| Number of Sides | 18 | 18 |
| Thickness (in) | 0.3125 | 0.4375 |
| Socket Length (ft) | 4.87 | |
| Top Dia (in) | 24.9600 | 33.1737 |
| Bot Dia (in) | 34.9600 | 45.5000 |
| Grade | A572-65 | |
| Weight (lb) | 4196.2 | 9637.9 |

Total Weight: 13834.1




## DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|---|---|---|---|
| (6) LNX-6514DS-T6M | 90 | (3) RRUS 11 B12 | 80 |
| (6) HBXX-6517DS-VTM/A2M | 90 | (3) RRUS-12 | 80 |
| (6) RRH 2x60 1900-4R | 90 | EE 12 LOW PROFILE PLATFORM | 80 |
| (6) RRH 2x40 -07L (700 MHz) | 90 | (2) MW DISH 1.5' | 79.5 |
| DISTRIB. BOX DB-B1-6C | 90 | (3) NNVV-65B-R4 | 70 |
| EE 12 LOW PROFILE PLATFORM | 90 | (6) 800 MHz RRH | 70 |
| (3) AIR 3246 B66 | 80 | (3) 1900 Mhz RRH | 70 |
| (3) APXVAA24-43-U-A20 | 80 | EE 12 LOW PROFILE PLATFORM | 70 |
| (3) APX16DWV-16DWV | 80 | (3) Nokia AAHC | 70 |
| (3) RRUS-32 B66 | 80 | | |

## MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---|---|---|---|---|---|
| A572-65 | 65000 psi | 80000 psi | | | |

## TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 100 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. Design wind speed per CT Building Code for the City of Bridgeport is 100 mph
9. Max Fall Zone radius - 53 ft
10. TOWER RATING: 44.4%

*ALL REACTIONS ARE FACTORED*

*AXIAL 55173 lb*

*SHEAR 6126 lb* — *MOMENT 511 kip-ft*

*TORQUE 11 kip-ft*
*50 mph WIND - 0.7500 in ICE*

*AXIAL 31054 lb*

*SHEAR 25646 lb* — *MOMENT 1867 kip-ft*

*TORQUE 51 kip-ft*
*REACTIONS - 100 mph WIND*

STATE OF CONNECTICUT
BORIS FAYMAN
No. 29864
LICENSED
PROFESSIONAL ENGINEER

05-15-2018


**Engineered Endeavors**
15175 Kinsman Road
Burton, OH
Consulting Engineers
Phone: 440.970.5004
FAX: www.engend.com


| | | |
|---|---|---|
| Job: 18308-P01 | | |
| Project: 90-ft Monopole. CT1221. Bridgeport. | | |
| Client: Tarpon Towers | Drawn by: bfayman | App'd: |
| Code: TIA-222-G | Date: 05/14/18 | Scale: NTS |
| Path: | | Dwg No. E-1 |

| tnxTower | Job | Page |
|---|---|---|
| Engineered Endeavors<br>15175 Kinsman Road<br>Burton, OH<br>Phone: 440.970.5004<br>FAX: www.engend.com | 18308-P01 | 1 of 13 |
| | Project<br>90-ft Monopole. CT1221. Bridgeport. | Date<br>16:39:34 05/14/18 |
| | Client<br>Tarpon Towers | Designed by<br>bfayman |

## Tower Input Data

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

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 100 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56.00 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Design wind speed per CT Building Code for the City of Bridgeport is 100 mph.
Max Fall Zone radius - 53 ft.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

| | | | | | |
|---|---|---|---|---|---|
| | Consider Moments - Legs | | Distribute Leg Loads As Uniform | | Use ASCE 10 X-Brace Ly Rules |
| | Consider Moments - Horizontals | | Assume Legs Pinned | | Calculate Redundant Bracing Forces |
| | Consider Moments - Diagonals | √ | Assume Rigid Index Plate | | Ignore Redundant Members in FEA |
| | Use Moment Magnification | √ | Use Clear Spans For Wind Area | | SR Leg Bolts Resist Compression |
| √ | Use Code Stress Ratios | | Use Clear Spans For KL/r | | All Leg Panels Have Same Allowable |
| √ | Use Code Safety Factors - Guys | | Retension Guys To Initial Tension | | Offset Girt At Foundation |
| | Escalate Ice | √ | Bypass Mast Stability Checks | √ | Consider Feed Line Torque |
| | Always Use Max Kz | √ | Use Azimuth Dish Coefficients | | Include Angle Block Shear Check |
| | Use Special Wind Profile | √ | Project Wind Area of Appurt. | | Use TIA-222-G Bracing Resist. Exemption |
| | Include Bolts In Member Capacity | | Autocalc Torque Arm Areas | | Use TIA-222-G Tension Splice Exemption |
| | Leg Bolts Are At Top Of Section | | Add IBC .6D+W Combination | | Poles |
| | Secondary Horizontal Braces Leg | | Sort Capacity Reports By Component | | Include Shear-Torsion Interaction |
| | Use Diamond Inner Bracing (4 Sided) | | Triangulate Diamond Inner Bracing | | Always Use Sub-Critical Flow |
| | SR Members Have Cut Ends | | Treat Feed Line Bundles As Cylinder | | Use Top Mounted Sockets |
| | SR Members Are Concentric | | | | |

## Tapered Pole Section Geometry

| Section | Elevation ft | Section Length ft | Splice Length ft | Number of Sides | Top Diameter in | Bottom Diameter in | Wall Thickness in | Bend Radius in | Pole Grade |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 90.00-48.07 | 41.94 | 4.87 | 18 | 24.9600 | 34.9600 | 0.3125 | 1.2500 | A572-65 (65000 psi) |
| L2 | 48.07-0.50 | 52.44 | | 18 | 33.1737 | 45.5000 | 0.4375 | 1.7500 | A572-65 (65000 psi) |

## Tapered Pole Properties

| Section | Tip Dia. in | Area $in^2$ | I $in^4$ | r in | C in | I/C $in^3$ | J $in^4$ | It/Q $in^2$ | w in | w/t |
|---|---|---|---|---|---|---|---|---|---|---|
| L1 | 25.3450 | 24.4472 | 1876.3464 | 8.7499 | 12.6797 | 147.9806 | 3755.1618 | 12.2259 | 3.8430 | 12.297 |
| | 35.4993 | 34.3660 | 5212.0684 | 12.2999 | 17.7597 | 293.4776 | 10430.9949 | 17.1863 | 5.6030 | 17.929 |
| L2 | 34.8479 | 45.4583 | 6154.6929 | 11.6213 | 16.8522 | 365.2154 | 12317.4843 | 22.7335 | 5.0686 | 11.585 |
| | 46.2019 | 62.5749 | 16053.4462 | 15.9972 | 23.1140 | 694.5335 | 32128.0159 | 31.2934 | 7.2380 | 16.544 |

| Tower Elevation ft | Gusset Area (per face) $ft^2$ | Gusset Thickness in | Gusset Grade | Adjust. Factor $A_f$ | Adjust. Factor $A_r$ | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals in | Double Angle Stitch Bolt Spacing Horizontals in | Double Angle Stitch Bolt Spacing Redundants in |
|---|---|---|---|---|---|---|---|---|---|
| L1<br>90.00-48.07 | | | | 1 | 1 | 1 | | | |
| L2<br>48.07-0.50 | | | | 1 | 1 | 1 | | | |

## Feed Line/Linear Appurtenances - Entered As Area

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Total Number | | $C_AA_A$ $ft^2/ft$ | Weight plf |
|---|---|---|---|---|---|---|---|---|
| AVA7-50 (1-5/8 LOW DENSI. FOAM) | C | No | Inside Pole | 119.50 - 3.50 | 12 | No Ice | 0.00 | 0.72 |
| | | | | | | 1/2" Ice | 0.00 | 0.72 |
| | | | | | | 1" Ice | 0.00 | 0.72 |
| AVA7-50 (1-5/8 LOW DENSI. FOAM) | C | No | Inside Pole | 109.50 - 3.50 | 12 | No Ice | 0.00 | 0.72 |
| | | | | | | 1/2" Ice | 0.00 | 0.72 |
| | | | | | | 1" Ice | 0.00 | 0.72 |
| AVA7-50 (1-5/8 LOW DENSI. FOAM) | C | No | Inside Pole | 89.50 - 3.50 | 12 | No Ice | 0.00 | 0.72 |
| | | | | | | 1/2" Ice | 0.00 | 0.72 |
| | | | | | | 1" Ice | 0.00 | 0.72 |
| AVA7-50 (1-5/8 LOW DENSI. FOAM) | C | No | Inside Pole | 79.50 - 3.50 | 12 | No Ice | 0.00 | 0.72 |
| | | | | | | 1/2" Ice | 0.00 | 0.72 |
| | | | | | | 1" Ice | 0.00 | 0.72 |
| AVA7-50 (1-5/8 LOW DENSI. FOAM) | C | No | Inside Pole | 69.50 - 3.50 | 12 | No Ice | 0.00 | 0.72 |
| | | | | | | 1/2" Ice | 0.00 | 0.72 |
| | | | | | | 1" Ice | 0.00 | 0.72 |

## Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | $A_R$ ft² | $A_F$ ft² | $C_AA_A$ In Face ft² | $C_AA_A$ Out Face ft² | Weight lb |
|---|---|---|---|---|---|---|---|
| L1 | 90.00-48.07 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 1539.43 |
| L2 | 48.07-0.50 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 1925.21 |

## Feed Line/Linear Appurtenances Section Areas - With Ice

| Tower Section | Tower Elevation ft | Face or Leg | Ice Thickness in | $A_R$ ft² | $A_F$ ft² | $C_AA_A$ In Face ft² | $C_AA_A$ Out Face ft² | Weight lb |
|---|---|---|---|---|---|---|---|---|
| L1 | 90.00-48.07 | A | 1.613 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 1539.43 |
| L2 | 48.07-0.50 | A | 1.455 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 1925.21 |

## Feed Line Center of Pressure

| Section | Elevation ft | $CP_X$ in | $CP_Z$ in | $CP_X$ Ice in | $CP_Z$ Ice in |
|---|---|---|---|---|---|
| L1 | 90.00-48.07 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L2 | 48.07-0.50 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

## Shielding Factor Ka

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | $K_a$ No Ice | $K_a$ Ice |
|---|---|---|---|---|---|

## Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft | Vert ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front ft² | $C_AA_A$ Side ft² | Weight lb |
|---|---|---|---|---|---|---|---|---|---|---|
| (6) LNX-6514DS-T6M | A | From Leg | 4.00 | | 0.00 | 90.00 | No | 8.17 | 5.41 | 100.00 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft / ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0.00 | | | Ice | 8.62 | 5.85 | 150.51 |
| | | | 0.00 | | | 1/2" Ice | 9.07 | 6.30 | 207.15 |
| | | | | | | 1" Ice | | | |
| (6) HBXX-6517DS-VTM/A2M | A | From Leg | 4.00 | 0.00 | 90.00 | No | 11.88 | 10.86 | 129.20 |
| | | | 0.00 | | | Ice | 12.52 | 12.17 | 230.66 |
| | | | 0.00 | | | 1/2" Ice | 13.14 | 13.30 | 341.36 |
| | | | | | | 1" Ice | | | |
| (6) RRH 2x60 1900-4R | A | From Leg | 4.00 | 0.00 | 90.00 | No | 1.88 | 1.31 | 56.00 |
| | | | 0.00 | | | Ice | 2.05 | 1.47 | 72.51 |
| | | | 0.00 | | | 1/2" Ice | 2.24 | 1.63 | 91.74 |
| | | | | | | 1" Ice | | | |
| (6) RRH 2x40 -07L (700 MHz) | A | From Leg | 4.00 | 0.00 | 90.00 | No | 2.13 | 1.89 | 51.00 |
| | | | 0.00 | | | Ice | 2.32 | 2.07 | 72.38 |
| | | | 0.00 | | | 1/2" Ice | 2.52 | 2.26 | 96.81 |
| | | | | | | 1" Ice | | | |
| DISTRIB. BOX DB-B1-6C | C | None | | 0.00 | 90.00 | No | 4.80 | 4.80 | 100.00 |
| | | | | | | Ice | 5.07 | 5.07 | 158.37 |
| | | | | | | 1/2" Ice | 5.35 | 5.35 | 221.59 |
| | | | | | | 1" Ice | | | |
| EE 12 LOW PROFILE PLATFORM | C | None | | 0.00 | 90.00 | No | 22.00 | 22.00 | 1100.00 |
| | | | | | | Ice | 28.00 | 28.00 | 2245.00 |
| | | | | | | 1/2" Ice | 34.00 | 34.00 | 2895.00 |
| | | | | | | 1" Ice | | | |
| ********** | | | | | | | | | |
| (3) AIR 3246 B66 | A | From Leg | 4.00 | 0.00 | 80.00 | No | 8.06 | 5.42 | 100.00 |
| | | | 0.00 | | | Ice | 8.44 | 5.78 | 156.81 |
| | | | 0.00 | | | 1/2" Ice | 8.84 | 6.15 | 219.26 |
| | | | | | | 1" Ice | | | |
| (3) APXVAA24-43-U-A20 | A | From Leg | 4.00 | 0.00 | 80.00 | No | 20.27 | 8.74 | 150.00 |
| | | | 0.00 | | | Ice | 20.89 | 9.33 | 261.92 |
| | | | 0.00 | | | 1/2" Ice | 21.53 | 9.92 | 382.36 |
| | | | | | | 1" Ice | | | |
| (3) APX16DWV-16DWV | A | From Leg | 4.00 | 0.00 | 80.00 | No | 7.00 | 8.00 | 121.90 |
| | | | 0.00 | | | Ice | 7.48 | 8.86 | 194.84 |
| | | | 0.00 | | | 1/2" Ice | 7.93 | 9.58 | 275.02 |
| | | | | | | 1" Ice | | | |
| (3) RRUS-32 B66 | A | From Leg | 4.00 | 0.00 | 80.00 | No | 3.67 | 2.22 | 60.00 |
| | | | 0.00 | | | Ice | 3.92 | 2.45 | 86.23 |
| | | | 0.00 | | | 1/2" | 4.18 | 2.68 | 116.19 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft / ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| (3) RRUS 11 B12 | A | From Leg | 4.00 | 0.00 | 80.00 | No | 2.79 | 1.19 | 55.00 |
| | | | 0.00 | | | Ice | 3.00 | 1.34 | 75.87 |
| | | | 0.00 | | | 1/2" | 3.21 | 1.50 | 99.78 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| (3) RRUS-12 | A | From Leg | 4.00 | 0.00 | 80.00 | No | 2.39 | 1.16 | 60.00 |
| | | | 0.00 | | | Ice | 2.58 | 1.30 | 78.93 |
| | | | 0.00 | | | 1/2" | 2.78 | 1.46 | 100.75 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| EE 12 LOW PROFILE PLATFORM | A | None | | 0.00 | 80.00 | No | 22.00 | 22.00 | 1100.00 |
| | | | | | | Ice | 28.00 | 28.00 | 2245.00 |
| | | | | | | 1/2" | 34.00 | 34.00 | 2895.00 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| ********** | | | | | | | | | |
| (3) Nokia AAHC | A | From Leg | 4.00 | 0.00 | 70.00 | No | 4.95 | 3.42 | 121.90 |
| | | | 0.00 | | | Ice | 5.52 | 4.11 | 169.38 |
| | | | 0.00 | | | 1/2" | 6.02 | 4.66 | 222.24 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| (3) NNVV-65B-R4 | A | From Leg | 4.00 | 0.00 | 70.00 | No | 12.49 | 5.87 | 100.00 |
| | | | 0.00 | | | Ice | 12.97 | 6.31 | 173.79 |
| | | | 0.00 | | | 1/2" | 13.46 | 6.77 | 254.26 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| (6) 800 MHz RRH | A | From Leg | 4.00 | 0.00 | 70.00 | No | 1.69 | 1.28 | 100.00 |
| | | | 0.00 | | | Ice | 1.85 | 1.43 | 116.92 |
| | | | 0.00 | | | 1/2" | 2.02 | 1.58 | 136.53 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| (3) 1900 Mhz RRH | A | From Leg | 4.00 | 0.00 | 70.00 | No | 1.00 | 2.20 | 52.00 |
| | | | 0.00 | | | Ice | 1.13 | 2.39 | 73.03 |
| | | | 0.00 | | | 1/2" | 1.26 | 2.59 | 97.11 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| EE 12 LOW PROFILE PLATFORM | A | None | | 0.00 | 70.00 | No | 22.00 | 22.00 | 1100.00 |
| | | | | | | Ice | 28.00 | 28.00 | 2245.00 |
| | | | | | | 1/2" | 34.00 | 34.00 | 2895.00 |
| | | | | | | Ice | | | |
| | | | | | | 1" | | | |
| | | | | | | Ice | | | |
| ********** | | | | | | | | | |
| ********** | | | | | | | | | |
| ********** | | | | | | | | | |

## Dishes

| Description | Face or Leg | Dish Type | Offset Type | Offsets: Horz Lateral ft | Azimuth Adjustment ° | 3 dB Beam Width ° | Elevation ft | Outside Diameter ft | | Aperture Area ft² | Weight lb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (2) MW DISH 1.5' | | Paraboloid w/Radome | None | | 0.00 | | 79.50 | 1.50 | No Ice<br>1/2" Ice<br>1" Ice | 1.77<br>1.97<br>2.17 | 50.00<br>60.11<br>70.23 |

