

KENNETH C. BALDWIN

280 Trumbull Street  
Hartford, CT 06103-3597  
Main (860) 275-8200  
Fax (860) 275-8299  
kbaldwin@rc.com  
Direct (860) 275-8345

Also admitted in Massachusetts  
and New York

April 21, 2021

*Via Electronic Mail*

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

Re: **Notice of Exempt Modification – Facility Modification  
Folly Lane, Coventry, Connecticut**

Dear Attorney Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains an existing wireless telecommunications facility at the above-referenced property address (the “Property”). The facility consists of antennas and remote radio heads attached to a tower and related equipment on the ground, near the base of the tower. The tower and Cellco’s use of the tower were approved by the Council in Docket No. 475. A copy of Docket No. 475’s Decision and Order is included in [Attachment 1](#).

Cellco now intends to modify its facility by installing three (3) Samsung 64T64RMMU antennas; and replacing six (6) existing remote radio heads (“RRHs”) with six (6) newer model RRHs on Cellco’s existing antenna platform. A set of project plans showing Cellco’s proposed facility modifications and new antennas and RRHs specifications are included in [Attachment 2](#).

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Coventry’s Chief Elected Official and Land Use Officer.

Melanie A. Bachman, Esq.  
April 21, 2021  
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The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on Cellco's existing antenna platform.

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

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

4. The installation of Cellco's new antennas and RRHs will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A General Power Density table for the modified facility is included in Attachment 3. The modified facility will be capable of providing Cellco's 5G wireless service.

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

6. According to the attached Structural Analysis ("SA") and Mount Analysis ("MA"), the existing tower, tower foundation, tower base plate and antenna mounting device, can support Cellco's proposed modifications. Copies of the SA and MA are included in Attachment 4. Also included in Attachment 4 is a separate letter prepared by the consulting engineer responsible for the preparation of the SA and MA verifying that the antenna model described in the SA and MA, respectively, as a nL-Sub6 Antenna or VZS01 Antenna, is the Samsung 64T64R model antenna and RRH that will be installed on the tower.

A copy of the parcel map and Property owner information is included in Attachment 5. A Certificate of Mailing verifying that this filing was sent to municipal officials is included in Attachment 6.

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

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth C. Baldwin". The signature is fluid and cursive, with a long horizontal stroke at the end.

Kenneth C. Baldwin

Enclosures

Copy to:

John Elsesser, Coventry Town Manger  
Eric Trott, Coventry Director of Land Use  
J Motycka LLC, Property Owner  
Aleksey Tyurin

Melanie A. Bachman, Esq.  
April 21, 2021  
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John Elsesser, Town Manager  
Town of Coventry  
1712 Main Street  
Coventry, CT 06238

Eric Trott, Director of Land Use  
Town of Coventry  
1712 Main Street  
Coventry, CT 06238

J Motycka LLC  
62 Folly Lane  
Coventry, CT 06238

Aleksey Tyurin  
Verizon Wireless  
20 Alexander Drive  
Wallingford, CT 06492

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Aleksey Tyurin

# Attachment 1

<p><b>DOCKET NO. 475</b> - Cellco Partnership d/b/a Verizon Wireless application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a telecommunications facility located adjacent to the maintenance building at the Skungamaug Golf Course, south of Folly Lane, at Coventry Tax Assessor's Map 006, Block 0026, Lot 0101, Coventry, Connecticut.</p>	<p>} Connecticut          } Siting          } Council</p>	<p>February 1, 2018</p>
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**Decision and Order**

Pursuant to Connecticut General Statutes §16-50p, and the foregoing Findings of Fact and Opinion, the Connecticut Siting Council (Council) finds that the effects associated with the construction, maintenance, and operation of a telecommunications facility, including effects on the natural environment; ecological integrity and balance; public health and safety; scenic, historic, and recreational values; forests and parks; air and water purity; and fish and wildlife are not disproportionate, either alone or cumulatively with other effects, when compared to need, are not in conflict with the policies of the State concerning such effects, and are not sufficient reason to deny the application, and therefore directs that a Certificate of Environmental Compatibility and Public Need, as provided by General Statutes § 16-50k, be issued to Cellco Partnership d/b/a Verizon Wireless, hereinafter referred to as the Certificate Holder, for a telecommunications facility at the Skungamaug Golf Course, south of Folly Lane, Coventry, Connecticut.

Unless otherwise approved by the Council, the facility shall be constructed, operated, and maintained substantially as specified in the Council's record in this matter, and subject to the following conditions:

1. The tower shall be constructed as a monopole at a height of 140 feet above ground level to provide the proposed wireless services, sufficient to accommodate the antennas of Cellco Partnership d/b/a Verizon Wireless and other entities, both public and private. The height of the tower may be extended after the date of this Decision and Order pursuant to regulations of the Federal Communications Commission.
  
2. The Certificate Holder shall prepare a Development and Management (D&M) Plan for this site in compliance with Sections 16-50j-75 through 16-50j-77 of the Regulations of Connecticut State Agencies. The D&M Plan shall be served on the Town of Coventry for comment, and all parties and intervenors as listed in the service list, and submitted to and approved by the Council prior to the commencement of facility construction and shall include:
  - a) final site plan(s) for development of the facility that employ the governing standard in the State of Connecticut for tower design in accordance with the currently adopted International Building Code and include specifications for the tower, tower foundation, antennas, and equipment compound including fencing, radio equipment, access road, utility line and emergency backup generator;
  - b) construction plans for site clearing, grading, water drainage and stormwater control, and erosion and sedimentation controls consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, as amended; and
  - c) hours of construction.

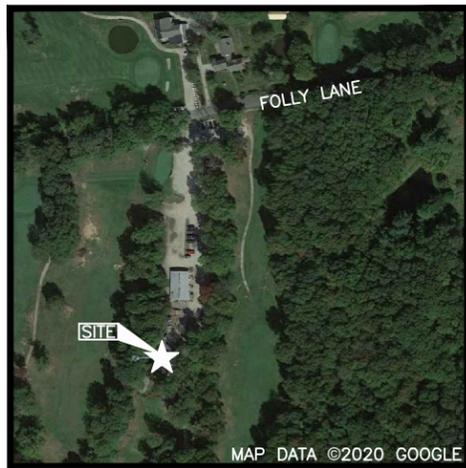
3. Prior to the commencement of operation, the Certificate Holder shall provide the Council worst-case modeling of the electromagnetic radio frequency power density of all proposed entities' antennas at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin No. 65, August 1997. The Certificate Holder shall ensure a recalculated report of the electromagnetic radio frequency power density be submitted to the Council if and when circumstances in operation cause a change in power density above the levels calculated and provided pursuant to this Decision and Order.
4. Upon the establishment of any new federal radio frequency standards applicable to frequencies of this facility, the facility granted herein shall be brought into compliance with such standards.
5. The Certificate Holder shall permit public or private entities to share space on the proposed tower for fair consideration, or shall provide any requesting entity with specific legal, technical, environmental, or economic reasons precluding such tower sharing.
6. Unless otherwise approved by the Council, if the facility authorized herein is not fully constructed with at least one fully operational wireless telecommunications carrier providing wireless service within eighteen months from the date of the mailing of the Council's Findings of Fact, Opinion, and Decision and Order (collectively called "Final Decision"), this Decision and Order shall be void, and the Certificate Holder shall dismantle the tower and remove all associated equipment or reapply for any continued or new use to the Council before any such use is made. The time between the filing and resolution of any appeals of the Council's Final Decision shall not be counted in calculating this deadline. Authority to monitor and modify this schedule, as necessary, is delegated to the Executive Director. The Certificate Holder shall provide written notice to the Executive Director of any schedule changes as soon as is practicable.
7. Any request for extension of the time period referred to in Condition 6 shall be filed with the Council not later than 60 days prior to the expiration date of this Certificate and shall be served on all parties and intervenors, as listed in the service list, and the Town of Coventry.
8. If the facility ceases to provide wireless services for a period of one year, this Decision and Order shall be void, and the Certificate Holder shall dismantle the tower and remove all associated equipment or reapply for any continued or new use to the Council within 90 days from the one year period of cessation of service. The Certificate Holder may submit a written request to the Council for an extension of the 90 day period not later than 60 days prior to the expiration of the 90 day period.
9. Any nonfunctioning antenna, and associated antenna mounting equipment, on this facility shall be removed within 60 days of the date the antenna ceased to function.
10. In accordance with Section 16-50j-77 of the Regulations of Connecticut State Agencies, the Certificate Holder shall provide the Council with written notice two weeks prior to the commencement of site construction activities. In addition, the Certificate Holder shall provide the Council with written notice of the completion of site construction, and the commencement of site operation.
11. The Certificate Holder shall remit timely payments associated with annual assessments and invoices submitted by the Council for expenses attributable to the facility under Conn. Gen. Stat. §16-50v.

12. This Certificate may be transferred in accordance with Conn. Gen. Stat. §16-50k(b), provided both the Certificate Holder/transferor and the transferee are current with payments to the Council for their respective annual assessments and invoices under Conn. Gen. Stat. §16-50v. In addition, both the Certificate Holder/transferor and the transferee shall provide the Council a written agreement as to the entity responsible for any quarterly assessment charges under Conn. Gen. Stat. §16-50v(b)(2) that may be associated with this facility.
13. The Certificate Holder shall maintain the facility and associated equipment, including but not limited to, the tower, tower foundation, antennas, equipment compound, radio equipment, access road, utility line and landscaping in a reasonable physical and operational condition that is consistent with this Decision and Order and a Development and Management Plan to be approved by the Council.
14. If the Certificate Holder is a wholly-owned subsidiary of a corporation or other entity and is sold/transferred to another corporation or other entity, the Council shall be notified of such sale and/or transfer and of any change in contact information for the individual or representative responsible for management and operations of the Certificate Holder within 30 days of the sale and/or transfer.
15. This Certificate may be surrendered by the Certificate Holder upon written notification and approval by the Council.

We hereby direct that a copy of the Findings of Fact, Opinion, and Decision and Order be served on each person listed in the Service List, dated July 5, 2017, and notice of issuance published in The Chronicle.

By this Decision and Order, the Council disposes of the legal rights, duties, and privileges of each party named or admitted to the proceeding in accordance with Section 16-50j-17 of the Regulations of Connecticut State Agencies.

# Attachment 2



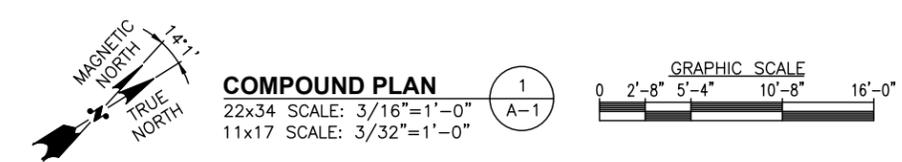
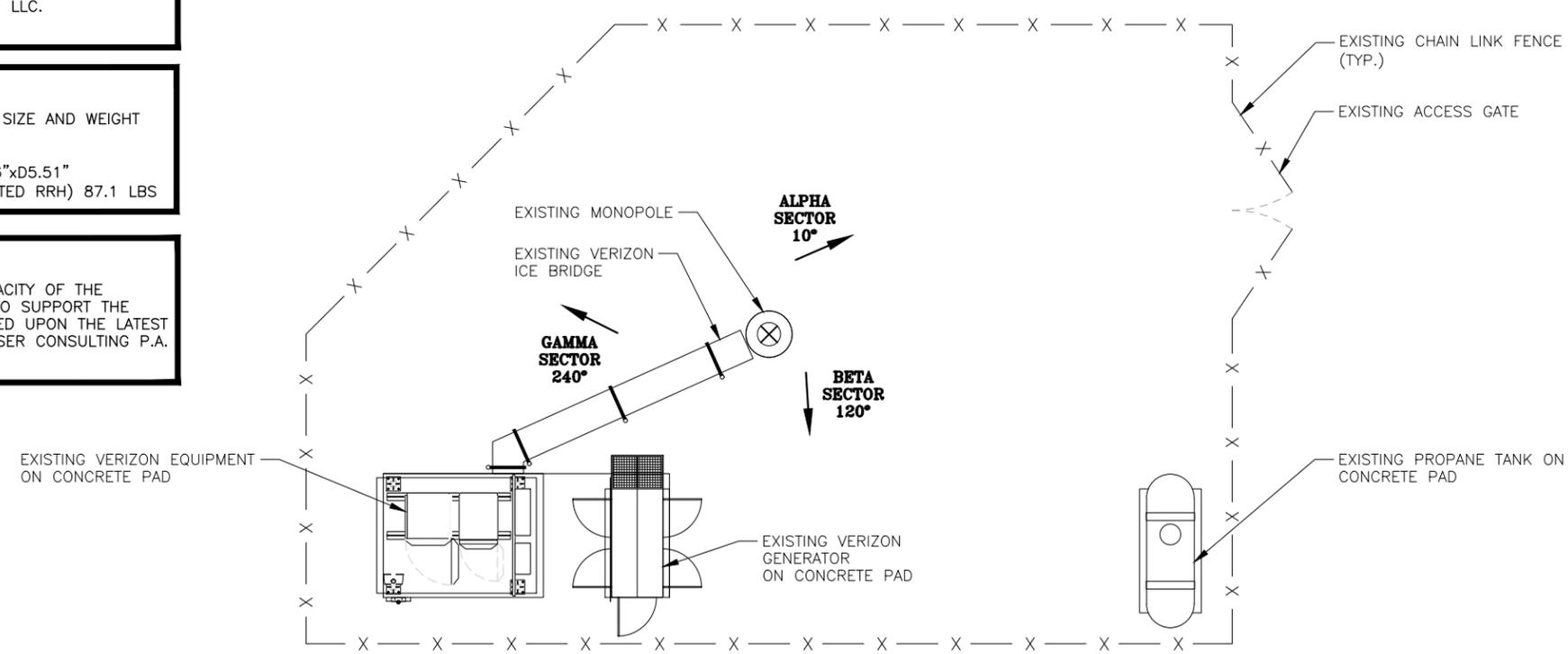
**VICINITY MAP**  
SCALE: N.T.S.

APPROXIMATE COORDINATES: LATITUDE: N41° 49' 26.39" LONGITUDE: W72° 20' 53.74"

**NOTE:**  
AN ANALYSIS OF THE CAPACITY OF THE EXISTING STRUCTURE TO SUPPORT THE PROPOSED LOADING HAS BEEN COMPLETED BY HUDSON DESIGN GROUP, LLC. DATED: MARCH 16, 2021

**NOTE:**  
PROPOSED VZS01 ANTENNA SIZE AND WEIGHT ARE NOT TO EXCEED:  
DIMENSIONS H35.12"xW16.06"xD5.51"  
WEIGHT (INCLUDING INTEGRATED RRH) 87.1 LBS

**NOTE:**  
AN ANALYSIS FOR THE CAPACITY OF THE EXISTING ANTENNA MOUNT TO SUPPORT THE PROPOSED LOADING IS BASED UPON THE LATEST MOUNT ASSESSMENT BY MASER CONSULTING P.A.



**COMPOUND PLAN**  
22x34 SCALE: 3/16"=1'-0"  
11x17 SCALE: 3/32"=1'-0"

FIELD INSPECTION DATE: 02-17-2021

- SCOPE**
- EXISTING (6) ANTENNAS TO REMAIN PER 'RF'. INSTALL (3) ANTENNAS PER 'RF'
  - EXISTING (6) RRH's TO BE REMOVED, INSTALL (9) RRH's PER 'RF'.
  - EXISTING (2) JUNCTION BOX TO REMAIN PER 'RF'
  - EXISTING (2) HYBRID CABLES TO REMAIN PER 'RF'
  - ALL REPLACEMENT ANTENNAS TO MATCH EXISTING CONDITION & HEIGHTS.
  - RECONFIGURE/RELOCATE EXISTING ANTENNA MOUNTS AS NECESSARY TO ACCOMMODATE HORIZONTAL SEPARATION, PROPOSED AZIMUTHS, AND ANTENNAS CONFIGURATION.

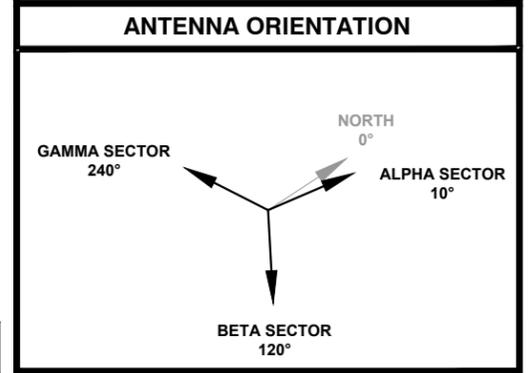
**NEW ANTENNA CONFIGURATION**

**NOTE TO GENERAL CONTRACTOR:**

'RF' DESIGN AND EQUIPMENT IS BASED UPON **RFDS ISSUED BY VZW DATED: JANUARY 22, 2021**

THE CONTRACTOR OF RECORD SHALL CONTACT VZW PRIOR TO ANY AND ALL ORDERING/PURCHASING/INSTALLATION OF EQUIPMENT TO VERIFY THAT THE 'RF' LISTED IN THE DRAWING SET IS CURRENT AND UP TO DATE.

- NOTES**
- NORTH SHOWN AS APPROXIMATE.
  - SOME EXISTING & PROPOSED INFORMATION NOT SHOWN FOR CLARITY.
  - ANTENNAS WILL BE CAMOUFLAGED WITH 3M WRAP, AS NEEDED, PER VERIZON WIRELESS AND BUILDING OWNER'S APPROVAL.
  - PRIOR TO COMMENCEMENT OF ANY WORK, PROPOSED ANTENNA INSTALLATION IS PURSUANT TO FINDINGS DICTATED IN STRUCTURAL ANALYSIS. STRUCTURAL ANALYSIS TO VERIFY CAPACITY OF EXISTING STRUCTURE TO ENSURE STRUCTURAL INTEGRITY FOLLOWING INSTALLATION OF PROPOSED ANTENNAS, COAX CABLES AND REQUIRED HARDWARE. COPY OF STRUCTURAL ANALYSIS TO BE SENT TO DESIGN ENGINEER.
  - CONTRACTOR SHALL FIELD VERIFY SCOPE OF WORK, VERIZON WIRELESS ANTENNA MOUNT LOCATION AND ANTENNAS TO BE INSTALLED.
  - CONTRACTOR SHALL NOTIFY ENGINEERS IF FIELD CONDITIONS DIFFER FROM DESIGN.
  - RAD CENTERS MEASURED IN THE FIELD WITH LASER BY HDG. RAD CENTERS MAY NOT MATCH RF ANTENNA DESIGN SHEET.



PREPARED FOR: CELLCO PARTNERSHIP D.B.A.