## Load Combinations

| Comb. No. | Description |
|---|---|
| 1 | Dead Only |
| 2 | 1.2 Dead+1.6 Wind 0 deg - No Ice |
| 3 | 0.9 Dead+1.6 Wind 0 deg - No Ice |
| 4 | 1.2 Dead+1.6 Wind 30 deg - No Ice |
| 5 | 0.9 Dead+1.6 Wind 30 deg - No Ice |
| 6 | 1.2 Dead+1.6 Wind 60 deg - No Ice |
| 7 | 0.9 Dead+1.6 Wind 60 deg - No Ice |
| 8 | 1.2 Dead+1.6 Wind 90 deg - No Ice |
| 9 | 0.9 Dead+1.6 Wind 90 deg - No Ice |
| 10 | 1.2 Dead+1.6 Wind 120 deg - No Ice |
| 11 | 0.9 Dead+1.6 Wind 120 deg - No Ice |
| 12 | 1.2 Dead+1.6 Wind 150 deg - No Ice |
| 13 | 0.9 Dead+1.6 Wind 150 deg - No Ice |
| 14 | 1.2 Dead+1.6 Wind 180 deg - No Ice |
| 15 | 0.9 Dead+1.6 Wind 180 deg - No Ice |
| 16 | 1.2 Dead+1.6 Wind 210 deg - No Ice |
| 17 | 0.9 Dead+1.6 Wind 210 deg - No Ice |
| 18 | 1.2 Dead+1.6 Wind 240 deg - No Ice |
| 19 | 0.9 Dead+1.6 Wind 240 deg - No Ice |
| 20 | 1.2 Dead+1.6 Wind 270 deg - No Ice |
| 21 | 0.9 Dead+1.6 Wind 270 deg - No Ice |
| 22 | 1.2 Dead+1.6 Wind 300 deg - No Ice |
| 23 | 0.9 Dead+1.6 Wind 300 deg - No Ice |
| 24 | 1.2 Dead+1.6 Wind 330 deg - No Ice |
| 25 | 0.9 Dead+1.6 Wind 330 deg - No Ice |
| 26 | 1.2 Dead+1.0 Ice+1.0 Temp |
| 27 | 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp |
| 28 | 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp |
| 29 | 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp |
| 30 | 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp |
| 31 | 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp |
| 32 | 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp |
| 33 | 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp |
| 34 | 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp |
| 35 | 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp |
| 36 | 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp |
| 37 | 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp |

| Comb. No. | Description |
|---|---|
| 38 | 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp |
| 39 | Dead+Wind 0 deg - Service |
| 40 | Dead+Wind 30 deg - Service |
| 41 | Dead+Wind 60 deg - Service |
| 42 | Dead+Wind 90 deg - Service |
| 43 | Dead+Wind 120 deg - Service |
| 44 | Dead+Wind 150 deg - Service |
| 45 | Dead+Wind 180 deg - Service |
| 46 | Dead+Wind 210 deg - Service |
| 47 | Dead+Wind 240 deg - Service |
| 48 | Dead+Wind 270 deg - Service |
| 49 | Dead+Wind 300 deg - Service |
| 50 | Dead+Wind 330 deg - Service |

## Maximum Member Forces

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial lb | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|---|---|---|---|---|---|---|---|
| L1 | 90 - 48.065 | Pole | Max Tension | 26 | 0.00 | 0.00 | -0.00 |
| | | | Max. Compression | 26 | -36210.50 | 0.00 | 84.59 |
| | | | Max. Mx | 8 | -15900.62 | -473.18 | 31.37 |
| | | | Max. My | 2 | -15663.25 | 0.00 | 625.30 |
| | | | Max. Vy | 8 | 17156.23 | -473.18 | 31.37 |
| | | | Max. Vx | 2 | -21524.01 | 0.00 | 625.30 |
| | | | Max. Torque | 8 | | | 51.33 |
| L2 | 48.065 - 0.5 | Pole | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 26 | -55172.90 | 0.00 | 86.71 |
| | | | Max. Mx | 8 | -31041.65 | -1487.33 | 32.12 |
| | | | Max. My | 2 | -31035.37 | 0.00 | 1866.70 |
| | | | Max. Vy | 8 | 21397.00 | -1487.33 | 32.12 |
| | | | Max. Vx | 2 | -25668.60 | 0.00 | 1866.70 |
| | | | Max. Torque | 8 | | | 51.31 |

## Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical lb | Horizontal, X lb | Horizontal, Z lb |
|---|---|---|---|---|---|
| Pole | Max. Vert | 27 | 55172.90 | 0.00 | 6126.25 |
| | Max. $H_x$ | 21 | 23290.54 | 21378.99 | 0.00 |
| | Max. $H_z$ | 2 | 31054.06 | 0.00 | 25645.98 |
| | Max. $M_x$ | 2 | 1866.70 | 0.00 | 25645.98 |
| | Max. $M_z$ | 8 | 1487.33 | -21378.99 | 0.00 |
| | Max. Torsion | 8 | 51.29 | -21378.99 | 0.00 |
| | Min. Vert | 9 | 23290.54 | -21378.99 | 0.00 |
| | Min. $H_x$ | 8 | 31054.06 | -21378.99 | 0.00 |
| | Min. $H_z$ | 14 | 31054.06 | 0.00 | -25645.98 |
| | Min. $M_x$ | 15 | -1802.94 | 0.00 | -25645.98 |
| | Min. $M_z$ | 20 | -1487.33 | 21378.99 | 0.00 |
| | Min. Torsion | 20 | -51.29 | 21378.99 | 0.00 |

| tnxTower | Job | Page |
|---|---|---|
| Engineered Endeavors<br>15175 Kinsman Road<br>Burton, OH<br>Phone: 440.970.5004<br>FAX: www.engend.com | 18308-P01 | 8 of 13 |
| | Project<br>90-ft Monopole. CT1221. Bridgeport. | Date<br>16:39:34 05/14/18 |
| | Client<br>Tarpon Towers | Designed by<br>bfayman |

# Tower Mast Reaction Summary

| Load Combination | Vertical<br>lb | $Shear_x$<br>lb | $Shear_z$<br>lb | Overturning Moment, $M_x$<br>kip-ft | Overturning Moment, $M_z$<br>kip-ft | Torque<br>kip-ft |
|---|---|---|---|---|---|---|
| Dead Only | 25878.38 | 0.00 | -0.00 | -26.68 | 0.00 | 0.00 |
| 1.2 Dead+1.6 Wind 0 deg - No Ice | 31054.06 | 0.00 | -25645.98 | -1866.70 | 0.00 | 0.00 |
| 0.9 Dead+1.6 Wind 0 deg - No Ice | 23290.54 | 0.00 | -25645.98 | -1850.79 | 0.00 | 0.00 |
| 1.2 Dead+1.6 Wind 30 deg - No Ice | 31054.06 | 10689.49 | -22210.07 | -1620.95 | -743.63 | -25.62 |
| 0.9 Dead+1.6 Wind 30 deg - No Ice | 23290.54 | 10689.49 | -22210.07 | -1606.07 | -740.52 | -25.56 |
| 1.2 Dead+1.6 Wind 60 deg - No Ice | 31054.06 | 18514.74 | -12822.99 | -949.47 | -1288.05 | -44.40 |
| 0.9 Dead+1.6 Wind 60 deg - No Ice | 23290.54 | 18514.74 | -12822.99 | -937.42 | -1282.67 | -44.30 |
| 1.2 Dead+1.6 Wind 90 deg - No Ice | 31054.06 | 21378.99 | -0.00 | -32.11 | -1487.33 | -51.29 |
| 0.9 Dead+1.6 Wind 90 deg - No Ice | 23290.54 | 21378.99 | -0.00 | -23.91 | -1481.13 | -51.17 |
| 1.2 Dead+1.6 Wind 120 deg - No Ice | 31054.06 | 18514.74 | 12822.99 | 885.25 | -1288.01 | -44.41 |
| 0.9 Dead+1.6 Wind 120 deg - No Ice | 23290.54 | 18514.74 | 12822.99 | 889.59 | -1282.64 | -44.31 |
| 1.2 Dead+1.6 Wind 150 deg - No Ice | 31054.06 | 10689.49 | 22210.07 | 1556.70 | -743.59 | -25.63 |
| 0.9 Dead+1.6 Wind 150 deg - No Ice | 23290.54 | 10689.49 | 22210.07 | 1558.24 | -740.49 | -25.57 |
| 1.2 Dead+1.6 Wind 180 deg - No Ice | 31054.06 | 0.00 | 25645.98 | 1802.44 | 0.00 | 0.00 |
| 0.9 Dead+1.6 Wind 180 deg - No Ice | 23290.54 | 0.00 | 25645.98 | 1802.94 | 0.00 | 0.00 |
| 1.2 Dead+1.6 Wind 210 deg - No Ice | 31054.06 | -10689.49 | 22210.07 | 1556.70 | 743.59 | 25.63 |
| 0.9 Dead+1.6 Wind 210 deg - No Ice | 23290.54 | -10689.49 | 22210.07 | 1558.24 | 740.49 | 25.57 |
| 1.2 Dead+1.6 Wind 240 deg - No Ice | 31054.06 | -18514.74 | 12822.99 | 885.25 | 1288.01 | 44.41 |
| 0.9 Dead+1.6 Wind 240 deg - No Ice | 23290.54 | -18514.74 | 12822.99 | 889.59 | 1282.64 | 44.31 |
| 1.2 Dead+1.6 Wind 270 deg - No Ice | 31054.06 | -21378.99 | -0.00 | -32.11 | 1487.33 | 51.29 |
| 0.9 Dead+1.6 Wind 270 deg - No Ice | 23290.54 | -21378.99 | -0.00 | -23.91 | 1481.13 | 51.17 |
| 1.2 Dead+1.6 Wind 300 deg - No Ice | 31054.06 | -18514.74 | -12822.99 | -949.47 | 1288.05 | 44.40 |
| 0.9 Dead+1.6 Wind 300 deg - No Ice | 23290.54 | -18514.74 | -12822.99 | -937.42 | 1282.67 | 44.30 |
| 1.2 Dead+1.6 Wind 330 deg - No Ice | 31054.06 | -10689.49 | -22210.07 | -1620.95 | 743.63 | 25.62 |
| 0.9 Dead+1.6 Wind 330 deg - No Ice | 23290.54 | -10689.49 | -22210.07 | -1606.07 | 740.52 | 25.56 |
| 1.2 Dead+1.0 Ice+1.0 Temp | 55172.90 | 0.00 | -0.01 | -86.71 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp | 55172.90 | 0.00 | -6126.25 | -510.96 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp | 55172.90 | 2767.18 | -5305.49 | -454.12 | -187.81 | -5.41 |
| 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp | 55172.90 | 4792.90 | -3063.13 | -298.83 | -325.30 | -9.37 |
| 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp | 55172.90 | 5534.37 | -0.01 | -86.70 | -375.62 | -10.82 |