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



CHECKED BY: JX

APPROVED BY: DPH

**SUBMITTALS**

REV.	DATE	DESCRIPTION	BY
0	03/19/21	ISSUED FOR CONSTRUCTION	MR

SITE NAME:  
**COVENTRY NORTHWEST CT**

SITE ADDRESS:  
FOLLY LANE  
COVENTRY, CT 06238

SHEET TITLE  
**COMPOUND PLAN**

SHEET NUMBER  
**A-1**

**PROPOSED ANTENNA INFORMATION**

SECTOR	STATUS	AZIMUTH	CABLE LENGTH
ALPHA	PROPOSED/EXISTING	10°	185'
BETA	PROPOSED/EXISTING	120°	185'
GAMMA	PROPOSED/EXISTING	140°	185'

**NOTE:** CABLE LENGTH = EXACT LENGTH PLUS 25'. CONTRACTOR TO VERIFY CABLE LENGTH PRIOR TO ORDERING.

**NOTE:**

AN ANALYSIS OF THE CAPACITY OF THE EXISTING STRUCTURE TO SUPPORT THE PROPOSED LOADING HAS BEEN COMPLETED BY HUDSON DESIGN GROUP, LLC. DATED: MARCH 16, 2021

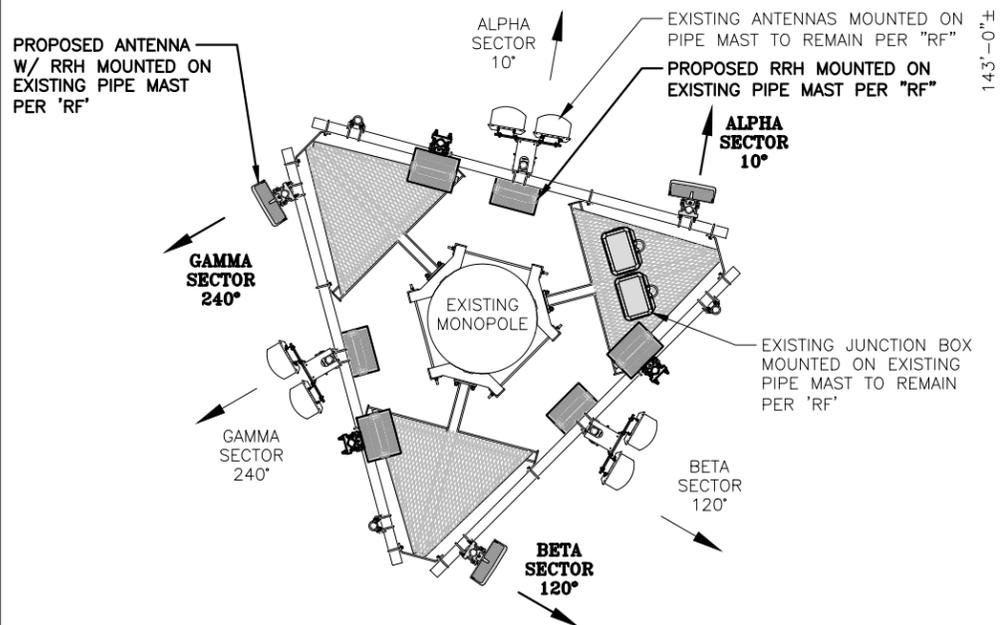
**NOTE:**

PROPOSED VZS01 ANTENNA SIZE AND WEIGHT ARE NOT TO EXCEED:

DIMENSIONS H35.12"xW16.06"xD5.51"  
WEIGHT (INCLUDING INTEGRATED RRH) 87.1 LBS

**NOTE:**

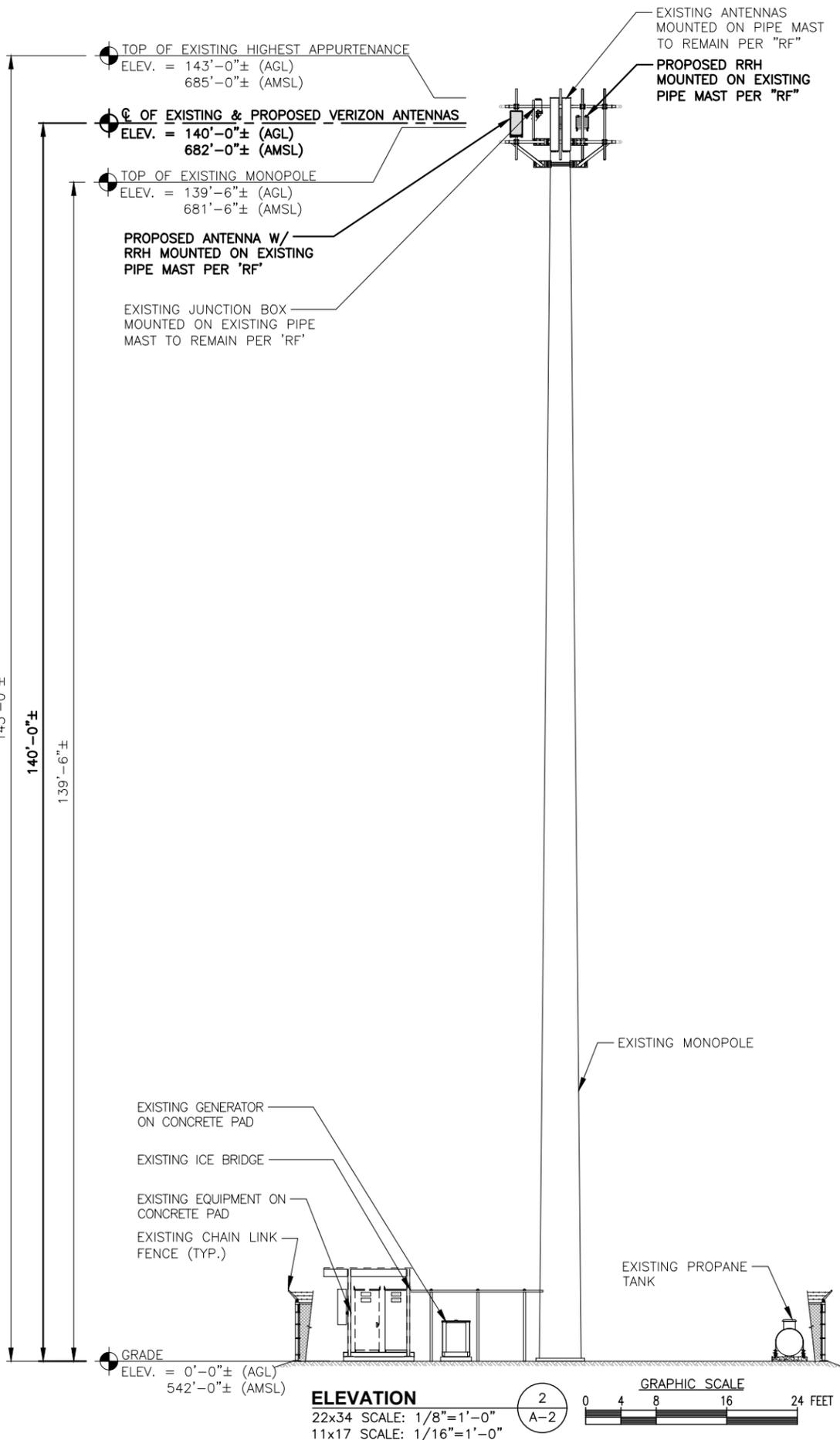
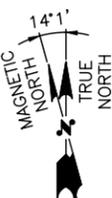
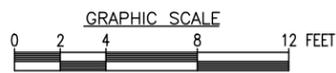
AN ANALYSIS FOR THE CAPACITY OF THE EXISTING ANTENNA MOUNT TO SUPPORT THE PROPOSED LOADING IS BASED UPON THE LATEST MOUNT ASSESSMENT BY MASER CONSULTING P.A.



**ANTENNA PLAN**

22x34 SCALE: 3/8"=1'-0"  
11x17 SCALE: 3/16"=1'-0"

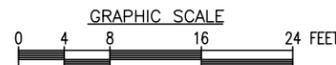
1  
A-2



**ELEVATION**

22x34 SCALE: 1/8"=1'-0"  
11x17 SCALE: 1/16"=1'-0"

2  
A-2



**SCOPE**

- EXISTING (6) ANTENNAS TO REMAIN PER 'RF'. INSTALL (3) ANTENNAS PER 'RF'
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- RECONFIGURE/RELOCATE EXISTING ANTENNA MOUNTS AS NECESSARY TO ACCOMMODATE HORIZONTAL SEPARATION, PROPOSED AZIMUTHS, AND ANTENNAS CONFIGURATION.

**NEW ANTENNA CONFIGURATION**

**NOTE TO GENERAL CONTRACTOR:**

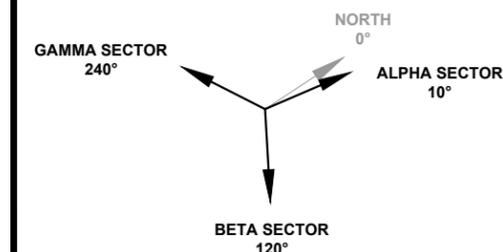
'RF' DESIGN AND EQUIPMENT IS BASED UPON **RFDS ISSUED BY VZW DATED: JANUARY 22, 2021**

THE CONTRACTOR OF RECORD SHALL CONTACT VZW PRIOR TO ANY AND ALL ORDERING/PURCHASING/INSTALLATION OF EQUIPMENT TO VERIFY THAT THE 'RF' LISTED IN THE DRAWING SET IS CURRENT AND UP TO DATE.

**NOTES**

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- SOME EXISTING & PROPOSED INFORMATION NOT SHOWN FOR CLARITY.
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- CONTRACTOR SHALL NOTIFY ENGINEERS IF FIELD CONDITIONS DIFFER FROM DESIGN.
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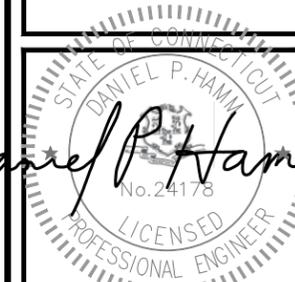
**ANTENNA ORIENTATION**



PREPARED FOR: CELLCO PARTNERSHIP D.B.A.



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



CONSTRUCTION DRAWINGS ARE VALID FOR SIX MONTHS AFTER ENGINEER OF RECORD'S STAMPED AND SIGNED SUBMITTAL DATE LISTED HEREIN

CHECKED BY: JX

APPROVED BY: DPH

**SUBMITTALS**

REV.	DATE	DESCRIPTION	BY
0	03/19/21	ISSUED FOR CONSTRUCTION	MR

SITE NAME:  
COVENTRY  
NORTHWEST CT

SITE ADDRESS:  
FOLLY LANE  
COVENTRY, CT 06238

SHEET TITLE  
ANTENNA PLAN &  
ELEVATION

SHEET NUMBER

**A-2**

**STRUCTURAL NOTES:**

- DESIGN REQUIREMENTS ARE PER STATE BUILDING CODE AND APPLICABLE SUPPLEMENTS, INTERNATIONAL BUILDING CODE, EIA/TIA-222-H STRUCTURAL STANDARDS FOR STEEL ANTENNA, TOWERS AND ANTENNA SUPPORTING STRUCTURES.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD PRIOR TO FABRICATION AND ERECTION OF ANY MATERIAL. ANY UNUSUAL CONDITIONS SHALL BE REPORTED TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND ENGINEER OF RECORD.
- DESIGN AND CONSTRUCTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION "SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS".
- STRUCTURAL STEEL SHALL CONFORM TO ASTM A992 (Fy=50 ksi), MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36 UNLESS OTHERWISE INDICATED.
- STEEL PIPE SHALL CONFORM TO ASTM A500 "COLD-FORMED WELDED & SEAMLESS CARBON STEEL STRUCTURAL TUBING", GRADE B, OR ASTM A53 PIPE STEEL BLACK AND HOT-DIPPED ZINC-COATED WELDED AND SEAMLESS TYPE E OR S, GRADE B. PIPE SIZES INDICATED ARE NOMINAL. ACTUAL OUTSIDE DIAMETER IS LARGER.
- STRUCTURAL CONNECTION BOLTS SHALL BE HIGH STRENGTH BOLTS (BEARING TYPE) AND CONFORM TO ASTM A325 TYPE-X "HIGH STRENGTH BOLTS FOR STRUCTURAL JOINTS, INCLUDING SUITABLE NUTS AND PLAIN HARDENED WASHERS". ALL BOLTS SHALL BE 3/4" DIA UON.
- ALL STEEL MATERIALS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS", UNLESS OTHERWISE NOTED.
- ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC-COATING (HOT-DIP) ON IRON AND STEEL HARDWARE", UNLESS OTHERWISE NOTED.
- FIELD WELDS, DRILL HOLES, SAW CUTS AND ALL DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED WITH AN ORGANIC ZINC REPAIR PAINT COMPLYING WITH REQUIREMENTS OF ASTM A780. GALVANIZING REPAIR PAINT SHALL HAVE 65 PERCENT ZINC BY WEIGHT, ZIRP BY DUNCAN GALVANIZING, GALVA BRIGHT PREMIUM BY CROWN OR EQUAL. THICKNESS OF APPLIED GALVANIZING REPAIR PAINT SHALL BE NOT NOT LESS THAN 4 COATS (ALLOW TIME TO DRY BETWEEN COATS) WITH A RESULTING COATING THICKNESS REQUIRED BY ASTM A123 OR A153 AS APPLICABLE.
- CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES, APPEARANCE AND QUALITY OF WELDS, AND FOR METHODS USED IN CORRECTING WELDING. ALL WELDERS AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING E70XX ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D.I.I. WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLE J2.4 IN THE AISC "STEEL CONSTRUCTION MANUAL". 14TH EDITION.
- INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON-CONFORMING MATERIALS OR CONDITIONS SHALL BE REPORTED TO THE CONSTRUCTION MANAGER PRIOR TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE CONSTRUCTION MANAGER APPROVAL.
- UNISTRUT SHALL BE FORMED STEEL CHANNEL STRUT FRAMING AS MANUFACTURED BY UNISTRUT CORP., WAYNE, MI OR EQUAL. STRUT MEMBERS SHALL BE 1 5/8"x1 5/8"x12GA, UNLESS OTHERWISE NOTED, AND SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION.
- EPOXY ANCHOR ASSEMBLY SHALL CONSIST OF STAINLESS STEEL ANCHOR ROD WITH NUTS & WASHERS, AN INTERNALLY THREADED INSERT, A SCREEN TUBE AND A EPOXY ADHESIVE. THE ANCHORING SYSTEM SHALL BE THE HILTI-HIT HY-270 AND OR HY-200 SYSTEMS (AS SPECIFIED IN DWG.) OR ENGINEERS APPROVED EQUAL.
- EXPANSION BOLTS SHALL CONFORM TO FEDERAL SPECIFICATION FF-S-325, GROUP II, TYPE 4, CLASS I, HILTI KWIK BOLT III OR APPROVED EQUAL. INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- LUMBER SHALL COMPLY WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF TIMBER CONSTRUCTION AND THE NATIONAL FOREST PRODUCTS ASSOCIATION'S NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION. ALL LUMBER SHALL BE PRESSURE TREATED AND SHALL BE STRUCTURAL GRADE NO. 2 OR BETTER.
- WHERE ROOF PENETRATIONS ARE REQUIRED, THE CONTRACTOR SHALL CONTACT AND COORDINATE RELATED WORK WITH THE BUILDING OWNER AND THE EXISTING ROOF INSTALLER. WORK SHALL BE PERFORMED IN SUCH A MANNER AS TO NOT VOID THE EXISTING ROOF WARRANTY. ROOF SHALL BE WATERTIGHT.
- ALL FIBERGLASS MEMBERS USED ARE AS MANUFACTURED BY STRONGWELL COMPANY OF BRISTOL, VA 24203. ALL DESIGN CRITERIA FOR THESE MEMBERS IS BASED ON INFORMATION PROVIDED IN THE DESIGN MANUAL. ALL REQUIREMENTS PUBLISHED IN SAID MANUAL MUST BE STRICTLY ADHERED TO.
- NO MATERIALS TO BE ORDERED AND NO WORK TO BE COMPLETED UNTIL SHOP DRAWINGS HAVE BEEN REVIEWED AND APPROVED IN WRITING.
- SUBCONTRACTOR SHALL FIREPROOF ALL STEEL TO PRE-EXISTING CONDITIONS.

**SPECIAL INSPECTIONS (REFERENCE IBC CHAPTER 17):**

**GENERAL:** WHERE APPLICATION IS MADE FOR CONSTRUCTION, THE OWNER OR THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE ACTING AS THE OWNER'S AGENT SHALL EMPLOY ONE OR MORE APPROVED AGENCIES TO PERFORM INSPECTIONS DURING CONSTRUCTION ON THE TYPES OF WORK LISTED IN THE INSPECTION CHECKLIST ABOVE.

THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE AND ENGINEERS OF RECORD INVOLVED IN THE DESIGN OF THE PROJECT ARE PERMITTED TO ACT AS THE APPROVED AGENCY AND THEIR PERSONNEL ARE PERMITTED TO ACT AS THE SPECIAL INSPECTOR FOR THE WORK DESIGNED BY THEM, PROVIDED THOSE PERSONNEL MEET THE QUALIFICATION REQUIREMENTS.

STATEMENT OF SPECIAL INSPECTIONS: THE APPLICANT SHALL SUBMIT A STATEMENT OF SPECIAL INSPECTIONS PREPARED BY THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE IN ACCORDANCE WITH SECTION 107.1 AS A CONDITION FOR ISSUANCE. THIS STATEMENT SHALL BE IN ACCORDANCE WITH SECTION 1705.

REPORT REQUIREMENT: SPECIAL INSPECTORS SHALL KEEP RECORDS OF INSPECTIONS. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THEY ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS SHALL BE SUBMITTED.

SPECIAL INSPECTION CHECKLIST	
<b>BEFORE CONSTRUCTION</b>	
CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY ENGINEER OF RECORD)	REPORT ITEM
N/A	ENGINEER OF RECORD APPROVED SHOP DRAWINGS <sup>1</sup>
N/A	MATERIAL SPECIFICATIONS REPORT <sup>2</sup>
N/A	FABRICATOR NDE INSPECTION
N/A	PACKING SLIPS <sup>3</sup>
ADDITIONAL TESTING AND INSPECTIONS:	
<b>DURING CONSTRUCTION</b>	
CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY ENGINEER OF RECORD)	REPORT ITEM
<b>REQUIRED</b>	STEEL INSPECTIONS
N/A	HIGH STRENGTH BOLT INSPECTIONS
N/A	HIGH WIND ZONE INSPECTIONS <sup>4</sup>
N/A	FOUNDATION INSPECTIONS
N/A	CONCRETE COMP. STRENGTH, SLUMP TESTS AND PLACEMENT
N/A	POST INSTALLED ANCHOR VERIFICATION <sup>5</sup>
N/A	GROUT VERIFICATION
N/A	CERTIFIED WELD INSPECTION
N/A	EARTHWORK: LIFT AND DENSITY
N/A	ON SITE COLD GALVANIZING VERIFICATION
N/A	GUY WIRE TENSION REPORT
ADDITIONAL TESTING AND INSPECTIONS:	
<b>AFTER CONSTRUCTION</b>	
CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY ENGINEER OF RECORD)	REPORT ITEM
<b>REQUIRED</b>	MODIFICATION INSPECTOR REDLINE OR RECORD DRAWINGS <sup>6</sup>
N/A	POST INSTALLED ANCHOR PULL-OUT TESTING
<b>REQUIRED</b>	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	

**NOTES:**

- REQUIRED FOR ANY NEW SHOP FABRICATED FRP OR STEEL.
- PROVIDED BY MANUFACTURER, REQUIRED IF HIGH STRENGTH BOLTS OR STEEL.
- PROVIDED BY GENERAL CONTRACTOR; PROOF OF MATERIALS.
- HIGH WIND ZONE INSPECTION CATB 120MPH OR CAT C,D 110MPH INSPECT FRAMING OF WALLS, ANCHORING, FASTENING SCHEDULE.
- ADHESIVE FOR REBAR AND ANCHORS SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ACI 355.4 AND ICC-ES AC308 FOR CRACKED CONCRETE AND SEISMIC APPLICATIONS. DESIGN ADHESIVE BOND STRENGTH HAS BEEN BASED ON ACI 355.4 TEMPERATURE CATEGORY B WITH INSTALLATIONS INTO DRY HOLES DRILLED USING A CARBIDE BIT INTO CRACKED CONCRETE THAT HAS CURED FOR AT LEAST 21 DAYS. ADHESIVE ANCHORS REQUIRING CERTIFIED INSTALLATIONS SHALL BE INSTALLED BY A CERTIFIED ADHESIVE ANCHOR INSTALLER PER ACI 318-11 D.9.2.2. INSTALLATIONS REQUIRING CERTIFIED INSTALLERS SHALL BE INSPECTED PER ACI 318-11 D.8.2.4.
- AS REQUIRED; FOR ANY FIELD CHANGES TO THE ITEMS IN THIS TABLE.