| Load Combination | Vertical | $Shear_x$ | $Shear_z$ | Overturning Moment, $M_x$ | Overturning Moment, $M_z$ | Torque |
|---|---|---|---|---|---|---|
| | lb | lb | lb | kip-ft | kip-ft | kip-ft |
| 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp | 55172.90 | 4792.90 | 3063.11 | 125.42 | -325.29 | -9.37 |
| 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp | 55172.90 | 2767.18 | 5305.47 | 280.71 | -187.81 | -5.41 |
| 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp | 55172.90 | 0.00 | 6126.23 | 337.55 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp | 55172.90 | -2767.18 | 5305.47 | 280.71 | 187.81 | 5.41 |
| 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp | 55172.90 | -4792.90 | 3063.11 | 125.42 | 325.29 | 9.37 |
| 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp | 55172.90 | -5534.37 | -0.01 | -86.70 | 375.62 | 10.82 |
| 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp | 55172.90 | -4792.90 | -3063.13 | -298.83 | 325.30 | 9.37 |
| 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp | 55172.90 | -2767.18 | -5305.49 | -454.12 | 187.81 | 5.41 |
| Dead+Wind 0 deg - Service | 25878.38 | 0.00 | -5162.94 | -395.08 | 0.00 | 0.00 |
| Dead+Wind 30 deg - Service | 25878.38 | 2151.96 | -4471.24 | -345.73 | -149.32 | -5.16 |
| Dead+Wind 60 deg - Service | 25878.38 | 3727.31 | -2581.47 | -210.88 | -258.63 | -8.94 |
| Dead+Wind 90 deg - Service | 25878.38 | 4303.93 | -0.00 | -26.68 | -298.64 | -10.32 |
| Dead+Wind 120 deg - Service | 25878.38 | 3727.31 | 2581.47 | 157.52 | -258.63 | -8.94 |
| Dead+Wind 150 deg - Service | 25878.38 | 2151.96 | 4471.24 | 292.36 | -149.32 | -5.16 |
| Dead+Wind 180 deg - Service | 25878.38 | 0.00 | 5162.94 | 341.71 | 0.00 | 0.00 |
| Dead+Wind 210 deg - Service | 25878.38 | -2151.96 | 4471.24 | 292.36 | 149.32 | 5.16 |
| Dead+Wind 240 deg - Service | 25878.38 | -3727.31 | 2581.47 | 157.52 | 258.63 | 8.94 |
| Dead+Wind 270 deg - Service | 25878.38 | -4303.93 | -0.00 | -26.68 | 298.64 | 10.32 |
| Dead+Wind 300 deg - Service | 25878.38 | -3727.31 | -2581.47 | -210.88 | 258.63 | 8.94 |
| Dead+Wind 330 deg - Service | 25878.38 | -2151.96 | -4471.24 | -345.73 | 149.32 | 5.16 |

# Solution Summary

| Load Comb. | Sum of Applied Forces PX lb | PY lb | PZ lb | Sum of Reactions PX lb | PY lb | PZ lb | % Error |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | -25878.38 | 0.00 | 0.00 | 25878.38 | 0.00 | 0.000% |
| 2 | 0.00 | -31054.06 | -25645.98 | 0.00 | 31054.06 | 25645.98 | 0.000% |
| 3 | 0.00 | -23290.54 | -25645.98 | 0.00 | 23290.54 | 25645.98 | 0.000% |
| 4 | 10689.49 | -31054.06 | -22210.07 | -10689.49 | 31054.06 | 22210.07 | 0.000% |
| 5 | 10689.49 | -23290.54 | -22210.07 | -10689.49 | 23290.54 | 22210.07 | 0.000% |
| 6 | 18514.74 | -31054.06 | -12822.99 | -18514.74 | 31054.06 | 12822.99 | 0.000% |
| 7 | 18514.74 | -23290.54 | -12822.99 | -18514.74 | 23290.54 | 12822.99 | 0.000% |
| 8 | 21378.99 | -31054.06 | 0.00 | -21378.99 | 31054.06 | 0.00 | 0.000% |
| 9 | 21378.99 | -23290.54 | 0.00 | -21378.99 | 23290.54 | 0.00 | 0.000% |
| 10 | 18514.74 | -31054.06 | 12822.99 | -18514.74 | 31054.06 | -12822.99 | 0.000% |
| 11 | 18514.74 | -23290.54 | 12822.99 | -18514.74 | 23290.54 | -12822.99 | 0.000% |
| 12 | 10689.49 | -31054.06 | 22210.07 | -10689.49 | 31054.06 | -22210.07 | 0.000% |
| 13 | 10689.49 | -23290.54 | 22210.07 | -10689.49 | 23290.54 | -22210.07 | 0.000% |
| 14 | 0.00 | -31054.06 | 25645.98 | 0.00 | 31054.06 | -25645.98 | 0.000% |
| 15 | 0.00 | -23290.54 | 25645.98 | 0.00 | 23290.54 | -25645.98 | 0.000% |
| 16 | -10689.49 | -31054.06 | 22210.07 | 10689.49 | 31054.06 | -22210.07 | 0.000% |

| Load Comb. | Sum of Applied Forces PX lb | PY lb | PZ lb | Sum of Reactions PX lb | PY lb | PZ lb | % Error |
|---|---|---|---|---|---|---|---|
| 17 | -10689.49 | -23290.54 | 22210.07 | 10689.49 | 23290.54 | -22210.07 | 0.000% |
| 18 | -18514.74 | -31054.06 | 12822.99 | 18514.74 | 31054.06 | -12822.99 | 0.000% |
| 19 | -18514.74 | -23290.54 | 12822.99 | 18514.74 | 23290.54 | -12822.99 | 0.000% |
| 20 | -21378.99 | -31054.06 | 0.00 | 21378.99 | 31054.06 | 0.00 | 0.000% |
| 21 | -21378.99 | -23290.54 | 0.00 | 21378.99 | 23290.54 | 0.00 | 0.000% |
| 22 | -18514.74 | -31054.06 | -12822.99 | 18514.74 | 31054.06 | 12822.99 | 0.000% |
| 23 | -18514.74 | -23290.54 | -12822.99 | 18514.74 | 23290.54 | 12822.99 | 0.000% |
| 24 | -10689.49 | -31054.06 | -22210.07 | 10689.49 | 31054.06 | 22210.07 | 0.000% |
| 25 | -10689.49 | -23290.54 | -22210.07 | 10689.49 | 23290.54 | 22210.07 | 0.000% |
| 26 | 0.00 | -55172.90 | 0.00 | 0.00 | 55172.90 | 0.01 | 0.000% |
| 27 | 0.00 | -55172.90 | -6126.21 | 0.00 | 55172.90 | 6126.25 | 0.000% |
| 28 | 2767.17 | -55172.90 | -5305.45 | -2767.18 | 55172.90 | 5305.49 | 0.000% |
| 29 | 4792.88 | -55172.90 | -3063.11 | -4792.90 | 55172.90 | 3063.13 | 0.000% |
| 30 | 5534.35 | -55172.90 | 0.00 | -5534.37 | 55172.90 | 0.01 | 0.000% |
| 31 | 4792.88 | -55172.90 | 3063.11 | -4792.90 | 55172.90 | -3063.11 | 0.000% |
| 32 | 2767.17 | -55172.90 | 5305.45 | -2767.18 | 55172.90 | -5305.47 | 0.000% |
| 33 | 0.00 | -55172.90 | 6126.21 | 0.00 | 55172.90 | -6126.23 | 0.000% |
| 34 | -2767.17 | -55172.90 | 5305.45 | 2767.18 | 55172.90 | -5305.47 | 0.000% |
| 35 | -4792.88 | -55172.90 | 3063.11 | 4792.90 | 55172.90 | -3063.11 | 0.000% |
| 36 | -5534.35 | -55172.90 | 0.00 | 5534.37 | 55172.90 | 0.01 | 0.000% |
| 37 | -4792.88 | -55172.90 | -3063.11 | 4792.90 | 55172.90 | 3063.13 | 0.000% |
| 38 | -2767.17 | -55172.90 | -5305.45 | 2767.18 | 55172.90 | 5305.49 | 0.000% |
| 39 | 0.00 | -25878.38 | -5162.94 | 0.00 | 25878.38 | 5162.94 | 0.000% |
| 40 | 2151.96 | -25878.38 | -4471.24 | -2151.96 | 25878.38 | 4471.24 | 0.000% |
| 41 | 3727.31 | -25878.38 | -2581.47 | -3727.31 | 25878.38 | 2581.47 | 0.000% |
| 42 | 4303.93 | -25878.38 | 0.00 | -4303.93 | 25878.38 | 0.00 | 0.000% |
| 43 | 3727.31 | -25878.38 | 2581.47 | -3727.31 | 25878.38 | -2581.47 | 0.000% |
| 44 | 2151.96 | -25878.38 | 4471.24 | -2151.96 | 25878.38 | -4471.24 | 0.000% |
| 45 | 0.00 | -25878.38 | 5162.94 | 0.00 | 25878.38 | -5162.94 | 0.000% |
| 46 | -2151.96 | -25878.38 | 4471.24 | 2151.96 | 25878.38 | -4471.24 | 0.000% |
| 47 | -3727.31 | -25878.38 | 2581.47 | 3727.31 | 25878.38 | -2581.47 | 0.000% |
| 48 | -4303.93 | -25878.38 | 0.00 | 4303.93 | 25878.38 | 0.00 | 0.000% |
| 49 | -3727.31 | -25878.38 | -2581.47 | 3727.31 | 25878.38 | 2581.47 | 0.000% |
| 50 | -2151.96 | -25878.38 | -4471.24 | 2151.96 | 25878.38 | 4471.24 | 0.000% |

## Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|---|---|---|---|---|
| 1 | Yes | 4 | 0.00000001 | 0.00000001 |
| 2 | Yes | 4 | 0.00000001 | 0.00000886 |
| 3 | Yes | 4 | 0.00000001 | 0.00000498 |
| 4 | Yes | 5 | 0.00000001 | 0.00002022 |
| 5 | Yes | 4 | 0.00000001 | 0.00064262 |
| 6 | Yes | 5 | 0.00000001 | 0.00004221 |
| 7 | Yes | 5 | 0.00000001 | 0.00002007 |
| 8 | Yes | 5 | 0.00000001 | 0.00004269 |
| 9 | Yes | 5 | 0.00000001 | 0.00002047 |
| 10 | Yes | 5 | 0.00000001 | 0.00003673 |
| 11 | Yes | 5 | 0.00000001 | 0.00001784 |
| 12 | Yes | 5 | 0.00000001 | 0.00002659 |
| 13 | Yes | 4 | 0.00000001 | 0.00084961 |
| 14 | Yes | 4 | 0.00000001 | 0.00000825 |
| 15 | Yes | 4 | 0.00000001 | 0.00000469 |
| 16 | Yes | 5 | 0.00000001 | 0.00002659 |
| 17 | Yes | 4 | 0.00000001 | 0.00084961 |

| | | | | |
|---|---|---|---|---|
| 18 | Yes | 5 | 0.00000001 | 0.00003673 |
| 19 | Yes | 5 | 0.00000001 | 0.00001784 |
| 20 | Yes | 5 | 0.00000001 | 0.00004269 |
| 21 | Yes | 5 | 0.00000001 | 0.00002047 |
| 22 | Yes | 5 | 0.00000001 | 0.00004221 |
| 23 | Yes | 5 | 0.00000001 | 0.00002007 |
| 24 | Yes | 5 | 0.00000001 | 0.00002022 |
| 25 | Yes | 4 | 0.00000001 | 0.00064262 |
| 26 | Yes | 4 | 0.00000001 | 0.00010602 |
| 27 | Yes | 4 | 0.00000001 | 0.00035853 |
| 28 | Yes | 4 | 0.00000001 | 0.00044183 |
| 29 | Yes | 4 | 0.00000001 | 0.00053758 |
| 30 | Yes | 4 | 0.00000001 | 0.00048813 |
| 31 | Yes | 4 | 0.00000001 | 0.00033687 |
| 32 | Yes | 4 | 0.00000001 | 0.00021014 |
| 33 | Yes | 4 | 0.00000001 | 0.00014929 |
| 34 | Yes | 4 | 0.00000001 | 0.00021014 |
| 35 | Yes | 4 | 0.00000001 | 0.00033687 |
| 36 | Yes | 4 | 0.00000001 | 0.00048813 |
| 37 | Yes | 4 | 0.00000001 | 0.00053758 |
| 38 | Yes | 4 | 0.00000001 | 0.00044183 |
| 39 | Yes | 4 | 0.00000001 | 0.00000001 |
| 40 | Yes | 4 | 0.00000001 | 0.00005987 |
| 41 | Yes | 4 | 0.00000001 | 0.00009625 |
| 42 | Yes | 4 | 0.00000001 | 0.00009647 |
| 43 | Yes | 4 | 0.00000001 | 0.00007814 |
| 44 | Yes | 4 | 0.00000001 | 0.00004930 |
| 45 | Yes | 4 | 0.00000001 | 0.00000001 |
| 46 | Yes | 4 | 0.00000001 | 0.00004930 |
| 47 | Yes | 4 | 0.00000001 | 0.00007814 |
| 48 | Yes | 4 | 0.00000001 | 0.00009647 |
| 49 | Yes | 4 | 0.00000001 | 0.00009625 |
| 50 | Yes | 4 | 0.00000001 | 0.00005987 |

## Maximum Tower Deflections - Service Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load Comb. | Tilt<br>° | Twist<br>° |
|---|---|---|---|---|---|
| L1 | 90 - 48.065 | 5.87 | 39 | 0.57 | 0.06 |
| L2 | 52.935 - 0.5 | 2.06 | 39 | 0.36 | 0.02 |

## Critical Deflections and Radius of Curvature - Service Wind

| Elevation<br>ft | Appurtenance | Gov. Load Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|---|---|---|---|---|---|---|
| 90.00 | (6) LNX-6514DS-T6M | 39 | 5.87 | 0.57 | 0.06 | 41873 |
| 80.00 | (3) AIR 3246 B66 | 39 | 4.72 | 0.52 | 0.04 | 20936 |
| 79.50 | (2) MW DISH 1.5' | 39 | 4.66 | 0.51 | 0.04 | 19939 |
| 70.00 | (3) Nokia AAHC | 39 | 3.63 | 0.46 | 0.03 | 10468 |

## Maximum Tower Deflections - Design Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load Comb. | Tilt<br>° | Twist<br>° |
|---|---|---|---|---|---|
| L1 | 90 - 48.065 | 26.41 | 2 | 2.45 | 0.28 |
| L2 | 52.935 - 0.5 | 9.57 | 2 | 1.65 | 0.09 |

## Critical Deflections and Radius of Curvature - Design Wind

| Elevation<br>ft | Appurtenance | Gov. Load Comb. | Deflection<br>in | Tilt<br>° | Twist<br>° | Radius of Curvature<br>ft |
|---|---|---|---|---|---|---|
| 90.00 | (6) LNX-6514DS-T6M | 2 | 26.41 | 2.45 | 0.28 | 9782 |
| 80.00 | (3) AIR 3246 B66 | 2 | 21.34 | 2.25 | 0.22 | 4891 |
| 79.50 | (2) MW DISH 1.5' | 2 | 21.09 | 2.24 | 0.22 | 4658 |
| 70.00 | (3) Nokia AAHC | 2 | 16.52 | 2.05 | 0.17 | 2444 |

## Compression Checks

## Pole Design Data

| Section No. | Elevation<br>ft | Size | L<br>ft | $L_u$<br>ft | Kl/r | A<br>$in^2$ | $P_u$<br>lb | $\phi P_n$<br>lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 90 - 48.065 (1) | TP34.96x24.96x0.3125 | 41.94 | 0.00 | 0.0 | 33.2141 | -15663.30 | 2423750.00 | 0.006 |
| L2 | 48.065 - 0.5 (2) | TP45.5x33.1737x0.4375 | 52.43 | 0.00 | 0.0 | 62.5749 | -31035.40 | 4614750.00 | 0.007 |