**NOTES:**

- ALL CONNECTIONS TO BE SHOP WELDED & FIELD BOLTED USING 3/4"Ø A325-X BOLTS, UNLESS OTHERWISE NOTIFIED.
- SHOP DRAWING ENGINEER REVIEW & APPROVAL REQUIRED BEFORE ORDERING MATERIAL.
- SHOP DRAWING ENGINEER REVIEW & APPROVAL REQUIRED PRIOR TO STEEL FABRICATION.
- VERIFICATION OF EXISTING ROOF CONSTRUCTION IS REQUIRED PRIOR TO THE INSTALLATION OF THE ROOF PLATFORM. ENGINEER OF RECORD IS TO APPROVE EXISTING CONDITIONS IN ORDER TO MOVE FORWARD.
- CENTERLINE OF PROPOSED STEEL PLATFORM SUPPORT COLUMNS TO BE CENTRALLY LOCATED OVER THE EXISTING BUILDING COLUMNS.
- EXISTING BRICK MASONRY COLUMNS/BEARING TO BE REPAIRED/REPLACED AT ALL PROPOSED PLATFORM SUPPORT POINTS. ENGINEER OF RECORD TO REVIEW AND APPROVE.

PREPARED FOR: CELLCO PARTNERSHIP D.B.A.



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



CONSTRUCTION DRAWINGS ARE VALID FOR SIX MONTHS AFTER ENGINEER OF RECORD'S STAMPED AND SIGNED SUBMITTAL DATE LISTED HEREIN

CHECKED BY: JX

APPROVED BY: DPH

SUBMITTALS			
REV.	DATE	DESCRIPTION	BY
0	03/19/21	ISSUED FOR CONSTRUCTION	MR

SITE NAME:  
COVENTRY  
NORTHWEST CT

SITE ADDRESS:  
FOLLY LANE  
COVENTRY, CT 06238

SHEET TITLE  
STRUCTURAL NOTES  
&  
SPECIAL INSPECTIONS

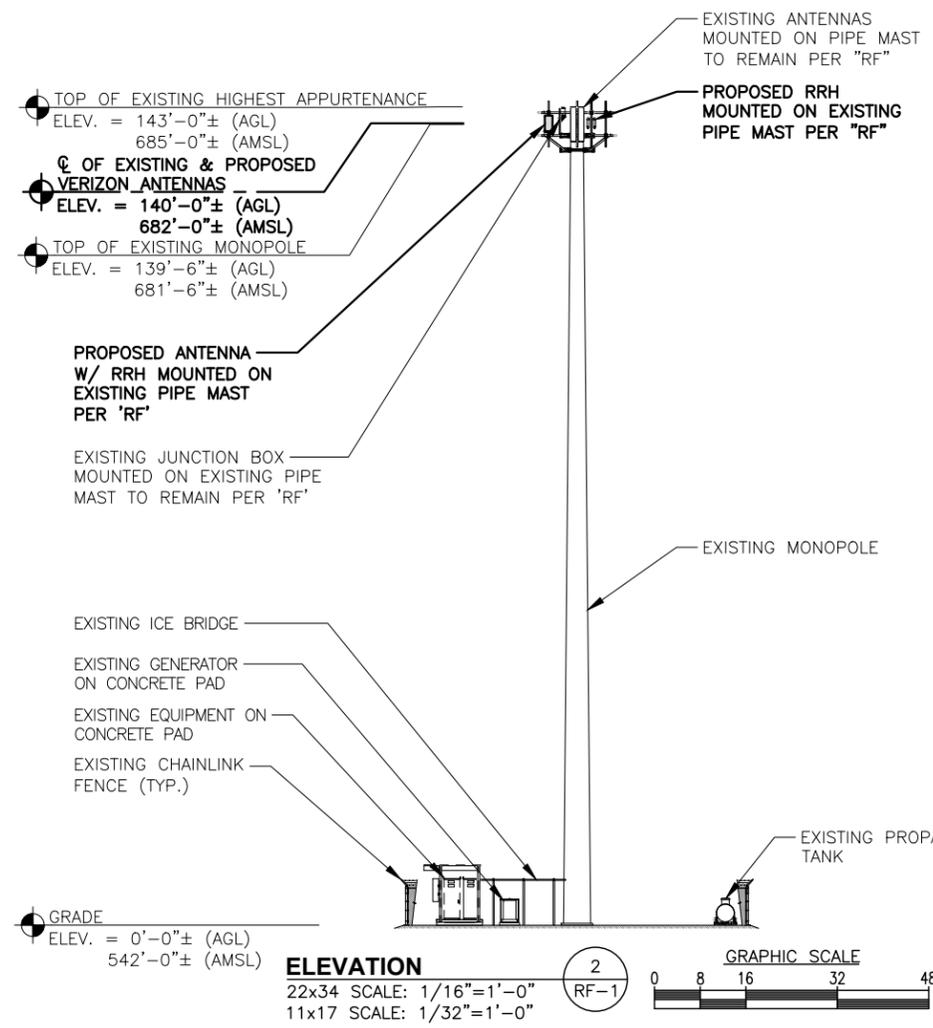
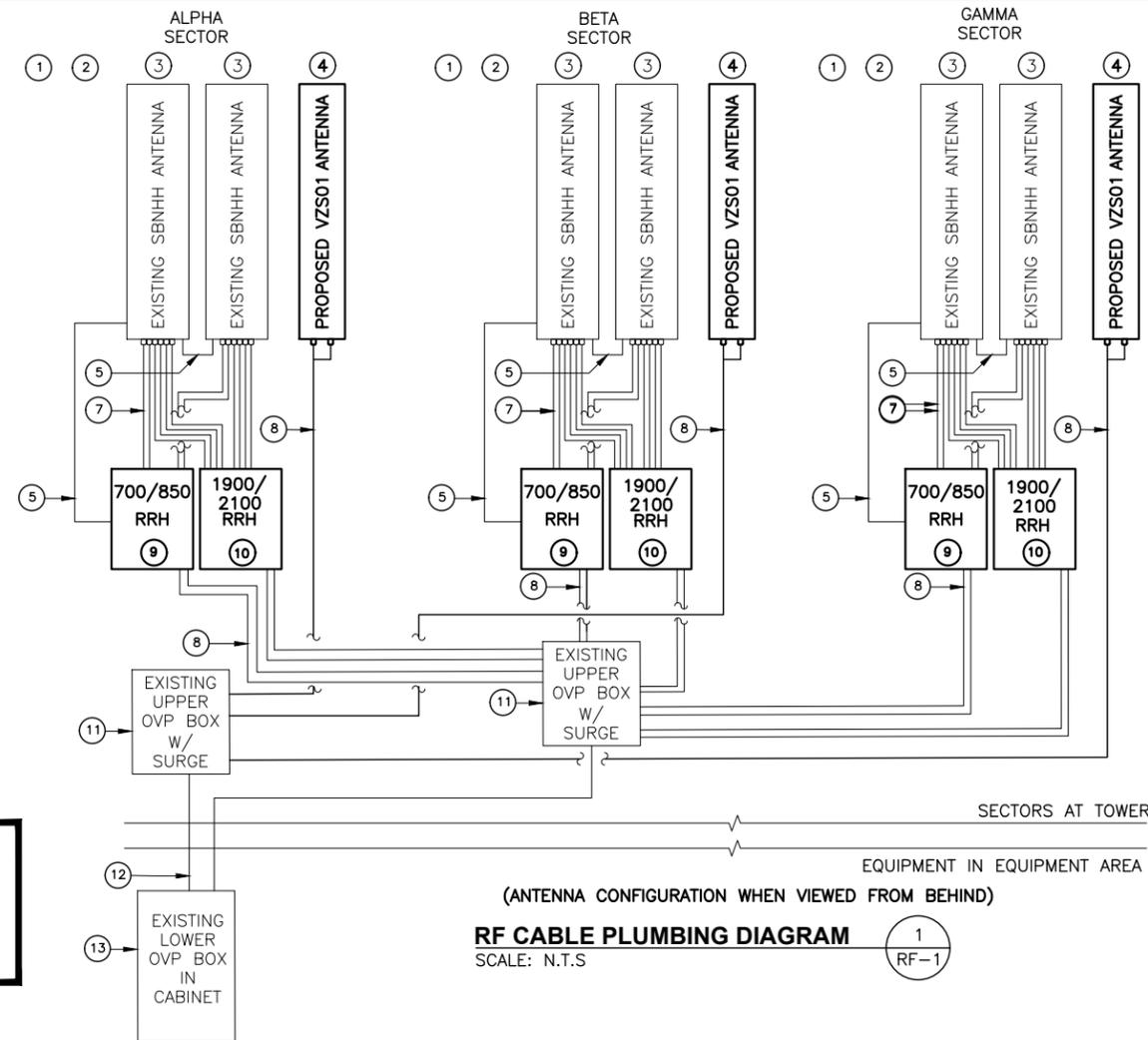
SHEET NUMBER  
SN-1

**BILL OF MATERIALS**

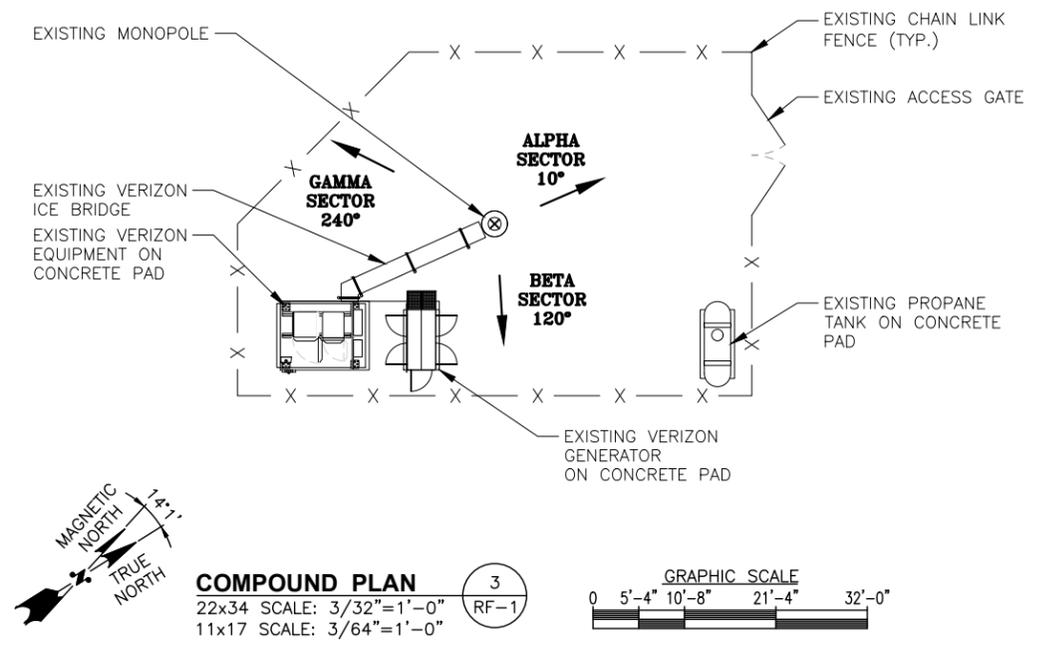
**SITE NAME: COVENTRY NORTHWEST CT**

ITEM	DESCRIPTION	QTY	LENGTH	COMMENTS
①				
②				
③	EXISTING SBNHH-1D65B ANTENNA	6		MOUNTED TO EXISTING PIPE MAST
④	PROPOSED VZS01 ANTENNA	3		MOUNTED TO EXISTING PIPE MAST
⑤	EXISTING RET CABLES	6		ROUTED FROM RRH TO ANTENNA OR ANTENNA TO ANTENNA
⑦	EXISTING 1/2" TOP COAX JUMPERS	24	10 FT.	ROUTE FROM RRH TO ANTENNA
⑦	PROPOSED 1/2" TOP COAX JUMPERS	12	10 FT.	ROUTE FROM RRH TO ANTENNA
⑧	PROPOSED SAMSUNG FIBER JUMPER CABLES	9	10 FT.	ROUTE FROM OVP TO RRH/ANTENNA
⑧	PROPOSED SAMSUNG POWER JUMPER CABLES	9	10 FT.	ROUTE FROM OVP TO RRH/ANTENNA
⑨	PROPOSED LTE 700/850 RRH	3		SAMSUNG RRH B5/B13 RRH-BR04C BALLAST MOUNT MOUNTED
⑩	PROPOSED PCS/AWS 1900/2100 RRH	3		SAMSUNG RRH B2/B66A RRH-BR049 BALLAST MOUNT MOUNTED
⑪	EXISTING UPPER 6 OVP	2		MOUNTED TO EXISTING PIPE MAST
⑫	EXISTING 6X12 HYBRID CABLE	2		ROUTE FROM EQUIPMENT TO ANTENNA SECTOR
⑬	EXISTING LOWER OVP	2		MOUNTED INSIDE CABINET

THE ABOVE RF-BOM SHEET IS BASED ON INFORMATION LISTED ON ANTENNA RECOMMENDATION SHEET DATED 01/22/21



**NOTE:**  
PROPOSED VZS01 ANTENNA SIZE AND WEIGHT ARE NOT TO EXCEED:  
DIMENSIONS H35.12"xW16.06"xD5.51"  
WEIGHT (INCLUDING INTEGRATED RRH) 87.1 LBS



PREPARED FOR: CELLCO PARTNERSHIP D.B.A.



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

CHECKED BY: JX

APPROVED BY: DPH

**SUBMITTALS**

REV.	DATE	DESCRIPTION	BY
0	03/19/21	ISSUED FOR CONSTRUCTION	MR

SITE NAME:  
**COVENTRY NORTHWEST CT**

SITE ADDRESS:  
FOLLY LANE  
COVENTRY, CT 06238

SHEET TITLE  
**RF PLUMBING DIAGRAM & BILL OF MATERIALS**

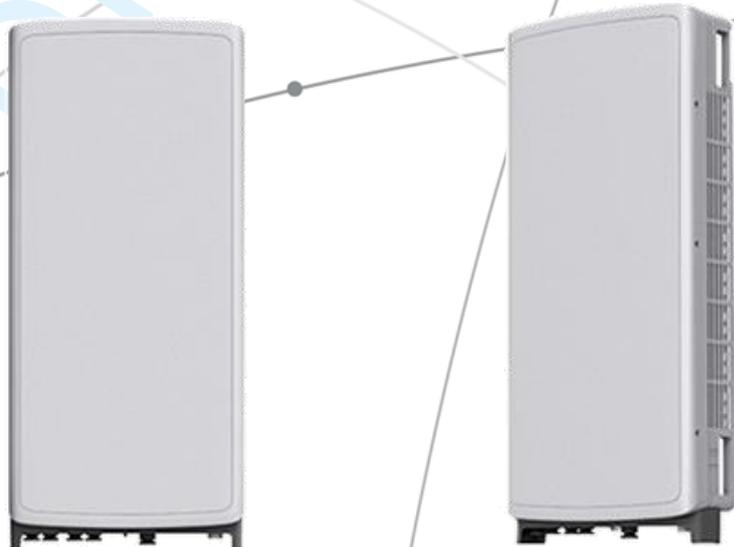
SHEET NUMBER  
**RF-1**

## **SAMSUNG** C-Band 64T64R Massive MIMO

C-Band 64T64R Massive MIMO Radio  
for High Capacity and Wide Coverage

Samsung C-Band 64T64R Massive MIMO Radio enables mobile operators to increase coverage range, boost data speeds and ultimately offer enriched 5G experiences to users in the U.S..

**Model Code :** MT6407-77A

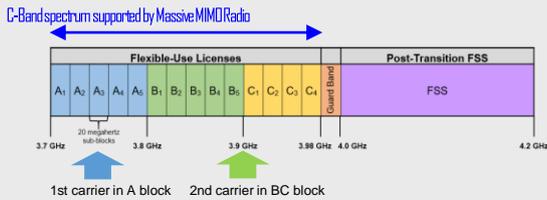


## Points of Differentiation

### Wide Bandwidth

Being able to support up to 2 CC carrier configuration, Samsung C-Band massive MIMO Radio supports 200 MHz bandwidth in the C-Band spectrum.

Samsung C-Band massive MIMO Radio uses C-Band 280 MHz spectrum at the same time, so it can cover all the bands the operator can be auctioned.



### Future Proof Product

Samsung C-Band Massive MIMO radio supports eCPRI interface, thus, it can be used as O-RAN Massive MIMO Radio in the future. To provide O-RAN service, operators only need to update software since the hardware is already ready.

With the support of O-RAN, operators can reduce OPEX/CAPEX by increasing compatibility between equipment and get opportunity to design and develop their network with best-in-class solution that interoperate.



### Enhanced Performance

C-Band massive MIMO Radio creates sharp beams and extends networks' coverage on the critical mid-band spectrum using a large number of antenna elements and high output power to boost data speeds.

This helps operators reduce their CAPEX as they now need less products to cover the same area than before.

Furthermore, as C-Band massive MIMO Radio supports MU-MIMO (Multi-user MIMO), it enables increased user throughput by minimizing interference.



### Well Matched Design

Samsung's C-Band Massive MIMO radio utilizes 64 antennas, supports up to 280MHz bandwidth, and delivers a 200W output power. Despite the above advanced performance, the Radio has a compact size of 48L and 87.1 lbs. This makes it easy to install the Radio.

It is designed to look solid and small, and in particular, the design with wrap around has a thinly looking effect so that it can be harmonized with the surrounding environment when installed.



## Technical Specifications

Item	Specification
Tech	NR
Brand	n77
Frequency Band	3700-3980 MHz
EIRP	78.5dBm (53.0 dBm+25.5 dB)
IBW/OBW	280 MHz / 200 MHz
Installation	Pole/Wall
Size/Weight	16.06 x 35.12 x 5.51 inch (50.95L) / 87.1 lbs

DRAFT

## **About Samsung Electronics Co., Ltd.**

Samsung inspires the world and shapes the future with transformative ideas and technologies. The company is redefining the worlds of TVs, smartphones, wearable devices, tablets, digital appliances, network systems, and memory, system LSI, foundry and LED solutions.

129 Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, Korea

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# SAMSUNG

## Dual-Band Radio Unit AWS/PCS (B66/B2)

RFV01U-D1A

Samsung's RFV01U-D1A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.