## Pole Bending Design Data

| Section No. | Elevation<br>ft | Size | $M_{ux}$<br>kip-ft | $\phi M_{nx}$<br>kip-ft | Ratio $\frac{M_{ux}}{\phi M_{nx}}$ | $M_{uy}$<br>kip-ft | $\phi M_{ny}$<br>kip-ft | Ratio $\frac{M_{uy}}{\phi M_{ny}}$ |
|---|---|---|---|---|---|---|---|---|
| L1 | 90 - 48.065 (1) | TP34.96x24.96x0.3125 | 625.30 | 1666.53 | 0.375 | 0.00 | 1666.53 | 0.000 |
| L2 | 48.065 - 0.5 (2) | TP45.5x33.1737x0.4375 | 1866.70 | 4268.35 | 0.437 | 0.00 | 4268.35 | 0.000 |

## Pole Shear Design Data

| Section No. | Elevation ft | Size | Actual $V_u$ lb | $\phi V_n$ lb | Ratio $\frac{V_u}{\phi V_n}$ | Actual $T_u$ kip-ft | $\phi T_n$ kip-ft | Ratio $\frac{T_u}{\phi T_n}$ |
|---|---|---|---|---|---|---|---|---|
| L1 | 90 - 48.065 (1) | TP34.96x24.96x0.3125 | 21524.00 | 1211870.00 | 0.018 | 0.00 | 3337.12 | 0.000 |
| L2 | 48.065 - 0.5 (2) | TP45.5x33.1737x0.4375 | 25668.60 | 2307380.00 | 0.011 | 0.00 | 8547.17 | 0.000 |

## Pole Interaction Design Data

| Section No. | Elevation ft | Ratio $\frac{P_u}{\phi P_n}$ | Ratio $\frac{M_{ux}}{\phi M_{ux}}$ | Ratio $\frac{M_{uy}}{\phi M_{uy}}$ | Ratio $\frac{V_u}{\phi V_n}$ | Ratio $\frac{T_u}{\phi T_n}$ | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 90 - 48.065 (1) | 0.006 | 0.375 | 0.000 | 0.018 | 0.000 | 0.382 ✔ | 1.000 | 4.8.2 ✔ |
| L2 | 48.065 - 0.5 (2) | 0.007 | 0.437 | 0.000 | 0.011 | 0.000 | 0.444 ✔ | 1.000 | 4.8.2 ✔ |

## Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P lb | $\phi P_{allow}$ lb | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| L1 | 90 - 48.065 | Pole | TP34.96x24.96x0.3125 | 1 | -15663.30 | 2423750.00 | 38.2 | Pass |
| L2 | 48.065 - 0.5 | Pole | TP45.5x33.1737x0.4375 | 2 | -31035.40 | 4614750.00 | 44.4 | Pass |
| | | | | | | | Summary | |
| | | | | | | Pole (L2) | 44.4 | Pass |
| | | | | | | **RATING =** | **44.4** | **Pass** |

# Anchor Rod and Base Plate Design

*Designed per:TIA-222-G*



| | |
|---|---|
| **EEI Job #:** | 18308-P01 |
| **Site Name:** | CT1221. Bridgeport |
| **Structure:** | 90-ft Monopole |

5/14/2018

| | |
|---|---|
| **Client:** | Tarpon Tower |
| **Site #:** | |
| **Location:** | Bridgeport, CT |

**Pole Properties at Base**

| | |
|---|---|
| Pole Diameter = | 45.5 in |
| Pole Thickness = | 0.4375 in |
| Yield Strength = | 65 ksi |
| Monopole Shape = | 18-Sided |

**Base Reactions**

| | |
|---|---|
| $M_u$ = | 1867 ft-kip |
| $V_u$ = | 25.6 kip |
| $P_u$ = | 31.1 kip |

**Anchor Rod Properties**

| | |
|---|---|
| Anchor Material = | A615GR75 |
| Anchor Diameter = | 2.25 in |
| Anchor Length = | 6 ft |
| No. of Anchors = | 18 |
| Weight = | 1607 lbs |

**Bolt Circle Diameter & Spacing**

| | |
|---|---|
| Minimum Bolt Circle Ø = | 52.70 in |
| Actual Bolt Circle Ø = | 52.75 in |
| Spacing = | 9.21 in |

**Anchor Rod Inter. Eq. 1 (4.9.9)**

| | |
|---|---|
| $P_{ub}$ = | 96 kip |
| $V_{ub}$ = | 1.42 kip |
| η = | 0.5 |
| $\Phi_t$ = | 0.80 |
| $\Phi_t R_{nt}$ = | 260 kip |
| Inter. Eq. 1 = | 0.38 |

**Anchor Rod Inter. Eq. 2 (4.9.9)**

| | |
|---|---|
| $L_{ar}$ = | 1.5 in |
| $V_{ub}$ = | 1.42 kip |
| $P_{ub}$ = | 96 kip |
| $M_{ub}$ = | 1.39 kip-in |
| $\Phi_v R_{nv}$ = | 134 kip |
| $\Phi_t R_{nt}$ = | 260 kip |
| $\Phi_f R_{nm}$ = | 95 kip-in |
| Inter. Eq. 2 = | 0.38 |

**Base Plate Properties**

| | |
|---|---|
| Base Plate Material = | A572GR50 |
| Outside Diameter = | 58.75 in |
| Inside Diameter = | 35.5 in |
| Weight = | 1322 lbf |

**Effective Base Plate Bend Line**

| | |
|---|---|
| Desantis' Bend Line = | 37.17 in |
| % Reduction = | 60 % |
| Reduced Bend Line = | 16.80 in |
| Brinker's Bend Line = | 11.46 in |
| Effective Bend Line = | 16.80 in |

**Base Plate Thickness**

| | |
|---|---|
| Section Modulus: | Plastic |
| $\Phi_b$ = | 0.9 |
| Minimum Thickness = | 1.68 in |
| Actual Thickness = | 2.75 in |
| $M_{ub}$ = | 532 in-k |
| $\Phi M_n$ = | 1429 in-kip |
| Capacity Usage = | 37.2% |

**Setting Template Properties**

| | |
|---|---|
| Outside Diameter = | 58.75 in |
| Inside Diameter = | 46.75 in |
| Thickness = | 0.375 in |
| Template Hole Ø = | 2.375 in |
| Template Weight = | 97.3 lbs |
| **Bottom Template Must Be Bolted** | |

**Summary Table**

| | |
|---|---|
| Anchor Material = | A615GR75 |
| Anchor Diameter = | 2.25 in |
| Anchor Length = | 6 ft |
| No. of Anchors = | 18 |
| Actual Bolt Circle Ø = | 52.75 in |
| Base Plate Material = | A572GR50 |
| Actual Thickness = | 2.75 in |
| Outside Diameter = | 58.75 in |
| Inside Diameter = | 35.5 in |

10975 Kinsman Road
Newbury, OH 44065

Telephone: (440) 564-5484
Email: sales@engend.com

ENGINEERED ENDEAVORS

# DESIGN CALCULATIONS
# FOR A
# SPREAD FOOTER FOUNDATION

Tarpon Towers

Bridgeport / CT1221 Site

Bridgeport, CT

EEI Project Number 18308-P01, Rev. 2

May 14, 2018

15175 Kinsman Road, Burton, Ohio 44062
Phone: (440) 970-5004* (888) 270-3855
www.engend.com

# FOUNDATION DESIGN CALCULATIONS FOR A SPREAD FOOTER FOUNDATION

ENGINEERED ENDEAVORS

**CUSTOMER:** Tarpon Towers **DATE:** 5/14/2018

**LOCATION:** Bridgeport, CT

**SITE NAME:** Bridgeport **JOB NUMBER:** 18308-P01

**SITE NUMBER:** CT1221 **STATUS:** Rev. 2

## FOUNDATION DESIGN LOADS

| DESIGN CODE | TIA-222-G |
|---|---|

| | OVERTURNING MOMENT, kip-ft | SHEAR, kips | AXIAL, kips |
|---|---|---|---|
| TIA/EIA 222F | 0.0 | 0 | 0 |
| TIA-222-G | 1867.00 | 25.6 | 31.1 |
| FACTORED w/φ=0.75 | 2489.3 | 34.1 | 41.5 |

## ANCHOR BOLT DATA

| QUANTITY | LENGTH | BOLT CIRCLE Ø | PROJECTION |
|---|---|---|---|
| 18 | 6.0 ft | 52.8 in | 12.0 in |

SOIL UNIT WEIGHT, pcf: 125.00 CONCRETE UNIT WEIGHT, pcf: 150.00

## MINIMUM FOUNDATION PARAMETERS

PEDESTAL MINIMUM WIDTH 78.0 in
FOUNDATION MINIMUM HEIGHT 5.50 ft

PEDESTAL PROJECTION: 6.0 in

## ACTUAL FOUNDATION SIZE

| | HEIGHT, ft | WIDTH, ft |
|---|---|---|
| SLAB | 3.00 | 26.00 |
| PEDESTAL | 2.50 | 6.50 |

## STABILITY

| | |
|---|---|
| Foundation Weight, kips | 320.04 |
| Concrete, cub.yd. | 79.02 |
| Soil Weight, kips | 158.44 |
| Total weight foundation and soil (unfactored), kips | 478.48 |
| Total Vertical Load, kips | 458.62 |
| Total Overturning Moment, kip-ft | 2007.80 |
| Total Resisting Moment, kip-ft | 5962.10 |
| OVERTURNING SAFETY FACTOR | 2.97 |
| Kern of Eccentricity, ft | 4.33 |
| Actual Eccentricity, ft | 4.38 uplift exists! |
| Allowable Gross Soil Pressure, ksf (see soil report) | 5.25 (min SF=1.5) |
| Allowable Net Soil Pressure, ksf (see soil report) | 6.0 Per Soil Report |
| Max soil pressure, ksf per TIA-222-G | 1.8 (Include. OLF) |
| per TIA/EIA-222-F | n/a |