The RFV01U-D1A RU targets dual-band support across Band 66 (AWS) and Band 2 (PCS), making it an ideal product for broad coverage footprints across multiple common mid-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung's CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

### Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation
- Built-in Broadcast Auxiliary Services (BAS) filter ensures compliant AWS operation without impacting footprint

### Key Technical Specifications

Duplex Type: FDD

Operating Frequencies:

B66: DL(2,110-2,180MHz)/UL(1,710-1,780MHz)

B2: DL(1,930-1,990MHz)/UL(1,850-1,910MHz)

Instantaneous Bandwidth:

70MHz(B66) + 60MHz(B2)

RF Chain: 4T4R/2T4R/2T2R

Output Power: Total 320W

DU-RU Interface: CPRI (10Gbps)

Dimensions: 380 x 380 x 255mm (36.8L)

Weight: 38.3kg

Input Power: -48V DC

Operating Temp.: -40 - 55°(w/o solar load)

Cooling: Natural convection

# SAMSUNG

## Dual-Band Radio Unit 700/850MHz (B13/B5) RFV01U-D2A

Samsung's RFV01U-D2A is a compact remote Radio Unit (RU) designed for deployments that require flexibility in installation and rapid onlining, without compromising on coverage, capacity or operational expenses.



The RFV01U-D2A RU targets dual-band support across Band 13 (700MHz) and Band 5 (850MHz), making it an ideal product for broad coverage footprints across multiple common low-end, long-range frequencies.

The RU handles all Radio Frequency (RF) processing in a single, compact unit, and is designed to interface via CPRI with Samsung's CDU baseband offerings, in both distributed- and central-RAN configurations.

In addition to its minimal footprint and ease of installation, the RU is also designed to reduce cost of ownership through its integrated spectrum analyzer, which allows for remote RF monitoring, greatly reducing the need for on-site maintenance visits.

### Features and Benefits

- Dual-band support for broad frequency coverage
- Minimal footprint reduces site costs
- Rapid, easy installation
- Flexibly deployable in any location
- Remote RF monitoring capability
- Convection cooled, silent operation

### Key Technical Specifications

Duplex Type: FDD  
Operating Frequencies:  
B13: DL(746-756MHz)/UL(777-787MHz)  
B5: DL(869-894MHz)/UL(824-849MHz)  
Instantaneous Bandwidth: 10MHz(B13) + 25MHz(B5)  
RF Chain: 4T4R/2T4R/2T2R  
Output Power: Total 320W  
DU-RU Interface: CPRI (10Gbps)  
Dimensions: 380 x 380 x 207mm (29.9L)  
Weight: 31.9kg  
Input Power: -48V DC  
Operating Temp.: -40 - 55°(w/o solar load)  
Cooling: Natural convection

# Attachment 3

Site Name: **COVENTRY NORTHWEST CT**  
 Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissible Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(%)
VZW 700	751	4	693	2772	140	0.0051	0.5007	1.02%
VZW Cellular	874	4	825	3302	140	0.0061	0.5827	1.04%
VZW PCS	1975	4	1587	6347	140	0.0116	1.0000	1.16%
VZW AWS	2120	4	1581	6322	140	0.0116	1.0000	1.16%
VZW CBAND	3730.005	4	6531	26125	140	0.0479	1.0000	4.79%
<b>Total Percentage of Maximum Permissible Exposure</b>								9.17%

\*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992  
 \*\*Calculation includes a -10 dB Off Beam Antenna Pattern Adjustment pursuant to Attachments B and C of the Siting Council's November 10, 2015 Memorandum for Exempt Modification filings

MHz = Megahertz  
 mW/cm<sup>2</sup> = milliwatts per square centimeter  
 ERP = Effective Radiated Power

Absolute worst case maximum values used.

# Attachment 4

# STRUCTURAL ANALYSIS REPORT

For

**SITE NAME: COVENTRY NORTHWEST CT**

Folly Lane  
Coventry, CT 06238

**Antennas Mounted on Monopole**



Prepared for:

**verizon**<sup>v</sup>

20 Alexander Drive  
Wallingford CT 06492

Dated: March 16, 2021

Prepared by:

**HGD** **HUDSON**  
Design Group LLC

45 Beechwood Drive  
North Andover, MA 01845  
(P) 978.557.5553 (F) 978.336.5586  
[www.hudsondesigngroupllc.com](http://www.hudsondesigngroupllc.com)



### SCOPE OF WORK:

Hudson Design Engineering, PLLC (HDG) has been authorized by Verizon to conduct a structural evaluation of the 140' monopole supporting the proposed Verizon's antennas located at elevation 140' above the ground level.

This report represents this office's findings, conclusions and recommendations pertaining to the support of Verizon's existing and proposed antennas listed below.

The following documents were used for our reference:

- Structural Design Report prepared by Sabre Industries dated October 15, 2018.
- HDG Geotechnical Evaluation of Subsurface Conditions dated March 2, 2018.
- Tower Mapping Report prepared by ProVertic LLC dated January 9, 2020.
- Mount Structural Analysis Report prepared by Maser Consulting dated March 10, 2021.

### CONCLUSION SUMMARY:

Based on our evaluation, we have determined that the existing tower is in conformance with the ANSI/TIA-222-G Standard for the loading considered under the criteria listed in this report. The tower structure is rated at 21.9 % - (Base Plate at EL.0' Controlling).

### FOUNDATION SUMMARY:

Based on our evaluation, we have determined that the existing foundation is in conformance with the ANSI/TIA-222-G Standard for the loading considered under the criteria listed in this report. The monopole structure is rated at 45.3 % - (Shear Controlling).



**APPURTENANCES CONFIGURATION:**

Tenant	Appurtenances	Elev.	Mount
Verizon	(6) SBNHH-1D65B Antennas	140'	Platform
Verizon	(2) Junction Boxes	140'	Platform
Verizon	<b>(3) VZS01 Antenna</b>	140'	Platform
Verizon	<b>(3) B2/B66A RRH-BR049 RRH's</b>	140'	Platform
Verizon	<b>(3) B5/B13 RRH-BR04C RRH's</b>	140'	Platform

*\*Proposed Verizon Appurtenances shown in Bold.*

**VERIZON EXISTING COAX CABLES:**

Tenant	Coax Cables	Elev.	Mount
Verizon	(2) 6x12 Hybrid Cables	140'	Within Pole

*\*Proposed Verizon Coax Cables shown in Bold.*

**ANALYSIS RESULTS SUMMARY:**

Component	Max. Stress Ratio	Elev. of Component (ft)	Pass/Fail	Comments
Pole Section-L1	11.9 %	93 - 140	PASS	
Pole Section-L2	12.9 %	45.75 - 93	PASS	
Pole Section-L3	17.2 %	0 - 47.75	PASS	
Base Plate	<b>21.9 %</b>	0	PASS	<b>Controlling</b>

**FOUNDATION COMPARISON SUMMARY:**

	Stress Ratio	Pass/Fail	Comments
Bearing	19.5 %	PASS	
Overturning	14.9 %	PASS	
Moment	11.0 %	PASS	
Shear	<b>45.3 %</b>	PASS	<b>Controlling</b>



**HUDSON**  
Design Group LLC

#### **DESIGN CRITERIA:**

1. EIA/TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

County: Tolland

Basic Wind Speed: 105 mph (per TIA-222-G)

Structural Class: II

Exposure Category: C

Topographic Category: 1

Nominal Ice Thickness: 1 inch

2. Approximate height above grade to proposed antennas: 140'

**\*Calculations and referenced documents are attached.**

#### **ASSUMPTIONS:**

1. The appurtenances configuration is as stated in this report. All antennas, coax cables and waveguide cables are assumed to be properly installed and supported as per the manufacturer's requirements.
2. The monopole and foundation are properly constructed and maintained. All structural members and their connections are assumed to be in good condition and are free from defects with no deterioration to its member capacities.
3. The support mounts and platforms are not analyzed and are considered adequate to support the loading. The analysis is limited to the primary support structure itself.

#### **SUPPORT RECOMMENDATIONS:**

HDG recommends that the proposed antennas, and RRHs be mounted on the existing platform supported by the monopole.

Reference HDG's Latest Construction Drawings for all component and connection requirements (attached).



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Design Group LLC

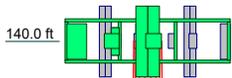


**Photo 1:** Photo illustrating the Monopole with Appurtenances shown.



**HUDSON**  
Design Group LLC

## CALCULATIONS



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Platform	140	Junction Box	140
SBNHH-1D65B Antenna w/ Mounting Pipe	140	Junction Box	140
		VZS01 Antenna w/ Mounting Pipe	140
SBNHH-1D65B Antenna w/ Mounting Pipe	140	VZS01 Antenna w/ Mounting Pipe	140
		VZS01 Antenna w/ Mounting Pipe	140
SBNHH-1D65B Antenna w/ Mounting Pipe	140	B2/B66A RRH-BR049 RRH	140
		B2/B66A RRH-BR049 RRH	140
SBNHH-1D65B Antenna w/ Mounting Pipe	140	B2/B66A RRH-BR049 RRH	140
		B2/B66A RRH-BR049 RRH	140
SBNHH-1D65B Antenna w/ Mounting Pipe	140	B5/13 RRH-BR04C RRH	140
		B5/13 RRH-BR04C RRH	140
SBNHH-1D65B Antenna w/ Mounting Pipe	140	B5/13 RRH-BR04C RRH	140

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

### TOWER DESIGN NOTES

1. Tower is located in Tolland County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 105 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 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. TOWER RATING: 21.9%

Section	1	2	3	
Length (ft)	47.00	53.50	53.25	
Number of Sides	18	18	18	
Thickness (in)	0.3750	0.5000	0.5000	
Socket Length (ft)	6.25	8.50		
Top Dia (in)	28.2500	41.7712	56.5328	
Bot Dia (in)	44.7100	60.5100	75.1800	
Grade		A572-65		
Weight (lb)	6872.9	14630.7	18794.0	40297.6

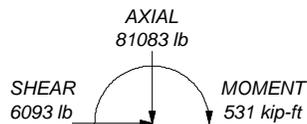
140.0 ft

93.0 ft

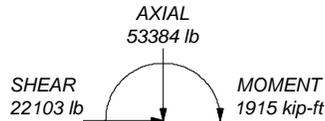
45.8 ft

1.0 ft

ALL REACTIONS ARE FACTORED



TORQUE 1 kip-ft  
50 mph WIND - 1.0000 in ICE



TORQUE 3 kip-ft  
REACTIONS - 105 mph WIND

<b>Hudson Design Group</b> 45 Beechwood Drive North Andover, MA Phone: 978.557.5553 FAX: 978.336.5586	Job: <b>CONVENTRY NORTHWEST CT</b>		
	Project: <b>5GSB6 2021</b>		
	Client: VERIZON	Drawn by: ID	App'd:
	Code: TIA-222-G	Date: 03/17/21	Scale: NTS
	Path:		Dwg No. E-1

<b>tnxTower</b>  <b>Hudson Design Group</b> 45 Beechwood Drive North Andover, MA Phone: 978.557.5553 FAX: 978.336.5586	<b>Job</b> CONVENTRY NORTHWEST CT	<b>Page</b> 1 of 5
	<b>Project</b> 5GSB6 2021	<b>Date</b> 08:41:20 03/17/21
	<b>Client</b> VERIZON	<b>Designed by</b> ID

## Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Tolland County, Connecticut.

Basic wind speed of 105 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 1.0000 in.

Ice thickness is considered to increase with height.

Ice density of 56 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.

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.

## 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	140.00-93.00	47.00	6.25	18	28.2500	44.7100	0.3750	1.5000	A572-65 (65 ksi)
L2	93.00-45.75	53.50	8.50	18	41.7712	60.5100	0.5000	2.0000	A572-65 (65 ksi)
L3	45.75-1.00	53.25		18	56.5328	75.1800	0.5000	2.0000	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	28.6280	33.1782	3257.0188	9.8956	14.3510	226.9541	6518.3233	16.5923	4.3120	11.499
	45.3419	52.7697	13104.3589	15.7389	22.7127	576.9622	26225.9608	26.3899	7.2090	19.224
L2	44.5613	65.4973	14094.6640	14.6513	21.2198	664.2237	28207.8741	32.7549	6.4717	12.943
	61.3663	95.2359	43329.6576	21.3036	30.7391	1409.5951	86716.3295	47.6270	9.7698	19.54
L3	60.3502	88.9241	35272.9202	19.8916	28.7187	1228.2229	70592.2534	44.4705	9.0698	18.14
	76.2626	118.5172	83507.8505	26.5114	38.1914	2186.5594	167125.582	59.2698	12.3517	24.703

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Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor $A_f$	Adjust. Factor $A_r$	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft <sup>2</sup>	in					in	in	in
L1 140.00-93.00				1	1	1			
L2 93.00-45.75				1	1	1			
L3 45.75-1.00				1	1	1			

### Monopole Base Plate Data

Base Plate Data	
Base plate is square	√
Base plate is grouted	
Anchor bolt grade	A615
Anchor bolt size	2.2500 in
Number of bolts	28
Embedment length	60.0000 in
$f_c$	4.5 ksi
Grout space	2.0000 in
Base plate grade	A572-50
Base plate thickness	2.7500 in
Bolt circle diameter	82.7500 in
Outer diameter	83.5000 in
Inner diameter	75.1800 in
Base plate type	Plain Plate

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		$C_{AA}$ ft <sup>2</sup> /ft	Weight plf
6X12 HYBRID FIBER CABLES	C	No	Yes	Inside Pole	141.00 - 1.00	2	No Ice	0.00	2.18
							1/2" Ice	0.00	2.18
							1" Ice	0.00	2.18

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight lb
L1	140.00-93.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	204.92
L2	93.00-45.75	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	206.01
L3	45.75-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	195.11

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight lb
L1	140.00-93.00	A	2.266	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	204.92
L2	93.00-45.75	A	2.152	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	206.01
L3	45.75-1.00	A	1.933	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	195.11

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight lb	
Platform	C	From Face	0.00	0.0000	140.00	No Ice	51.00	51.00	2245.02
			0.00			1/2" Ice	65.70	65.70	2635.00
			0.00			1" Ice	80.40	80.40	3024.98
SBNHH-1D65B Antenna w/ Mounting Pipe	A	From Face	3.00	0.0000	140.00	No Ice	8.20	6.85	62.90
			-0.50			1/2" Ice	8.66	7.81	129.42
			0.00			1" Ice	9.13	8.64	203.78
SBNHH-1D65B Antenna w/ Mounting Pipe	A	From Face	3.00	0.0000	140.00	No Ice	8.20	6.85	62.90
			0.50			1/2" Ice	8.66	7.81	129.42
			0.00			1" Ice	9.13	8.64	203.78
SBNHH-1D65B Antenna w/ Mounting Pipe	B	From Face	3.00	0.0000	140.00	No Ice	8.20	6.85	62.90
			-0.50			1/2" Ice	8.66	7.81	129.42
			0.00			1" Ice	9.13	8.64	203.78
SBNHH-1D65B Antenna w/ Mounting Pipe	B	From Face	3.00	0.0000	140.00	No Ice	8.20	6.85	62.90
			0.50			1/2" Ice	8.66	7.81	129.42
			0.00			1" Ice	9.13	8.64	203.78
SBNHH-1D65B Antenna w/ Mounting Pipe	C	From Face	3.00	0.0000	140.00	No Ice	8.20	6.85	62.90
			-0.50			1/2" Ice	8.66	7.81	129.42
			0.00			1" Ice	9.13	8.64	203.78
SBNHH-1D65B Antenna w/ Mounting Pipe	C	From Face	3.00	0.0000	140.00	No Ice	8.20	6.85	62.90
			0.50			1/2" Ice	8.66	7.81	129.42
			0.00			1" Ice	9.13	8.64	203.78
Junction Box	C	From Leg	2.00	0.0000	140.00	No Ice	3.78	2.51	32.00
			0.00			1/2" Ice	4.03	2.72	63.40
			0.00			1" Ice	4.29	2.94	98.56
Junction Box	C	From Leg	2.00	0.0000	140.00	No Ice	3.78	2.51	32.00
			0.00			1/2" Ice	4.03	2.72	63.40
			0.00			1" Ice	4.29	2.94	98.56
**									
VZS01 Antenna w/ Mounting Pipe	A	From Face	3.00	0.0000	140.00	No Ice	6.54	3.37	118.90
			6.00			1/2" Ice	7.10	4.10	169.80
			0.00			1" Ice	7.60	4.70	226.53
VZS01 Antenna w/ Mounting Pipe	B	From Face	3.00	0.0000	140.00	No Ice	6.54	3.37	118.90
			6.00			1/2" Ice	7.10	4.10	169.80
			0.00			1" Ice	7.60	4.70	226.53
VZS01 Antenna w/ Mounting Pipe	C	From Face	3.00	0.0000	140.00	No Ice	6.54	3.37	118.90
			6.00			1/2" Ice	7.10	4.10	169.80

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	CAAA Front	CAAA Side	Weight	
			Horz	Vert						
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	lb	
B2/B66A RRH-BR049 RRH	A	From Face	0.00		0.0000	140.00	1" Ice	7.60	4.70	226.53
			1.50				No Ice	1.88	1.25	98.00
			-0.50				1/2" Ice	2.05	1.39	116.34
			0.00				1" Ice	2.22	1.54	137.47
B2/B66A RRH-BR049 RRH	B	From Face	1.50		0.0000	140.00	No Ice	1.88	1.25	98.00
			-0.50				1/2" Ice	2.05	1.39	116.34
			0.00				1" Ice	2.22	1.54	137.47
			1.50				No Ice	1.88	1.25	98.00
B2/B66A RRH-BR049 RRH	C	From Face	-0.50		0.0000	140.00	1/2" Ice	2.05	1.39	116.34
			0.00				1" Ice	2.22	1.54	137.47
			1.50				No Ice	1.88	1.25	98.00
			-0.50				1/2" Ice	2.05	1.39	116.34
B5/13 RRH-BR04C RRH	A	From Face	0.00		0.0000	140.00	1" Ice	2.22	1.54	137.47
			1.50				No Ice	1.88	1.01	82.00
			3.00				1/2" Ice	2.05	1.14	98.43
			0.00				1" Ice	2.22	1.28	117.53
B5/13 RRH-BR04C RRH	B	From Face	1.50		0.0000	140.00	No Ice	1.88	1.01	82.00
			3.00				1/2" Ice	2.05	1.14	98.43
			0.00				1" Ice	2.22	1.28	117.53
			1.50				No Ice	1.88	1.01	82.00
B5/13 RRH-BR04C RRH	C	From Face	3.00		0.0000	140.00	1/2" Ice	2.05	1.14	98.43
			0.00				1" Ice	2.22	1.28	117.53
			1.50				No Ice	1.88	1.01	82.00
			3.00				1/2" Ice	2.05	1.14	98.43
			0.00				1" Ice	2.22	1.28	117.53

### Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual	Actual	Actual	Actual	Controlling Condition	Ratio
			Allowable Ratio Bolt Tension	Allowable Ratio Bolt Compression	Allowable Ratio Plate Stress	Allowable Ratio Stiffener Stress		
in		in	lb	lb	ksi	ksi		
2.7500	28	2.2500	38157.33	41583.97	9.869		Plate	0.22
			201288.96	334139.67	45.000			
			0.19	0.12	0.22			

### Compression Checks

### Pole Design Data

Section No.	Elevation	Size	L	L <sub>u</sub>	Kl/r	A	P <sub>u</sub>	φP <sub>n</sub>	Ratio P <sub>u</sub> /φP <sub>n</sub>
	ft		ft	ft		in <sup>2</sup>	lb	lb	
L1	140 - 93 (1)	TP44.71x28.25x0.375	47.00	139.00	111.5	50.1645	-11334.20	911837.00	0.012
L2	93 - 45.75 (2)	TP60.51x41.7712x0.5	53.50	139.00	82.4	90.5111	-27235.80	2943110.00	0.009
L3	45.75 - 1 (3)	TP75.18x56.5328x0.5	53.25	139.00	62.9	118.517	-53381.10	5076440.00	0.011
						0			

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### Pole Bending Design Data

Section No.	Elevation ft	Size	$M_{ux}$	$\phi M_{ux}$	Ratio	$M_{uy}$	$\phi M_{uy}$	Ratio
			kip-ft	kip-ft	$\frac{M_{ux}}{\phi M_{ux}}$	kip-ft	kip-ft	$\frac{M_{uy}}{\phi M_{uy}}$
L1	140 - 93 (1)	TP44.71x28.25x0.375	333.56	3126.96	0.107	0.00	3126.96	0.000
L2	93 - 45.75 (2)	TP60.51x41.7712x0.5	908.94	7602.62	0.120	0.00	7602.62	0.000
L3	45.75 - 1 (3)	TP75.18x56.5328x0.5	1915.27	11864.00	0.161	0.00	11864.00	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual	$\phi V_n$	Ratio	Actual	$\phi T_n$	Ratio
			$V_u$ lb	lb	$\frac{V_u}{\phi V_n}$	$T_u$ kip-ft	kip-ft	$\frac{T_u}{\phi T_n}$
L1	140 - 93 (1)	TP44.71x28.25x0.375	10128.20	1805880.00	0.006	0.69	6269.97	0.000
L2	93 - 45.75 (2)	TP60.51x41.7712x0.5	15554.50	3244190.00	0.005	3.42	15243.92	0.000
L3	45.75 - 1 (3)	TP75.18x56.5328x0.5	22109.60	3858370.00	0.006	3.42	23781.08	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\frac{P_u}{\phi P_n}$	$\frac{M_{ux}}{\phi M_{ux}}$	$\frac{M_{uy}}{\phi M_{uy}}$	$\frac{V_u}{\phi V_n}$	$\frac{T_u}{\phi T_n}$			
L1	140 - 93 (1)	0.012	0.107	0.000	0.006	0.000	0.119	1.000	4.8.2 ✓
L2	93 - 45.75 (2)	0.009	0.120	0.000	0.005	0.000	0.129	1.000	4.8.2 ✓
L3	45.75 - 1 (3)	0.011	0.161	0.000	0.006	0.000	0.172	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	140 - 93	Pole	TP44.71x28.25x0.375	1	-11334.20	911837.00	11.9	Pass
L2	93 - 45.75	Pole	TP60.51x41.7712x0.5	2	-27235.80	2943110.00	12.9	Pass
L3	45.75 - 1	Pole	TP75.18x56.5328x0.5	3	-53381.10	5076440.00	17.2	Pass
Summary								
Pole (L3)							17.2	Pass
Base Plate							21.9	Pass
<b>RATING =</b>							<b>21.9</b>	<b>Pass</b>

# Monopole Pier and Pad Foundation

**Site Name:** COVENTRY NORTHWEST CT

**Designed By:** ID

TIA-222 Revision: G

Design Reactions		
Shear, <b>S:</b>	22.103	kips
Moment, <b>M:</b>	1915	ft-kips
Tower Height, <b>H:</b>	140	ft
Tower Weight, <b>Wt:</b>	53.384	kips
Base Diameter, <b>BD:</b>	6.27	ft

Foundation Dimensions		
Depth, <b>D:</b>	6	ft
Pad Width, <b>W:</b>	33.5	ft
Neglected Depth, <b>N:</b>	0	ft
Thickness, <b>T:</b>	2.00	ft
Pier Diameter, <b>Pd:</b>	10.00	ft
Ext. Above Grade, <b>E:</b>	0.50	ft
BP Dist. Above Pier:	0.5	in.
Clear Cover, <b>Cc:</b>	3.0	in

Soil Properties		
Soil Unit Weight, <b>γ:</b>	0.110	kcf
Ult. Bearing Capacity, <b>Bc:</b>	8.0	ksf
Angle of Friction, <b>Φ:</b>	35	deg
Cohesion, <b>C<sub>o</sub>:</b>	0.000	ksf
Passive Pressure, <b>P<sub>p</sub>:</b>	0.000	ksf
Base Friction, <b>μ:</b>	0.30	

Material Properties		
Rebar Yield Strength, <b>F<sub>y</sub>:</b>	60000	psi
Concrete Strength, <b>F'<sub>c</sub>:</b>	4500	psi
Concrete Unit Weight, <b>δ<sub>c</sub>:</b>	0.150	kcf
Seismic Zone, <b>z:</b>	1	

Rebar Properties		
Pier Rebar Size, <b>Sp:</b>	9	
Pier Rebar Quantity, <b>mp:</b>	58	57
Pad Rebar Size, <b>Spad:</b>	9	
Pad Rebar Quantity, <b>mpad:</b>	74	9
Pier Tie Size, <b>St:</b>	5	3
Tie Quantity, <b>mt:</b>	8	5

Design Checks			
	Capacity/ Availability	Demand/ Limits	Check
<i>Req'd Pier Diam.(ft)</i>	10	8.265	<b>OK</b>
<i>Overturing (ft-kips)</i>	12826.09	1915.00	<b>14.9%</b>
<i>Shear Capacity (kips)</i>	222.63	22.10	<b>9.9%</b>
<i>Bearing (ksf)</i>	6.00	1.17	<b>19.5%</b>
<i>Pad Shear - 1-way (kips)</i>	826.65	374.17	<b>45.3%</b>
<i>Pad Shear - 2-way (kips)</i>	1814.48	129.96	<b>7.2%</b>
<i>Pad Moment Capacity (k-ft)</i>	6309.85	692.13	<b>11.0%</b>
<i>Pier Moment Capacity (k-ft)</i>	9815.92	2014.46	<b>20.5%</b>



Maser Consulting Connecticut  
2000 Midlantic Drive, Suite 100  
Mt. Laurel, NJ 08054  
(856) 797-0412  
peter.albano@colliersengineering.com

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## Antenna Mount Analysis Report and PMI Requirements

### Mount Analysis

SMART Tool Project #: 10037978  
Maser Consulting Connecticut Project #: 21777064A

March 10, 2021

#### Site Information

Site ID: 470423-VZW / Coventry North West CT - A  
Site Name: Coventry North West CT - A  
Carrier Name: Verizon Wireless  
Address: Folly Lane  
Coventry, Connecticut 06238  
Tolland County  
Latitude: 41.82399722°  
Longitude: -72.34826111°

#### Structure Information

Tower Type: 139.50-Ft Monopole  
Mount Type: 12.50-Ft Platform

FUZE ID # 16272150

#### Analysis Results

Platform: 34.3% Pass

#### **\*\*\*Contractor PMI Requirements:**

***Included at the end of this MA report***

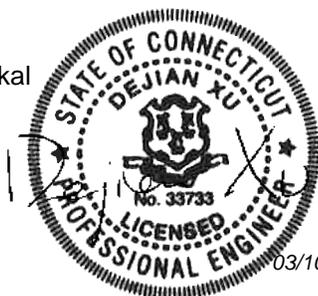
***Available & Submitted via portal at <https://pmi.vzwsmart.com>***

***Contractor – Please Review Specific Site PMI Requirements Upon Award***

***Requirements also Noted on Mount Modification Drawings***

***Requirements may also be Noted on A & E drawings***

Report Prepared By: Prasanna Dhakal



03/10/2021

## **Executive Summary:**

The objective of this report is to determine the capacity of the antenna support mount at the subject facility for the final wireless telecommunications configuration, per the applicable codes and standards. Any modification listed under Sources of Information was assumed completed and was included in this analysis.

This analysis is inclusive of the mount structure only and does not address the structural capacity of the supporting structure. This mounting frame was not analyzed as an anchor attachment point for fall protection. All climbing activities are required to have a fall protection plan completed by a competent person.

## **Sources of Information:**

<b>Document Type</b>	<b>Remarks</b>
<i>Radio Frequency Data Sheet (RFDS)</i>	<i>Verizon RFDS, Site ID: 5005160, dated January 22, 2021</i>
<i>Mount Mapping Report</i>	<i>Hudson Design Group, LLC, Site ID: 470423, dated February 25, 2021</i>

## **Analysis Criteria:**

Codes and Standards:	ANSI/TIA-222-H
Wind Parameters:	Basic Wind Speed (Ultimate 3-sec. Gust), $V_{ULT}$ : 119 mph Ice Wind Speed (3-sec. Gust): 50 mph Design Ice Thickness: 1.50 in Risk Category: II Exposure Category: C Topographic Category: 1 Topographic Feature Considered: N/A Topographic Method: N/A Ground Elevation Factor, $K_e$ : 0.981
Seismic Parameters:	$S_s$ : 0.185 $S_1$ : 0.055
Maintenance Parameters:	Wind Speed (3-sec. Gust): 30 mph Maintenance Live Load, $L_v$ : 250 lbs. Maintenance Live Load, $L_m$ : 500 lbs.
Analysis Software:	RISA-3D (V17)

### **Final Loading Configuration:**

The following equipment has been considered for the analysis of the mount:

Mount Elevation (ft)	Equipment Elevation (ft)	Quantity	Manufacturer	Model	Status
138.50	140.00	3	-	VZS01	Added
		3	Samsung	B2/B66A RRH-BR049	
		3	Samsung	B5/B13 RRH-BR04C	
		6	Andrew	SBNHH-1D65B	Retained
		2	Raycap	RC3DC-3315-PF-48	

### **Standard Conditions:**

1. All engineering services are performed on the basis that the information provided to Maser Consulting Connecticut and used in this analysis is current and correct. The existing equipment loading has been applied at locations determined from the supplied documentation. Any deviation from the loading locations specified in this report shall be communicated to Maser Consulting Connecticut to verify deviation will not adversely impact the analysis.
2. Mounts are assumed to have been properly fabricated, installed and maintained in good condition, twist free and plumb in accordance with its original design and manufacturer's specifications.

Obvious safety and structural issues/deficiencies noticed at the time of the mount mapping and reported in the Mount Mapping Report are assumed to be corrected and documented as part of the PMI process and are not considered in the mount analysis.

The mount analysis and the mount mapping are not a condition assessment of the mount. Proper maintenance and condition assessments are still required post analysis.

3. For mount analyses completed from other data sources (including new replacement mounts) and not specifically mapped by Maser Consulting Connecticut, the mounts are assumed to have been properly fabricated, installed and maintained in good condition, twist free and plumb in accordance with its original design and manufacturer's specifications.
4. All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
5. The mount was checked up to, and including, the bolts that fasten it to the mount collar/attachment and threaded rod connections in collar members if applicable. Local deformation and interaction between the mount collar/attachment and the supporting tower structure are outside the scope of this analysis.
6. All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. Maser Consulting Connecticut is not responsible for the conclusion, opinions, and recommendations made by others based on the information supplied.

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

**Discrepancies between in-field conditions and the assumptions listed above may render this analysis invalid unless explicitly approved by Maser Consulting Connecticut.**

**Analysis Results:**

Component	Utilization %	Pass/Fail
<i>Standoff Horizontal</i>	13.8%	Pass
<i>Inner Cross Arm</i>	6.5%	Pass
<i>Outer Cross Arm</i>	25.3%	Pass
<i>Grating Angle</i>	28.9%	Pass
<i>Vertical Pipe</i>	12.8%	Pass
<i>Face Horizontal</i>	31.5%	Pass
<i>Handrail</i>	31.0%	Pass
<i>Support Rail corner plate</i>	17.4%	Pass
<i>Kicker</i>	14.4%	Pass
<i>Mount Pipe</i>	32.8%	Pass
<i>Mount Connection (Bolt)</i>	9.7%	Pass
<i>Mount Connection (Plate)</i>	34.3%	Pass

<b>Structure Rating – (Controlling Utilization of all Components)</b>	<b>34.3%</b>
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**Recommendation:**

The existing mount is **SUFFICIENT** for the final loading configuration and do not require modifications.

ANSI/ASSP rigging plan review services compliant with the requirements of ANSI/TIA 322 are available for a Construction Class IV site or other, if required. Separate review fees will apply.

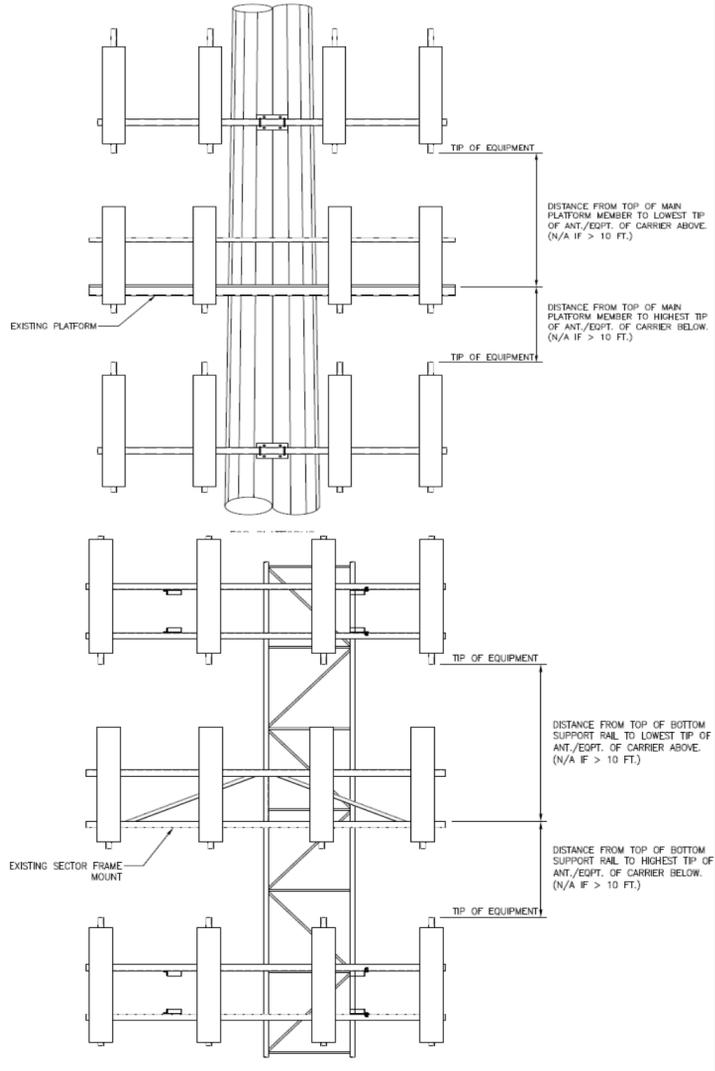
**Attachments:**

1. Mount Photos
2. Mount Mapping Report (for reference only)
3. Analysis Calculations
- 4. Contractor Required Post Installation Inspection (PMI) Report Deliverables**
5. Antenna Placement Diagrams
6. TIA Adoption and Wind Speed Usage Letter





Mount Azimuth (Degree) for Each Sector			Tower Leg Azimuth (Degree) for Each Sector			Sector B									
Sector A:	15.00	Deg	Leg A:		Deg	Ant <sub>1a</sub>									
Sector B:	135.00	Deg	Leg B:		Deg	Ant <sub>1b</sub>									
Sector C:	255.00	Deg	Leg C:		Deg	Ant <sub>1c</sub>									
Sector D:		Deg	Leg D:		Deg	Ant <sub>2a</sub>	B66a RRH 4x45	12.00	7.00	25.50	136.205	25.00	-7.00		61
<b>Climbing Facility Information</b>						Ant <sub>2b</sub>									
Location:	35.00	Deg				Ant <sub>2c</sub>									
Climbing Facility	Corrosion Type:	Good condition.				Ant <sub>3a</sub>	B13 RRH 4x30	12.00	9.00	21.50	136.372	23.00	-7.00		61
	Access:	Climbing path was obstructed.				Ant <sub>3b</sub>	(2) SBNHH-1D65B	12.00	7.00	73.00	135.538	33.00	9.00	135.00	61
	Condition:	Good condition.				Ant <sub>3c</sub>									



Ant <sub>4a</sub>															
Ant <sub>4b</sub>															
Ant <sub>4c</sub>															
Ant <sub>5a</sub>															
Ant <sub>5b</sub>															
Ant <sub>5c</sub>															
Ant on Standoff	(2) OVP	15.00	10.00	28.00											62
Ant on Standoff															
Ant on Tower															
Ant on Tower															

Sector C															
Ant <sub>1a</sub>															
Ant <sub>1b</sub>															
Ant <sub>1c</sub>															
Ant <sub>2a</sub>	B66a RRH 4x45	12.00	7.00	25.50	136.205	25.00	-7.00								63
Ant <sub>2b</sub>															
Ant <sub>2c</sub>															
Ant <sub>3a</sub>	B13 RRH 4x30	12.00	9.00	21.50	136.372	23.00	-7.00								63
Ant <sub>3b</sub>	(2) SBNHH-1D65B	12.00	7.00	73.00	135.538	33.00	9.00	255.00							63
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Ant on Standoff															
Ant on Tower															
Ant on Tower															

Observed Safety and Structural Issues During the Mount Mapping		
Issue #	Description of Issue	Photo #

1		
2	(2) 1-1/4" HYBRID CABLES	163
3	SAFETY CLIMB PATH OBSTRUCTED AT BOTH COLLAR MOUNTS	69
4	U-BOLTS MISSING AT SEVERAL CONNECTION POINTS (PHOTOS 72, 73, 90-94, 126-130)	72,73
5		
6		
7		
8		

**Mapping Notes**

1. Please report any visible structural or safety issues observed on the antenna mounts (Damaged members, loose connections, tilting mounts, safety climb issues, etc.)
2. If the thickness of the existing pipes or tubing can't be obtained from a general tool (such as Caliper), please use an ultrasonic measurement tool (thickness gauge) to measure the thickness.
3. Please create all required detail sketches of the mounts and insert them into the "Sketches" tab.
4. Please measure and enter the bolt sizes and types under the Members Box in the spreadsheet of the mount type.
5. Take and label the photos of the tower, mounts, connections, antennas and all measurements. Minimum 50 photos are required.
6. Please measure and report the size and length of all existing antenna mounting pipes.
7. Please measure and report the antenna information for all sectors.
8. Don't delete or rearrange any sheet or contents of any sheet from this mapping form.