## CONCRETE REINFORCEMENT

| | BAR SIZE | BAR WEIGHT (lbs/ft) | QUANTITY | LENGTH (ft) | WEIGHT (lbs) |
|---|---|---|---|---|---|
| TOP PAD | # 8 | 2.67 | 70 | 30.50 | 5700.45 |
| BOTTOM PAD | # 8 | 2.67 | 74 | 25.50 | 5038.29 |
| VERTICAL BARS | # 8 | 3.40 | 34 | 6.75 | 780.30 |
| HORIZONTAL TIES | # 4 | 1.50 | 5 | 18.95 | 142.14 |
| | | | | TOTAL STEEL WEIGHT (lbs) | 11661.18 |

## FOOTING STRENGTH DESIGN

| | | | | NOTES |
|---|---|---|---|---|
| Concrete, psi | 3000 | Concrete cover, in | 3 | |
| Steel, ksi | 60 | Distance, d (slab), in | 32 | |

## TWO-WAY SHEAR IN THE SLAB

| | | | |
|---|---|---|---|
| Vertical Load, kips | 31.10 | | |
| Bearing Soil Pressure, ksf | 0.05 | | |
| Shear in the slab, kips | **27.37** | | |
| Design shear Vn, kips | **1311.03** | φ = 0.85 | **OK** |

## ONE-WAY SHEAR IN THE SLAB

| | | | |
|---|---|---|---|
| Max soil pressure, ksf | 1.36 | | |
| Actual Eccentricity, ft | 4.38 | | |
| Kern of Eccentricity, ft | 4.33 | | |
| Pressure Distribution Zone, ft | 25.87 | | |
| Effective Pressure Zone, ft | 7.08 | | |
| Max Shear Force, kips | **251.1** | | |
| Design Shear, kips | **929.6** | φ = 0.85 | **OK** |

## SLAB DESIGN IN FLEXURE

| | |
|---|---|
| Max Soil Pressure, ksf | 1.36 |
| Actual Eccentricity, ft | 4.38 |
| Kern of Eccentricity, ft | 4.33 |
| Pressure Distribution Zone, ft | 25.87 |
| Effective Pressure Zone, ft | 9.75 |
| Soil Pressure at Effective Zone Edge | 0.85 |

| | | |
|---|---|---|
| Shear Force at Critical Section, kip | 280.5 | |
| Bending Moment, k-ft | 1473.4 | |
| Coefficient of Resistance, Rn | 61.5 | φ = 0.90 |

| | | |
|---|---|---|
| Min. Required Reinf. Ratio by Analysis | 0.00104 | |
| Min. Reinf. Ratio per ACI 318, 200/Fy | 0.00330 | |
| Min. Reinf. Ratio per ACI 318 | 0.00138 | ACI-318 Sect.10.5.3 |
| Design Reinforcement Ratio | 0.00180 | |
| Min. Steel Area, sq.in. | 17.97 | |
| Bar size | 8 | |
| Bar section area, in^2 | 0.79 | |

## BOTTOM BARS

| | | |
|---|---|---|
| Min. No.of Bars/One direction | 23.00 | |
| Actual No.of Bars/One direction | 35 | **OK** |
| Actual Steel Area, sq.in. | 27.65 | |
| Steel Ratio Actual | 0.00277 | **OK** |
| Revised Coeficient of Resistance, Rn | 166.15 | |
| Design Moment, kip-ft | 3981.27 | |
| Total bottom bars | 74 | |
| Horizontal Spacing (shor), in | 9.00 | **OK** |

## TOP BARS

| | | |
|---|---|---|
| Min. Steel Area, sq.in (0.18%) | 17.97 | |
| Minimum Number of Bars REQUIRED | 23 | One Direction |
| Actual Number of Bars | 35 | **OK** |
| Top Steel Area, sq.in | 27.65 | |
| Total Top Bars | 70 | |
| Horizontal Spacing, in | 9.00 | **OK** |

# PEDESTAL DESIGN

| | | |
|---|---|---|
| Pedestal Width, in | | 78 |
| Concrete Strength, ksi | | 3 |
| Reinforcement Strength, ksi | | 60 |
| Actual Rebars | QTY | 34 |
| Nominal Bars | QTY | 12 |
| Minimum reinforcement ratio | | 0.0033 |
| Actual reinforcement ratio | | 0.0044 |
| Concrete cover , in | | 3 |
| Rebar layout radius, in | | 35.50 |

Ultimate Moment 1931.0 ft-kips

| | |
|---|---|
| Rebar | 8 |
| Area, sq.in | 0.79 |
| Area, sq.in | 2.24 |
| Rebar space, in | 6.56 |
| $\varepsilon_u$ | 0.003 |
| $\varepsilon_y$ | 0.00207 |

**BENDING ABOUT THE MAJOR AXIS**

| Rebar Number | Angle *degrees* | Coordinate *in* | Edge Dist. *in* |
|---|---|---|---|
| 1 | 0 | 35.50 | 3.50 |
| 2 | 30 | 30.74 | 8.26 |
| 3 | 60 | 17.75 | 21.25 |
| 4 | 90 | 0.00 | 39.00 |
| 5 | 120 | -17.75 | 56.75 |
| 6 | 150 | -30.74 | 69.74 |

| Rebar Number | Angle *degrees* | Coordinate *in* | Edge Dist. *in* |
|---|---|---|---|
| 7 | 180 | -35.50 | 74.50 |
| 8 | 210 | -30.74 | 69.74 |
| 9 | 240 | -17.75 | 56.75 |
| 10 | 270 | 0.00 | 39.00 |
| 11 | 300 | 17.75 | 21.25 |
| 12 | 330 | 30.74 | 8.26 |

**Location of Neutral Axis** c = **7.02** in

**Compression Zone** a = **5.96** in

**Compression Zone**

| Rebar Number | ε in/in | Force *kips* |
|---|---|---|
| 1 | 0.0015 | 91.87 |

**Tension Zone**

| Rebar Number | ε in/in | Force *kips* |
|---|---|---|
| 2 | 0.0005 | 34.45 |
| 3 | 0.0061 | 134.30 |
| 4 | 0.0137 | 134.30 |
| 5 | 0.0213 | 134.30 |
| 6 | 0.0268 | 134.30 |
| 7 | 0.0289 | 134.30 |
| 8 | 0.0268 | 134.30 |
| 9 | 0.0213 | 134.30 |
| 10 | 0.0137 | 134.30 |
| 11 | 0.0061 | 134.30 |
| 12 | 0.0005 | 34.45 |

Concrete, kips 1185.99

**Total Compression, kips** **1277.86**

**Total Tension, kips** **1277.61**

**Moment Due to Compression**

| Rebar Number | Force *kips* | Arm *in* | Moment *k-ft* |
|---|---|---|---|
| 1 | 91.87 | 35.50 | 271.78 |
| 2 | 0.00 | 30.74 | 0.00 |
| 12 | 0.00 | 30.74 | 0.00 |
| Concrete | 1185.99 | 36.02 | 3559.81 |

**Total in Compression** **3831.59**

**Moment Due to Tension**

| Rebar Number | Force *kips* | Arm *in* | Moment *k-ft* |
|---|---|---|---|
| 2 | 34.45 | 30.74 | -88.27 |
| 3 | 134.30 | 17.75 | -198.65 |
| 4 | 134.30 | 0.00 | 0.00 |
| 5 | 134.30 | -17.75 | 198.65 |
| 6 | 134.30 | -30.74 | 344.08 |
| 7 | 134.30 | -35.50 | 397.30 |
| 8 | 134.30 | -30.74 | 344.08 |
| 9 | 134.30 | -17.75 | 198.65 |
| 10 | 134.30 | 0.00 | 0.00 |
| 11 | 134.30 | 17.75 | -198.65 |
| 12 | 34.45 | 30.74 | -88.27 |