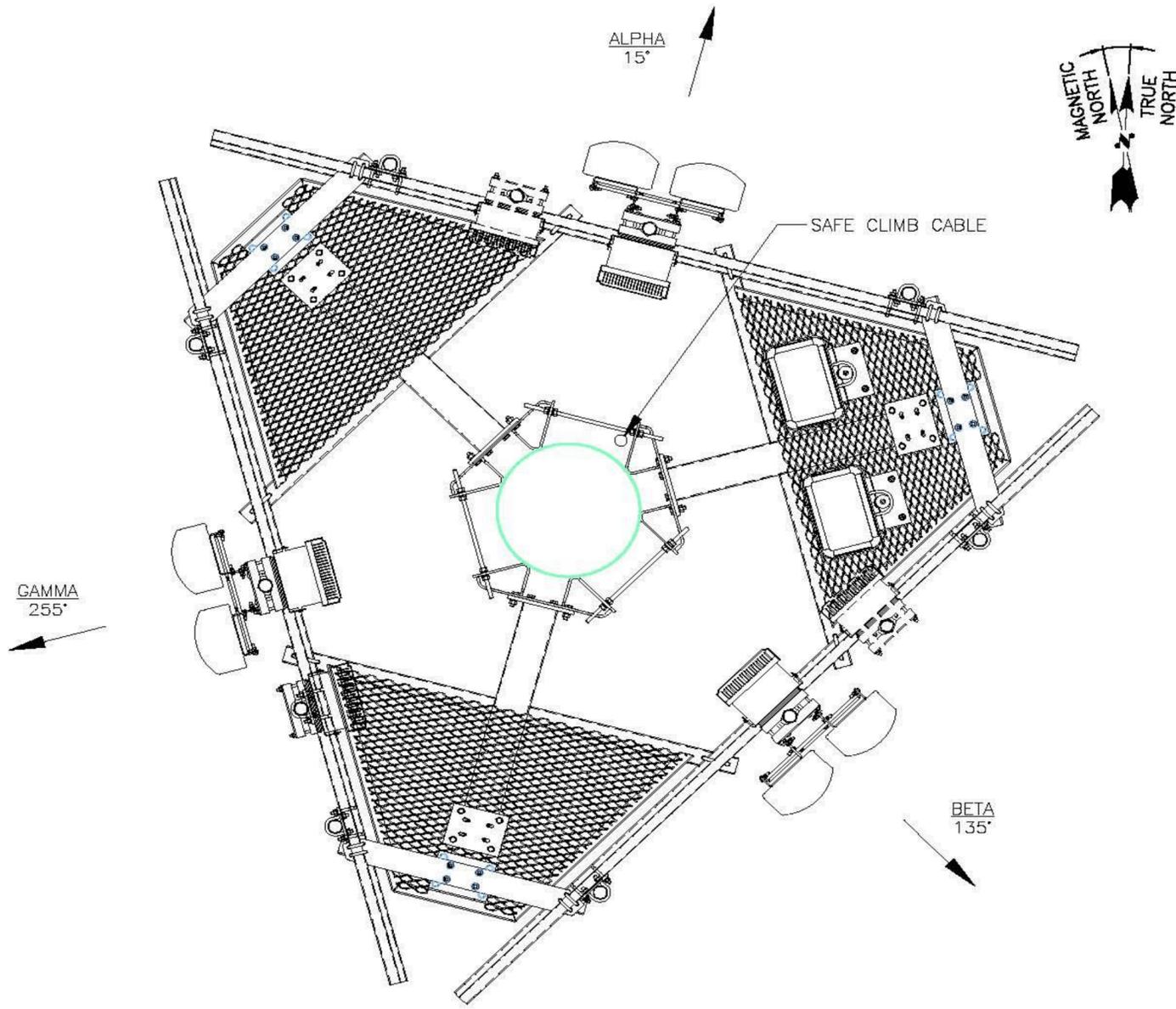
**Standard Conditions**

1. Obvious safety and structural issues/deficiencies noticed at the time of the mount mapping are to be reported in this mapping. However, this mount mapping is not a condition assessment of the mount.

Antenna Mount Mapping Form (PATENT PENDING)			FCC #	
	<b>Tower Owner:</b>	VZW	<b>Mapping Date:</b>	2/25/2021
	<b>Site Name:</b>	COVENTRY NORTHWEST CT	<b>Tower Type:</b>	Monopole
	<b>Site Number or ID:</b>	470423	<b>Tower Height (Ft.):</b>	139.5
	<b>Mapping Contractor:</b>	HUDSON DESIGN GROUP, LLC.	<b>Mount Elevation (Ft.):</b>	137.58

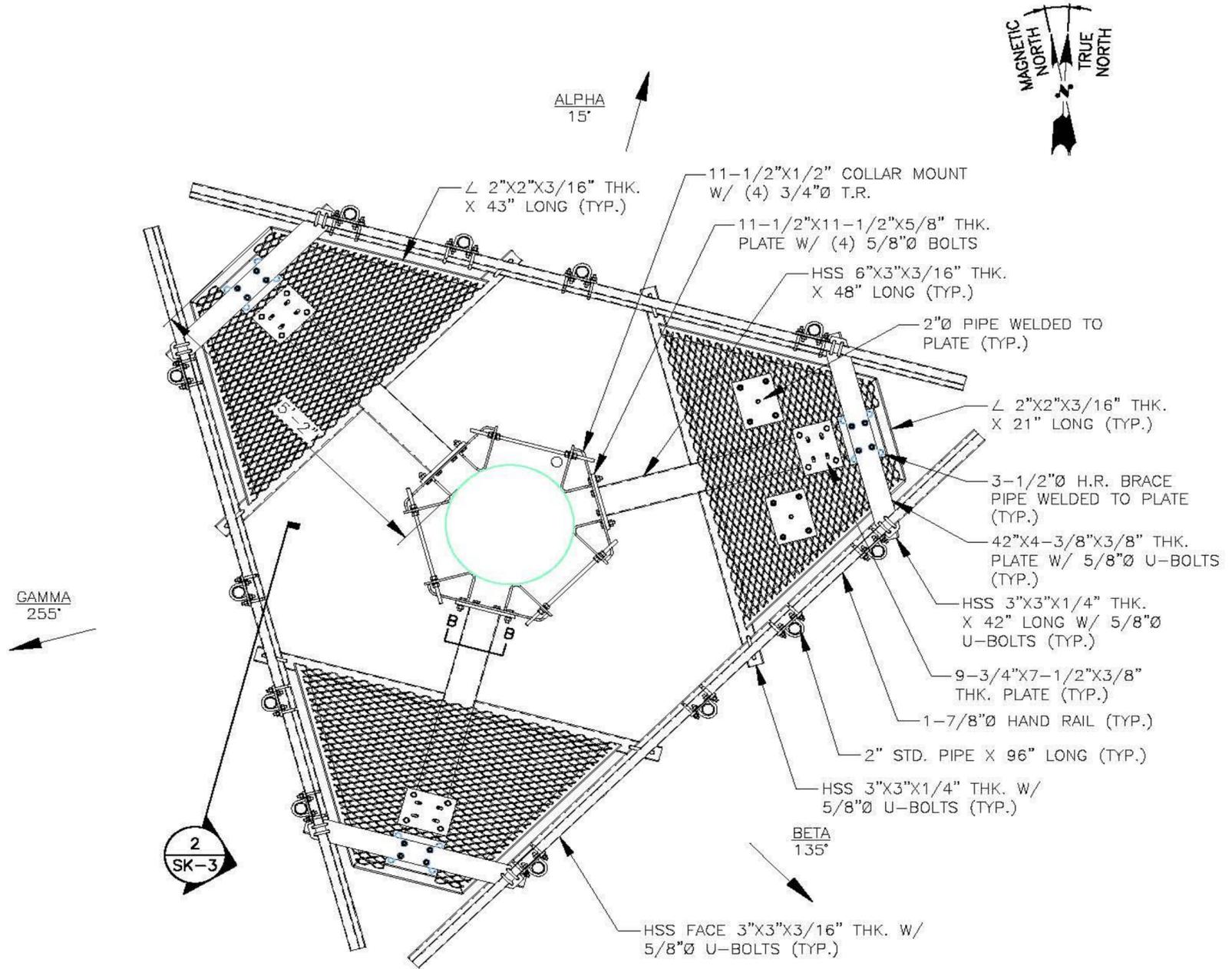
This antenna mapping form is the property of TES and under **PATENT PENDING**. The formation contained herein is considered confidential in nature and is to be used only for the specific customer it was intended for. Reproduction, transmission, publication, modification or disclosure by any method is prohibited except by express written permission of TES. All means and methods are the responsibility of the contractor and the work shall be compliant with ANSI/ASSE A 10.48, OSHA, FCC, FAA and other safety requirements that may apply. TES is not warranting the usability of the safety climb as it must be assessed prior to each use in compliance with OSHA requirements.

**Please Insert Sketches of the Antenna Mount**



**ANTENNA PLAN**  
SCALE: N.T.S

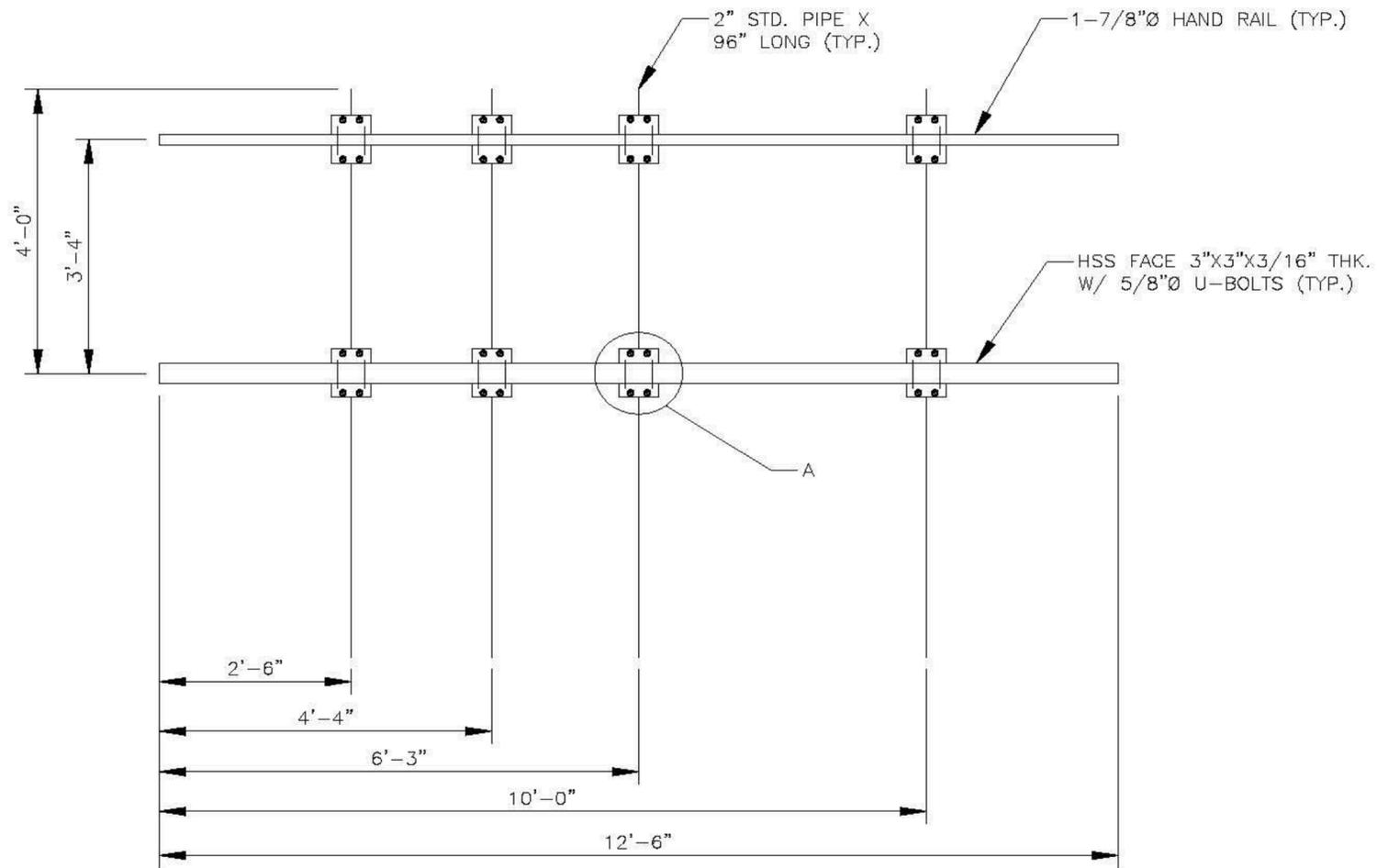
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SK-1



**MOUNT PLAN**  
SCALE: N.T.S

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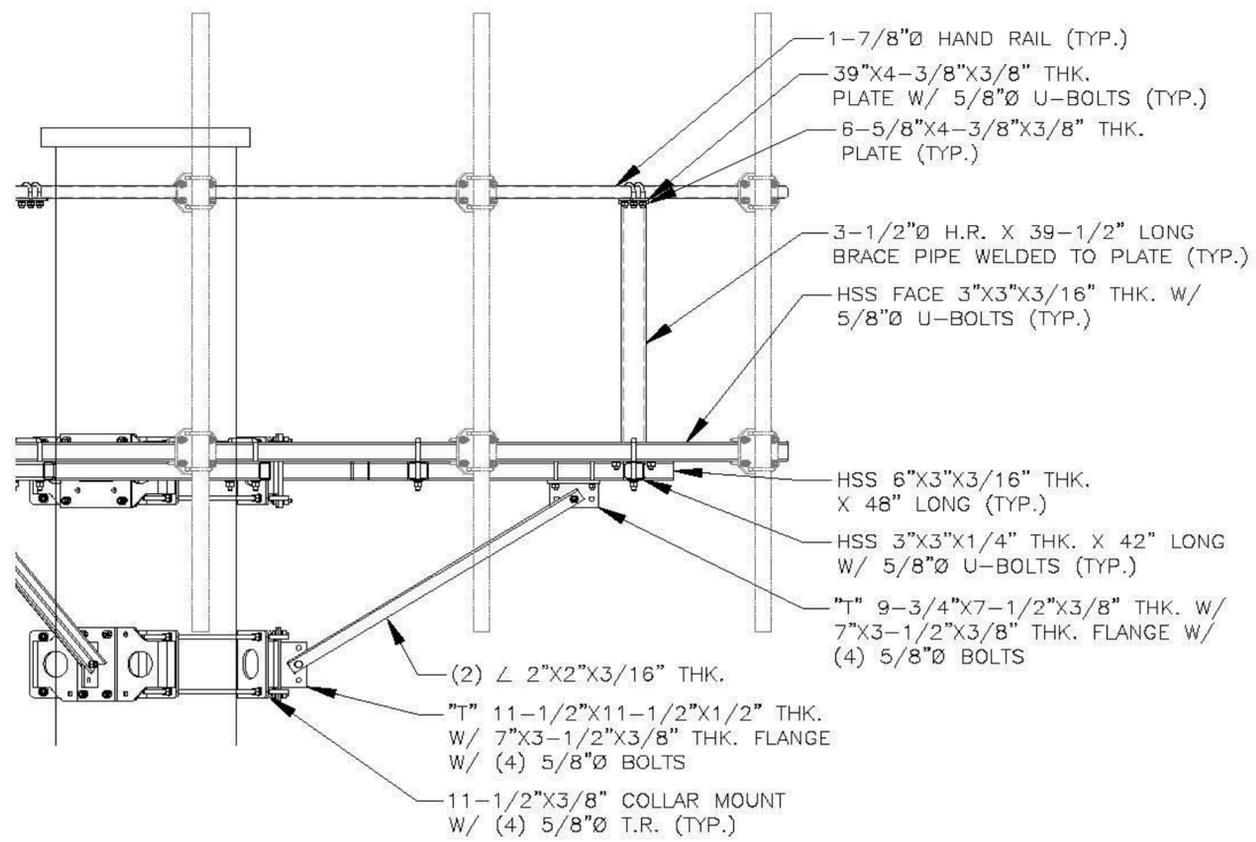
Please Insert Sketches of the Antenna Mount, cont'd



**FACE MOUNT ELEVATION**

SCALE: N.T.S

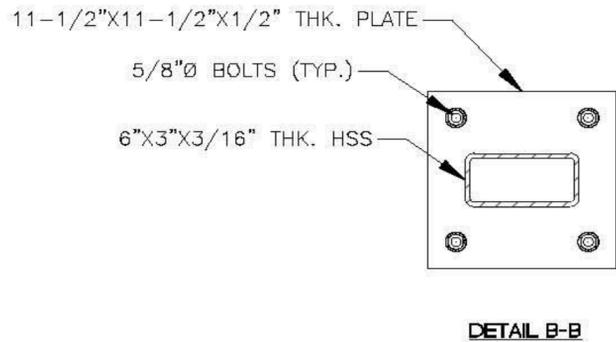
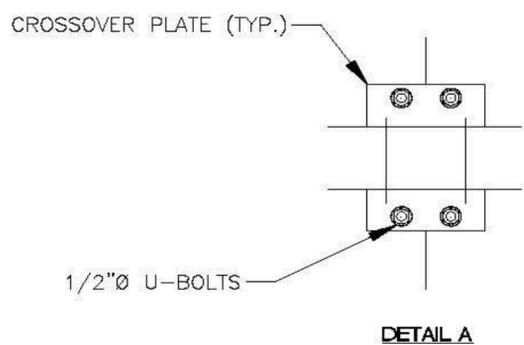
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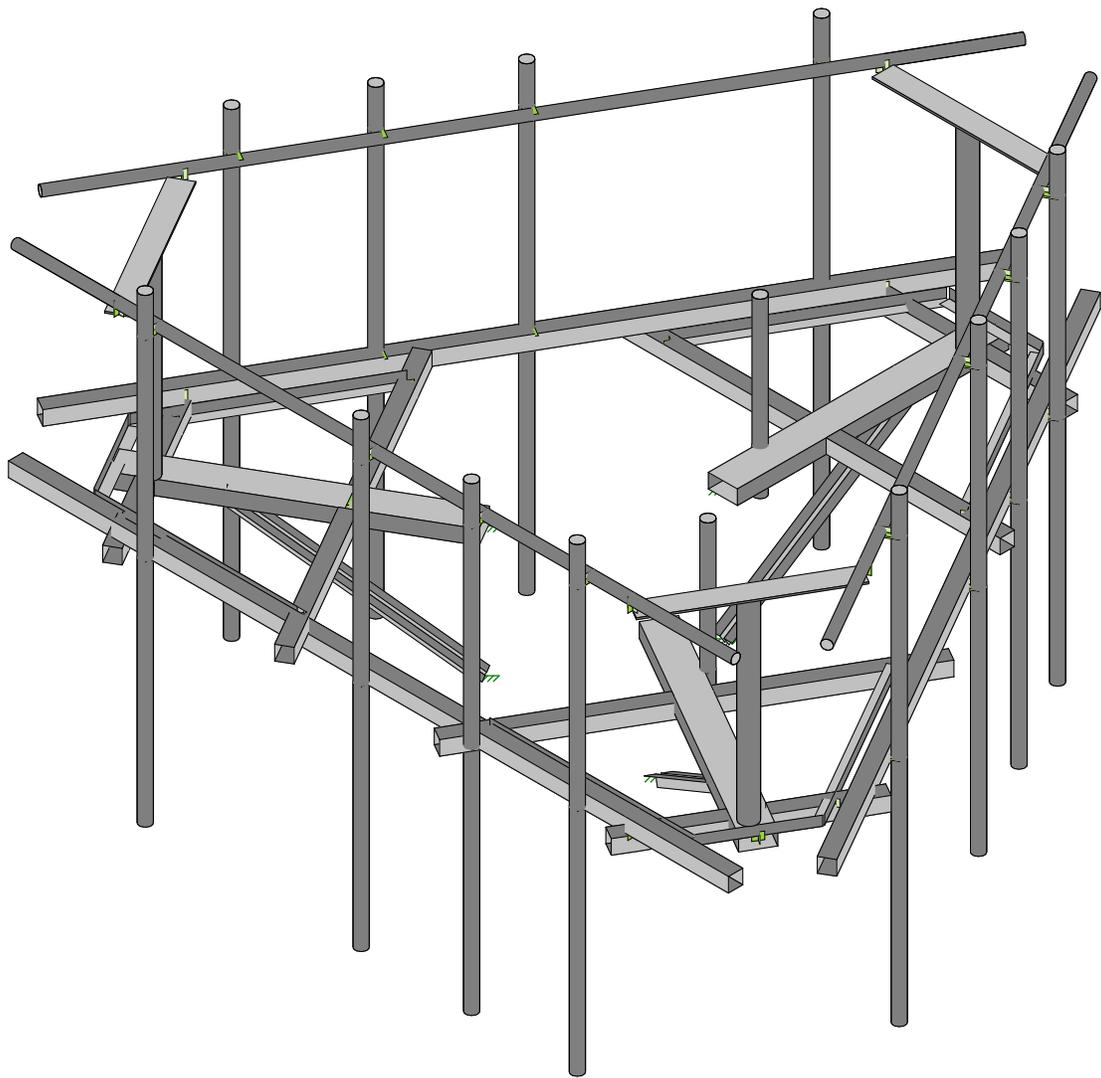
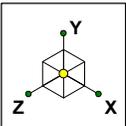


**FACE SIDE ELEVATION**

SCALE: N.T.S

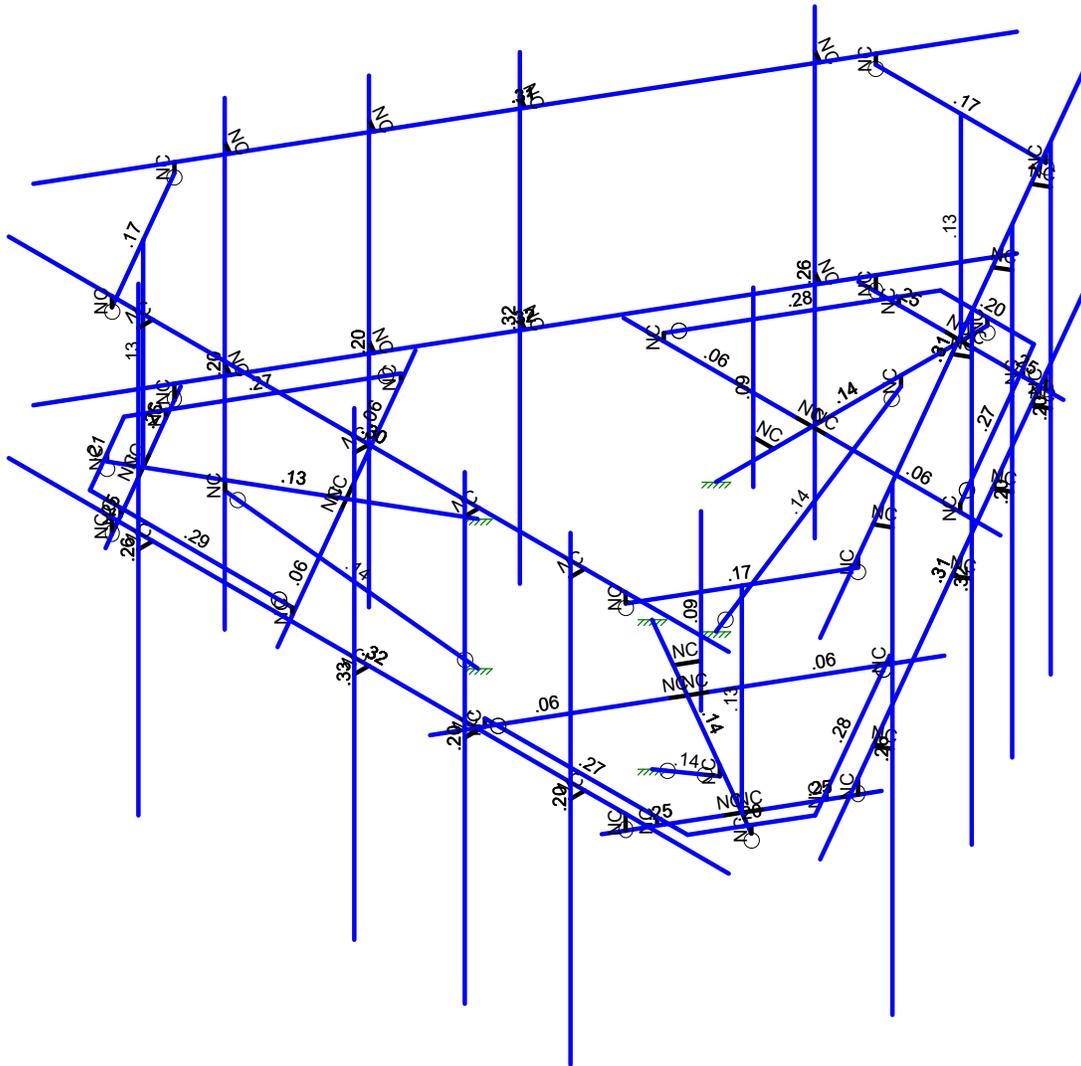
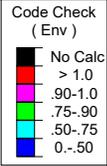
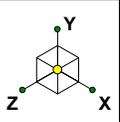
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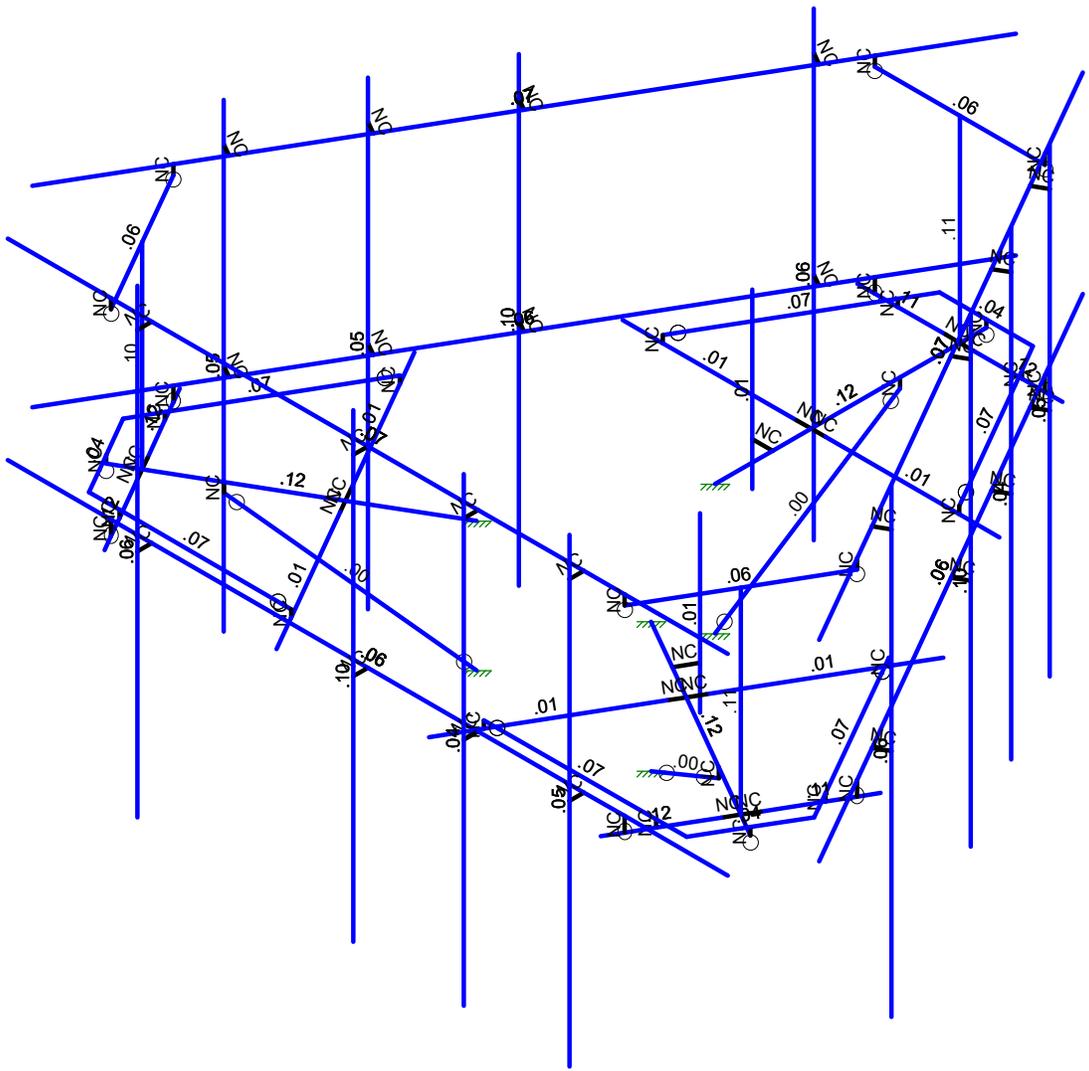
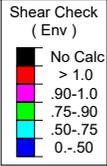
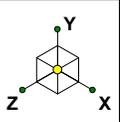
Envelope Only Solution

Maser Consulting	Antenna Mount Analysis	SK - 1
		Mar 10, 2021 at 9:36 AM
Project # 21777064A		470423-VZW_MT_LO_H.r3d



Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

Maser Consulting	Antenna Mount Analysis	SK - 2
		Mar 10, 2021 at 9:37 AM
Project # 21777064A		470423-VZW_MT_LO_H.r3d



Member Shear Checks Displayed (Enveloped)  
Envelope Only Solution

Maser Consulting	Antenna Mount Analysis	SK - 3
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FF	T ÚI Ó	€	I
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G€	T ÚH OE	€	F E I
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GH	T ÚH OE	€	I E
G	T ÚH OE	E E I	I E
Ğ	T ÚH Ó	F I E I I	F E I
Ğ	T ÚH Ó	€	F E I
Ğ	T ÚH Ó	E E F	F E I
Ğ	T ÚH Ó	F I E I I	I E
Q	T ÚH Ó	€	I E
H€	T ÚH Ó	E E F	I E
HF	T ÚH Ô	F I E J I	F E I
HG	T ÚH Ô	€	F E I
HH	T ÚH Ô	E F F	F E I
HI	T ÚH Ô	F I E J I	I E
HÍ	T ÚH Ô	€	I E
HÎ	T ÚH Ô	E F F	I E
HÏ	T ÚH OE	F F E H I	F E I
HÏ	T ÚH OE	€	F E I
HJ	T ÚH OE	E E I	F E I
I€	T ÚH OE	F F E H I	I E
IF	T ÚH OE	€	I E
IG	T ÚH OE	E E I	I E
IH	T ÚH Ó	F I E I I	F E I
II	T ÚH Ó	€	F E I

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**A Ya Vyf'Dc]bhi@UXg'f6 @ '\* : '5 bhYbbUK c'f' \$'8 Yl' t'f'7 cbhbi YXL**

	T^ { à^/Aæ^ }	Öä^&ç }	T æ } æ à^ ŽaB Eeá	Š &ç } ŽeA á
Ií	T ÚHÓ	T ç	È FÍ	F E C I
Iî	T ÚHÓ	Ý	F Í F È Ì Î	Í È
Iï	T ÚHÓ	Z	€	Í È
Iì	T ÚHÓ	T ç	È FÍ	Í È
Ij	T ÚHÔ	Ý	F I I È J I	F E C I
I€	T ÚHÔ	Z	€	F E C I
If	T ÚHÔ	T ç	È FÍ	F E C I
Ig	T ÚHÔ	Ý	F I I È J I	Í È
Ih	T ÚHÔ	Z	€	Í È
Ii	T ÚHÔ	T ç	È FÍ	Í È
Iî	T ÚGœ	Ý	Í F È Ì	G È
Iï	T ÚGœ	Z	€	G È
Iì	T ÚGœ	T ç	È G	G È
Ij	T ÚGó	Ý	Ì È F I F	G È
I€	T ÚGó	Z	€	G È
If	T ÚGó	T ç	È F H	G È
Ig	T ÚGó	Ý	Ì È J H	G È
Ih	T ÚGó	Z	€	G È
Ii	T ÚGó	T ç	È G F	G È
Iî	T ÚHœ	Ý	I F È Ì	G È
Iï	T ÚHœ	Z	€	G È
Iì	T ÚHœ	T ç	È G F	G È
Ij	T ÚHó	Ý	Ì È G Í	G È
I€	T ÚHó	Z	€	G È
If	T ÚHó	T ç	È F G	G È
Ig	T ÚHó	Ý	Ì G È Ì Ì	G È
Ih	T ÚHó	Z	€	G È
Ii	T ÚHó	T ç	È G	G È
Ij	T ÚHó	Ý	Ì G È G	G È
I€	T ÚHó	Z	€	G È
If	T ÚHó	T ç	È G	G È
Ig	T ÚHó	Ý	Ì G È G	G È
Ih	UXÚF	Z	€	F
Ii	UXÚF	T ç	€	F
Iî	UXÚG	Ý	Ì G È G	F
Iï	UXÚG	Z	€	F
Iì	UXÚG	T ç	€	F

**A Ya Vyf'Dc]bhi@UXg'f6 @ '+ : '5 bhYbbUK c'f'/\$'8 Yl' t'**

	T^ { à^/Aæ^ }	Öä^&ç }	T æ } æ à^ ŽaB Eeá	Š &ç } ŽeA á
F	T ÚI œ	Ý	Ì È Í H	G È Í
G	T ÚI œ	Z	G È Ì	G È Í
H	T ÚI œ	T ç	È G H	G È Í
I	T ÚI œ	Ý	Ì È Í H	I
Í	T ÚI œ	Z	G È Ì	I
Î	T ÚI œ	T ç	È G H	I
Ï	T ÚI ó	Ý	Ì G È H	G È Í
Ì	T ÚI ó	Z	Ì È J Í	G È Í
J	T ÚI ó	T ç	È E E	G È Í
F€	T ÚI ó	Ý	Ì G È H	I
FF	T ÚI ó	Z	Ì È J Í	I
FG	T ÚI ó	T ç	È E E	I
FH	T ÚI ó	Ý	H È Í Í	G È Í
FI	T ÚI ó	Z	G G È H	G È Í







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### A Ya Vyf Dc jbi @ UXg f6 @ ' : ' 5 bhYbbUK c fl% \$ '8 Yf t: f' c bhbi YXL

	T^{  ā^/Àcā^	Öā^&cā }	T ə ) ä ā^ žāĖ Ēcā	Š { &cā } ŽāĖ á
İ	T ÚI Ó	Ý	€	GĚÍ
Ì	T ÚI Ó	Z	ĚÎÎ	GĚÍ
J	T ÚI Ó	Tç	ĚEGF	GĚÍ
F€	T ÚI Ó	Ý	€	
FF	T ÚI Ó	Z	ĚÎÎ	
FG	T ÚI Ó	Tç	ĚEGF	
FH	T ÚI Ô	Ý	€	GĚÍ
FI	T ÚI Ô	Z	Ī GĚI	GĚÍ
FÍ	T ÚI Ô	Tç	ĚEG	GĚÍ
FÎ	T ÚI Ô	Ý	€	
FĪ	T ÚI Ô	Z	Ī GĚI	
FÌ	T ÚI Ô	Tç	ĚEG	
FJ	T ÚHœ	Ý	€	FIG
G€	T ÚHœ	Z	FĪ ĚĪ Ī	FIG
Gf	T ÚHœ	Tç	ĚEJĪ	FIG
Gg	T ÚHœ	Ý	€	Ī Ě
Gh	T ÚHœ	Z	FĪ ĚĪ Ī	Ī Ě
G	T ÚHœ	Tç	ĚEJĪ	Ī Ě
G	T ÚHÓ	Ý	€	FIG
G	T ÚHÓ	Z	FFĪ ĚĚĪ	FIG
G	T ÚHÓ	Tç	ĚĚJ	FIG
G	T ÚHÓ	Ý	€	Ī Ě
GJ	T ÚHÓ	Z	FFĪ ĚĚĪ	Ī Ě
H€	T ÚHÓ	Tç	ĚĚJ	Ī Ě
Hf	T ÚHÓ	Ý	€	FIG
Hg	T ÚHÓ	Z	FH ĚĪĪ	FIG
Hh	T ÚHÓ	Tç	ĚĚGF	FIG
Hi	T ÚHÓ	Ý	€	Ī Ě
HÍ	T ÚHÓ	Z	FH ĚĪĪ	Ī Ě
HÎ	T ÚHÓ	Tç	ĚĚGF	Ī Ě
HĪ	T ÚHœ	Ý	€	FIG
HÌ	T ÚHœ	Z	FĪ ĚĪ Ī	FIG
HJ	T ÚHœ	Tç	ĚEJĪ	FIG
I€	T ÚHœ	Ý	€	Ī Ě
If	T ÚHœ	Z	FĪ ĚĪ Ī	Ī Ě
Ig	T ÚHœ	Tç	ĚEJĪ	Ī Ě
Ih	T ÚHÓ	Ý	€	FIG
Ii	T ÚHÓ	Z	FFĪ ĚĚĪ	FIG
IÍ	T ÚHÓ	Tç	ĚĚHG	FIG
IÎ	T ÚHÓ	Ý	€	Ī Ě
IĪ	T ÚHÓ	Z	FFĪ ĚĚĪ	Ī Ě
IÌ	T ÚHÓ	Tç	ĚĚHG	Ī Ě
IJ	T ÚHÓ	Ý	€	FIG
I€	T ÚHÓ	Z	FH ĚĪĪ	FIG
If	T ÚHÓ	Tç	ĚEG	FIG
Ig	T ÚHÓ	Ý	€	Ī Ě
Ih	T ÚHÓ	Z	FH ĚĪĪ	Ī Ě
Ii	T ÚHÓ	Tç	ĚEG	Ī Ě
IĪ	T ÚGœ	Ý	€	GĚ
IÎ	T ÚGœ	Z	Ī ĚĪ Ī	GĚ
IĪ	T ÚGœ	Tç	€	GĚ
IĪ	T ÚGÓ	Ý	€	GĚ

























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**A Ya Vyf'Dc]bhi@UXg'f6 @ '%: '5 bhYbbUK]ff '\$'8 Yl H'f7 cb]bi YXL**