**Total in Tension** **908.92**

**Design Moment about the Major Axis, kip-ft** **4266.46** OK

**BENDING ABOUT THE DIAGONAL**

| Rebar Number | Angle, deg phi | Coord., in c1 | Edge Dist., in di |
|---|---|---|---|
| 1 | 0 | 35.50 | 19.65 |
| 2 | 30 | 30.74 | 24.41 |
| 3 | 60 | 17.75 | 37.40 |
| 4 | 90 | 0.00 | 55.15 |
| 5 | 120 | -17.75 | 72.90 |
| 6 | 150 | -30.74 | 85.90 |

| Rebar Number | Angle, deg phi | Coord., in c1 | Edge Dist., in di |
|---|---|---|---|
| 7 | 180 | -35.50 | 90.65 |
| 8 | 210 | -30.74 | 85.90 |
| 9 | 240 | -17.75 | 72.90 |
| 10 | 270 | 0.00 | 55.15 |
| 11 | 300 | 17.75 | 37.40 |
| 12 | 330 | 30.74 | 24.41 |

**Location of Neutral Axis** c = **23.76** in

**Compression Zone** a = **20.20** in

**Compression Zone**

| Rebar Number | ε in/in | Force *kips* |
|---|---|---|
| 1 | 0.000518 | 134.30 |

Concrete, kips 1040.09

**Total Compression, kips** **1174.39**

**Tension Zone**

| Rebar Number | ε in/in | Force *kips* |
|---|---|---|
| 2 | 0.0001 | 5.33 |
| 3 | 0.0017 | 111.83 |
| 4 | 0.0040 | 134.30 |
| 5 | 0.0062 | 134.30 |
| 6 | 0.0078 | 134.30 |
| 7 | 0.0084 | 134.30 |
| 8 | 0.0078 | 134.30 |
| 9 | 0.0062 | 134.30 |
| 10 | 0.0040 | 134.30 |
| 11 | 0.0017 | 111.83 |
| 12 | 0.0001 | 5.33 |

**Total tension, kips** **1174.42**

**Moment Due to Compression**

| Rebar Number | Force *kips* | Arm *in* | Moment *k-ft* |
|---|---|---|---|
| 1 | 134.30 | 35.50 | 397.30 |
| 2 | 0.00 | 30.74 | 0.00 |
| 12 | 0.00 | 30.74 | 0.00 |
| Concrete | 1040.09 | 48.42 | 4196.96 |

**Total in Compression, kips** **4594.27**

**Moment Due to Tension**

| Rebar Number | Force *kips* | Arm *in* | Moment *k-ft* |
|---|---|---|---|
| 3 | 111.83 | 17.75 | -165.41 |
| 4 | 134.30 | 17.75 | -198.65 |
| 5 | 134.30 | 0.00 | 0.00 |
| 6 | 134.30 | -17.75 | 198.65 |
| 7 | 134.30 | -35.50 | 397.30 |
| 8 | 134.30 | -30.74 | 344.08 |
| 9 | 134.30 | -17.75 | 198.65 |
| 10 | 134.30 | 0.00 | 0.00 |
| 11 | 111.83 | 17.75 | -165.41 |

**Total in Tension, kips** **609.21**

**Design Moment, kip-ft** **4683.13**

**Pedestal Design Moment, kip-ft** **4266.46** OK

ENGINEERED ENDEAVORS

May 15, 2018

Reference: Design and Reliability of a 90-ftMonopole
Quality of Steel and Fabrication of a Monopole Structure
Tarpon Towers Site CT1221 Bridgeport. Site Location: Bridgeport, CT
EE Job Number: 18308-P01

To Whom it May Concern:

In response to the inquiry regarding the design and anticipated reliability and theoretical initial collapse point of a 90-*ft* monopole, Engineered Endeavors (EE) offers the following comments:

1. The monopole structure is designed to meet the requirements of the ANSI TIA-222-G titled *Structural Standards for Antenna Supporting Structures and Antennas*. It also meets or exceeds the requirements of *The 2015 International Building Code, Connecticut Building Code,* and the *Steel Construction Manual 14th Edition* by the American Institute of Steel Construction (AISC). Furthermore, the foundation and anchor bolts meet the requirements of the American Concrete Institute's *Building Code Requirements for Structural Concrete* (ACI 318-15).

2. Based on the location of this structure, the monopole is designed for a 100-mph wind speed (nominal) 3-second gust per CT Building Code (City of Bridgeport). The wind exceeds the 50-year maximum anticipated wind velocity at 33 *ft* above ground level. Additional factors are applied to increase the wind loading, *e.g.*, a gust response factor is imposed in order to account for sudden changes in wind speed, a height coefficient to account for increasing wind speed with height, and an exposure coefficient. Based on these conservative coefficients, the structure could in fact survive even greater wind loads than the basic design wind speed without any failures.

3. The monopole structure design is controlled by wind induced loads, however, earthquake induced loads are also evaluated with all building code requirements being satisfied. Vertical loads (*i.e.*, gravity loads) are minimal on these types of structures, approximately 10% of the maximum capacity.

4. The design and loading assumptions which are used for the analysis of these structures are very conservative in nature when compared to other building codes; as a result, **structural failure is highly improbable.**

5. Failure of a **steel monopole structure** is defined as being that point at which the induced stresses exceed the yield strength of the material. At this point, deflections will be induced in the structure, which will no longer be recoverable once the load has been removed. Hence, a permanent deflection in the monopole would exist. The induced loads must be sustained for a long enough period in order that the structure has time to respond to the load without its removal. Monopoles are flexible, ductile structures, which are not generally susceptible to damage by impact loads such as wind gust or earthquake shocks.

6. As the structure leans over from the induced loads, it presents a reduced exposure area for the development of wind-induced forces. This would result in the lowering of the applied forces and, therefore, the reduction of stresses and a halting of the structural deflection.

7. Hypothetically, let's assume that a pole becomes overloaded. The typical consequence of this overloading is "local buckling" where a relatively small portion of the shaft distorts and "kinks" the steel. Upon the removal of the applied load, the structure will not return to a plumb position. This does not cause a free falling pole. Even though the buckle exists, the cross section of the pole is capable of carrying the entire vertical load. Thus, in the result, wind induced loads could not conceivably bring this type of structure to the ground due to the excellent ductile properties, design criteria, and failure mode.

8. **In regards to this particular monopole, this structure is designed with the highest design stresses not to exceed 50% of the maximum allowable. With this design approach and taking into account the design antenna loading and site conditions, and assuming the the pole will be fabricated in accordance with the applicable national and state codes it is extremely rare to encounter a monopole failure from wind induced loads, rather than from hurricane. The structure will remain intact and, therefore, no parts of it will fall outside the required 53-ft fall zone radius.**

9. Further proof to the integrity of these structure-types is the fact that all EE monopole structures have performed flawlessly in the northeast, southeast, and central United States where a number of tornadoes and hurricanes have been reported. Specifically, in the Florida region an EE monopole withstood the direct impact of Hurricane Andrew (1992) with absolutely no structural damage reported. Wind loading was reported to be in the range of 100-120 MPH. Another EE monopole withstood the impact of Hurricane Katrina (2005) in Alabama. In another case, EE's monopoles in the Wilmington, NC region withstood the force of Hurricanes Fran (1996), which had wind speeds of 105 MPH and wind gusts of 115 MPH.

10. EEI has never experienced a structural failure due to weather induced overloading. EE personnel have over 30 years combined experience in design and fabrication of these types of structures.

In response to your inquiry regarding the quality of steel and fabrication of a monopole structure:

1) The monopole is fabricated from ASTM A572 material with a controlled silicon content of 0.06% maximum to promote a uniform galvanized coating. The base plate material is also fabricated from ASTM A572 material. All plate material meets a Charpy V-Notch toughness requirement of 15 *ft-lbs* @ -20° Fahrenheit. By meeting the strict toughness requirement, the monopole is best suited to resist the cyclic/fatigue type loading (*i.e.*, wind induced loading) these structures exhibit. The toughness specification is based on 35 years of taper tubular poles being designed and manufactured for the electrical transmission and communication industries.

2) Anchor bolts are fabricated from A615 Grade 75 material. The bolts are 2 ¼ *in* diameter, made from #18J bar stock. All threads are rolled. Anchor bolts come complete with two (2) A194 Grade 2H hex nuts. The anchor bolt material must also meet a Charpy V-Notch toughness of 15 *ft-lbs* @ -20° Fahrenheit, to resist the cyclic/fatigue type loading (*i.e.*, wind induced loading) these structures exhibit.

*EEI* guarantees the quality of steel used on the entire monopole. Material Certifications (Mill Test Reports) are available on all material at the time of fabrication. The toughness requirement should be taken

very seriously, for over the lifetime of the structure not having this toughness requirement, "toe" cracks may occur at the base of the structure and the structure could ultimately fail. Fabrication of the monopole is performed in accordance with the provisions of the AISC *Steel Construction Manual* and TIA-222 and ASCE/SEI 48-11. All welding and inspection is in accordance with the American Welding Society's Specification D1.1 - latest revision. Testing and inspection reports are available upon request at the time of fabrication.

In conclusion, due to the aforementioned items, EE's monopole structures have never experienced a "free fall" type failure due to wind or seismic induced loads. I hope that these comments address the issues, which you might encounter relative to the anticipated performance of monopole structures and quality of steel and fabrication. However, I will be most happy to answer any specific questions, which you might have.

Sincerely,
Engineered Endeavors


05-15-2018

Boris Fayman, PE
Senior Engineer