	T ^{ à^/Aæ ^}	Öä^&cā }	T æ } æ à^ ŽaB Eeá	Š } &cā } ŽaA á
GJ	T ÚHÓ	Z	ÉI ÉGFH	Í È
H€	T ÚHÓ	T ç	ÉÉGGJ	Í È
HF	T ÚHÓ	Y	GJÉ I G	FÉ
HG	T ÚHÓ	Z	ÉI ÉI Í	FÉ
HH	T ÚHÓ	T ç	ÉGH	FÉ
H	T ÚHÓ	Y	GJÉ I G	Í È
Hí	T ÚHÓ	Z	ÉI ÉI Í	Í È
Hï	T ÚHÓ	T ç	ÉGH	Í È
Hî	T ÚHœ	Y	GHEI H	FÉ
Hï	T ÚHœ	Z	ÉHEI J	FÉ
HJ	T ÚHœ	T ç	ÉÉI	FÉ
I€	T ÚHœ	Y	GHEI H	Í È
IF	T ÚHœ	Z	ÉHEI J	Í È
IG	T ÚHœ	T ç	ÉÉI	Í È
IH	T ÚHÓ	Y	G É FI	FÉ
Ii	T ÚHÓ	Z	ÉI ÉGFH	FÉ
Ií	T ÚHÓ	T ç	ÉGG	FÉ
Iï	T ÚHÓ	Y	G É FI	Í È
Iî	T ÚHÓ	Z	ÉI ÉGFH	Í È
Iï	T ÚHÓ	T ç	ÉGG	Í È
IJ	T ÚHÓ	Y	GJÉ I G	FÉ
I€	T ÚHÓ	Z	ÉI ÉI Í	FÉ
ÍF	T ÚHÓ	T ç	ÉÉI	FÉ
ÍG	T ÚHÓ	Y	GJÉ I G	Í È
ÍH	T ÚHÓ	Z	ÉI ÉI Í	Í È
Íi	T ÚHÓ	T ç	ÉÉI	Í È
Íí	T ÚGœ	Y	FÉH	GÉ
Íï	T ÚGœ	Z	É É I	GÉ
Íï	T ÚGœ	T ç	ÉÉI	GÉ
Íî	T ÚGó	Y	FÉ I	GÉ
ÍJ	T ÚGó	Z	É É I	GÉ
Í€	T ÚGó	T ç	ÉÉI	GÉ
ÍF	T ÚGó	Y	FI ÉG F	GÉ
ÍG	T ÚGó	Z	É É É	GÉ
ÍH	T ÚGó	T ç	ÉÉEG	GÉ
Íi	T ÚHœ	Y	FÉ I I	GÉ
Íí	T ÚHœ	Z	É ÉGJ	GÉ
Íï	T ÚHœ	T ç	ÉÉI	GÉ
Íî	T ÚHÓ	Y	FFÉ I G	GÉ
Íï	T ÚHÓ	Z	É É JF	GÉ
ÍJ	T ÚHÓ	T ç	ÉÉI	GÉ
Í€	T ÚHÓ	Y	FI ÉJ J	GÉ
ÍF	T ÚHÓ	Z	É É I	GÉ
ÍG	T ÚHÓ	T ç	ÉÉEG	GÉ
ÍH	UXÚF	Y	FI ÉI I	F
Íi	UXÚF	Z	É É É	F
Íí	UXÚF	T ç	€	F
Íï	UXÚG	Y	FI ÉI I	F
Íî	UXÚG	Z	É É É	F
Íï	UXÚG	T ç	€	F

























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**A Ya Vyf'Dc]bhi@UXg'f6 @ ' & ' : ' 5 bhYbbUK ]'fl '\$\$ ' 8 Yl ɛ'f'7 cbh]bi YXL**

	T ʌ { à ʌ / ʌ ə ʌ ˆ }	Ö ä ʌ & ɔ̃ }	T ə ʌ ) ə ʌ ʌ ʌ ʌ E ə ʌ	Š ʌ ɔ̃ ʌ } Ž ɔ̃ ʌ á
í H	T Ú H Ó	Z	È È Ğ	Í È
í I	T Ú H Ó	T ɔ̃	È È Ğ	Í È
í Ĩ	T Ú G Æ	Y	È È Ğ H	Ğ È
í İ	T Ú G Æ	Z	È È Ĩ	Ğ È
í Ī	T Ú G Æ	T ɔ̃	È È Ğ	Ğ È
í Ì	T Ú G Ó	Y	È È Ğ F	Ğ È
í J	T Ú G Ó	Z	È È Ğ	Ğ È
í €	T Ú G Ó	T ɔ̃	È È Ğ	Ğ È
í F	T Ú G Ó	Y	È È Ğ H	Ğ È
í G	T Ú G Ó	Z	È È Ğ	Ğ È
í H	T Ú G Ó	T ɔ̃	È È Ğ	Ğ È
í I	T Ú H ɔ̃ E	Y	È È Ğ Ĩ	Ğ È
í Ĩ	T Ú H ɔ̃ E	Z	È È Ğ	Ğ È
í İ	T Ú H ɔ̃ E	T ɔ̃	È È Ğ	Ğ È
í Ī	T Ú H Ó	Y	È È Ğ J	Ğ È
í Ì	T Ú H Ó	Z	È È Ĩ	Ğ È
í J	T Ú H Ó	T ɔ̃	È È Ğ	Ğ È
í €	T Ú H Ó	Y	È È Ğ H	Ğ È
í F	T Ú H Ó	Z	È È Ğ	Ğ È
í G	T Ú H Ó	T ɔ̃	È È Ğ	Ğ È
í H	UX Ú F	Y	È È Ğ Ĩ	F
í I	UX Ú F	Z	È È Ğ Ğ	F
í Ĩ	UX Ú F	T ɔ̃	€	F
í Ī	UX Ú G	Y	È È Ğ Ĩ	F
í Ì	UX Ú G	Z	È È Ğ Ğ	F
í İ	UX Ú G	T ɔ̃	€	F

**A Ya Vyf'Dc]bhi@UXg'f6 @ ' & \* ' : ' 5 bhYbbUK ]'fl ' '\$ ' 8 Yl ɛ**

	T ʌ { à ʌ / ʌ ə ʌ ˆ }	Ö ä ʌ & ɔ̃ }	T ə ʌ ) ə ʌ ʌ ʌ ʌ E ə ʌ	Š ʌ ɔ̃ ʌ } Ž ɔ̃ ʌ á
F	T Ú I ɔ̃ E	Y	È È Ğ	Ğ È Ĩ
G	T Ú I ɔ̃ E	Z	È È Ğ Ğ	Ğ È Ĩ
H	T Ú I ɔ̃ E	T ɔ̃	È È Ğ	Ğ È Ĩ
I	T Ú I ɔ̃ E	Y	È È Ğ	Ĩ
Í	T Ú I ɔ̃ E	Z	È È Ğ Ğ	Ĩ
İ	T Ú I ɔ̃ E	T ɔ̃	È È Ğ	Ĩ
Ï	T Ú I Ó	Y	È È Ğ J	Ğ È Ĩ
Ì	T Ú I Ó	Z	È È Ğ Ĩ F	Ğ È Ĩ
J	T Ú I Ó	T ɔ̃	È È Ğ	Ğ È Ĩ
F€	T Ú I Ó	Y	È È Ğ J	Ĩ
FF	T Ú I Ó	Z	È È Ğ Ĩ F	Ĩ
FG	T Ú I Ó	T ɔ̃	È È Ğ	Ĩ
FH	T Ú I Ó	Y	È È Ğ	Ğ È Ĩ
FI	T Ú I Ó	Z	È È Ğ Ĩ	Ğ È Ĩ
FÍ	T Ú I Ó	T ɔ̃	È È Ğ	Ğ È Ĩ
Fİ	T Ú I Ó	Y	È È Ğ	Ĩ
FÌ	T Ú I Ó	Z	È È Ğ Ĩ	Ĩ
FÌ	T Ú I Ó	T ɔ̃	È È Ğ	Ĩ
FJ	T Ú H ɔ̃ E	Y	È È Ğ H H	F È Ğ
Ğ€	T Ú H ɔ̃ E	Z	È È Ğ Ĩ	F È Ğ
ĞF	T Ú H ɔ̃ E	T ɔ̃	È È Ğ	F È Ğ
ĞĞ	T Ú H ɔ̃ E	Y	È È Ğ H H	Í È







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Fí	T ÚI Ô	T ç	ÈÈÈÈJ J	GÈ Í
Fî	T ÚI Ô	Ý	GÈ Í G	I
Fï	T ÚI Ô	Z	È È Í Í	I
Fì	T ÚI Ô	T ç	ÈÈÈÈJ J	I
FJ	T ÚHÇE	Ý	I È J Í	FÈÇ
G€	T ÚHÇE	Z	È È Í G	FÈÇ
GF	T ÚHÇE	T ç	ÈÈÈÍ	FÈÇ
GG	T ÚHÇE	Ý	I È J Í	Í È
GH	T ÚHÇE	Z	È È Í G	Í È
G	T ÚHÇE	T ç	ÈÈÈÍ	Í È
Ġ	T ÚHÓ	Ý	HÈ JH	FÈÇ
G̈	T ÚHÓ	Z	È È ÇH	FÈÇ
G̉	T ÚHÓ	T ç	ÈÈH	FÈÇ
G̊	T ÚHÓ	Ý	HÈ JH	Í È
GJ	T ÚHÓ	Z	È È ÇH	Í È
H€	T ÚHÓ	T ç	ÈÈH	Í È
HF	T ÚHÓ	Ý	Í ÈH	FÈÇ
HG	T ÚHÓ	Z	È È J J	FÈÇ
HH	T ÚHÓ	T ç	ÈÈ	FÈÇ
Ḣ	T ÚHÓ	Ý	Í ÈH	Í È
Ḧ	T ÚHÓ	Z	È È J J	Í È
H̉	T ÚHÓ	T ç	ÈÈ	Í È
H̊	T ÚHÇE	Ý	I È J Í	FÈÇ
HJ	T ÚHÇE	Z	È È Í G	FÈÇ
HJ	T ÚHÇE	T ç	ÈÈG	FÈÇ
I€	T ÚHÇE	Ý	I È J Í	Í È
IF	T ÚHÇE	Z	È È Í G	Í È
IG	T ÚHÇE	T ç	ÈÈG	Í È
IH	T ÚHÓ	Ý	HÈ JH	FÈÇ
II	T ÚHÓ	Z	È È ÇH	FÈÇ
IÍ	T ÚHÓ	T ç	ÈÈ	FÈÇ
IÏ	T ÚHÓ	Ý	HÈ JH	Í È
IÏ	T ÚHÓ	Z	È È ÇH	Í È
Iï	T ÚHÓ	T ç	ÈÈ	Í È
IJ	T ÚHÓ	Ý	Í ÈH	FÈÇ
Í€	T ÚHÓ	Z	È È J J	FÈÇ
ÍF	T ÚHÓ	T ç	ÈÈÈÍ	FÈÇ
ÍG	T ÚHÓ	Ý	Í ÈH	Í È
ÍH	T ÚHÓ	Z	È È J J	Í È
ÍI	T ÚHÓ	T ç	ÈÈÈÍ	Í È
ÍÏ	T ÚÇE	Ý	GÈ J	GÈ
ÍÏ	T ÚÇE	Z	ÈÈÈÍ	GÈ
Íï	T ÚÇE	T ç	ÈÈÈÍ	GÈ
Íì	T ÚÇÓ	Ý	FÈ Í I	GÈ
ÍJ	T ÚÇÓ	Z	ÈÈ È Í F	GÈ
Í€	T ÚÇÓ	T ç	ÈÈÈG	GÈ
ÍF	T ÚÇÓ	Ý	GÈ Í I	GÈ
ÍG	T ÚÇÓ	Z	È È È G	GÈ
ÍH	T ÚÇÓ	T ç	ÈÈÈÈ	GÈ
ÍI	T ÚHÇE	Ý	GÈ Í F	GÈ
ÍÏ	T ÚHÇE	Z	ÈÈÈÍ	GÈ
ÍÏ	T ÚHÇE	T ç	ÈÈÈÍ	GÈ

















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**A Ya Vyf'Dc]bhi@UXg'f6 @ ' ' ' . ' 5 bhYbbUK a 'f% \$ '8 Y] t'f' c b]i YXL**

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ïï	UXUF	Tç	€	F
ïï	UXUG	Y	€	F
ïï	UXUG	Z	ï È	F
ïï	UXUG	Tç	€	F

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	T ^{ à^/ÆË^}	Öä^&cā }	T æ ) æ à^ žaË Èeá	Š &cā } žaË á
F	T ÚI OE	Y	ËË FH	ËË Í
G	T ÚI OE	Z	ï È G	ËË Í
H	T ÚI OE	Tç	ËË F	ËË Í
I	T ÚI OE	Y	ËË FH	ï
Í	T ÚI OE	Z	ï È G	ï
Î	T ÚI OE	Tç	ËË F	ï
Ï	T ÚI Ó	Y	ËË H	ËË Í
Ì	T ÚI Ó	Z	ËË Ì	ËË Í
J	T ÚI Ó	Tç	ËË F	ËË Í
ƒ	T ÚI Ó	Y	ËË H	ï
ff	T ÚI Ó	Z	ËË Ì	ï
fg	T ÚI Ó	Tç	ËË F	ï
fh	T ÚI Ô	Y	ËË Í G	ËË Í
fi	T ÚI Ô	Z	ï È Ì	ËË Í
fí	T ÚI Ô	Tç	ËË J J	ËË Í
fï	T ÚI Ô	Y	ËË Í G	ï
fì	T ÚI Ô	Z	ï È Ì	ï
fî	T ÚI Ô	Tç	ËË J J	ï
fj	T ÚHœ	Y	ËË J	fË Í
g	T ÚHœ	Z	ï È Ì G	fË Í
g	T ÚHœ	Tç	ËË	fË Í
g	T ÚHœ	Y	ËË J	ï È
g	T ÚHœ	Z	ï È Ì G	ï È
g	T ÚHœ	Tç	ËË	ï È
g	T ÚHó	Y	ËË JH	fË Í
g	T ÚHó	Z	ï È GH	fË Í
g	T ÚHó	Tç	ËË H	fË Í
g	T ÚHó	Y	ËË JH	ï È
g	T ÚHó	Z	ï È GH	ï È
h	T ÚHœ	Tç	ËË	ï È
h	T ÚHó	Y	ËË H	fË Í
h	T ÚHó	Z	ï È JJ	fË Í
h	T ÚHó	Tç	ËË	fË Í
h	T ÚHœ	Y	ËË J	fË Í
h	T ÚHœ	Z	ï È Ì G	fË Í
h	T ÚHœ	Tç	ËË G	fË Í
h	T ÚHœ	Y	ËË J	ï È
h	T ÚHœ	Z	ï È Ì G	ï È
h	T ÚHœ	Tç	ËË G	ï È
h	T ÚHó	Y	ËË JH	fË Í
h	T ÚHó	Z	ï È GH	fË Í







Ô[ { ] æ ^ K T æ ^ A Ô [ ] • ~ | c ā \*  
 Ô • ā ) ^! K  
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 T [ à ^ A a ē ^ K C c ) } æ T [ ~ ) C c æ • ā

T æ / F E Ĭ C E F  
 J K H I A E T  
 Ô @ & ^ à A Ô ' K ' ' ' '

**A Ya Vyf Dc ] bh @ UXg f6 @ ' \* . ' 5 bhYbUK a ' fB + \$ ' 8 YJ t f' c b ] bi YXL**

	T ^ { à ! A c a }	Ö ä ^ & c ā }	T æ ) æ à ^ ž a ĩ E c ā	Š ž a ĩ } Ž e Ā á
Hí	T ÚHŒ	Ý	Ě ě í	Ě ě
Hì	T ÚHŒ	Z	€	Ě ě
Hj	T ÚHŒ	T ě	Ě ě	Ě ě
I €	T ÚHŒ	Ý	Ě ě í	í Ě
I F	T ÚHŒ	Z	€	í Ě
I G	T ÚHŒ	T ě	Ě ě	í Ě
I H	T ÚHÓ	Ý	Ě ě í	Ě ě
I I	T ÚHÓ	Z	€	Ě ě
I Í	T ÚHÓ	T ě	Ě ě	Ě ě
I Ĩ	T ÚHÓ	Ý	Ě ě í	í Ě
I Ì	T ÚHÓ	Z	€	í Ě
I Î	T ÚHÓ	T ě	Ě ě	í Ě
I J	T ÚHŎ	Ý	Ě ě Ĥ	Ě ě
I €	T ÚHŎ	Z	€	Ě ě
I F	T ÚHŎ	T ě	Ě ě F	Ě ě
I G	T ÚHŎ	Ý	Ě ě Ĥ	í Ě
I H	T ÚHŎ	Z	€	í Ě
I I	T ÚHŎ	T ě	Ě ě F	í Ě
I Í	T ÚGŒ	Ý	Ě ě Ĩ	G Ě
I Ì	T ÚGŒ	Z	€	G Ě
I Î	T ÚGŒ	T ě	Ě ě G	G Ě
I Ï	T ÚGÓ	Ý	Ě ě Ĥ	G Ě
I J	T ÚGÓ	Z	€	G Ě
I €	T ÚGÓ	T ě	Ě ě Ĩ	G Ě
I F	T ÚGÓ	Ý	Ě ě Ĥ	G Ě
I G	T ÚGÓ	Z	€	G Ě
I H	T ÚGÓ	T ě	Ě ě F	G Ě
I I	T ÚHŒ	Ý	Ě ě í	G Ě
I Í	T ÚHŒ	Z	€	G Ě
I Ĩ	T ÚHŒ	T ě	Ě ě F	G Ě
I Ì	T ÚHÓ	Ý	Ě ě Ĥ	G Ě
I Ï	T ÚHÓ	Z	€	G Ě
I J	T ÚHÓ	T ě	Ě ě Ĥ	G Ě
I €	T ÚHÓ	Ý	Ě ě Ĩ	G Ě
I F	T ÚHÓ	Z	€	G Ě
I G	T ÚHÓ	T ě	Ě ě F	G Ě
I H	UXÚF	Ý	Ě ě F	F
I I	UXÚF	Z	€	F
I Í	UXÚF	T ě	€	F
I Ĩ	UXÚG	Ý	Ě ě F	F
I Ì	UXÚG	Z	€	F
I Î	UXÚG	T ě	€	F

**A Ya Vyf Dc ] bh @ UXg f6 @ ' + . ' 5 bhYbUK a ' fI \$ \$ ' 8 YJ t f**

	T ^ { à ! A c a }	Ö ä ^ & c ā }	T æ ) æ à ^ ž a ĩ E c ā	Š ž a ĩ } Ž e Ā á
F	T ÚI C E	Ý	Ě ě Ě	G Ě í
G	T ÚI C E	Z	Ě ě í	G Ě í
H	T ÚI C E	T ě	Ě ě F	G Ě í
I	T ÚI C E	Ý	Ě ě Ě	I
Í	T ÚI C E	Z	Ě ě í	I
Î	T ÚI C E	T ě	Ě ě F	I



Ô{ }æ^ K T æ^/Ô{ }• |cā\*  
 Ô•ā}^! K  
 R à^~{ à^! K Ú{ b&A( F i i € | OE  
 T [ à^/Aæ^ K O( c' ) æ [ " ] O( æ •ā

T æ^/ÆËËËËË  
 JKHI ÆË  
 Ô@&^à^Ô^K''''

**A Ya Vyf'Dc]bhi@UXg'f6 @ ' + : '5 bhMbbUK a 'fi '\$\$'8 Yf'Æ'f' c]b]bi YXL**

	T^ ( à^/Aæ^ )	Öä^&cā }	T æ ) æ à^ žaÈ Èeá	Š &cā } žaÈ á
Í J	T ÚGÓ	Z	ËËË G	GË
Î €	T ÚGÓ	T ç	ËËËË GG	GË
Ï F	T ÚGÓ	Ý	ËËËË	GË
Ï G	T ÚGÓ	Z	ËËË H	GË
Ï H	T ÚGÓ	T ç	ËËË G	GË
Ï I	T ÚHË	Ý	ËËË I I	GË
Ï Í	T ÚHË	Z	ËËË €	GË
Ï Î	T ÚHË	T ç	ËËË F	GË
Ï Ï	T ÚHÓ	Ý	ËËË I I	GË
Ï Ï	T ÚHÓ	Z	ËËË F I	GË
Ï J	T ÚHÓ	T ç	ËËËË G	GË
Ï €	T ÚHÓ	Ý	ËËË G	GË
Ï F	T ÚHÓ	Z	ËËË I J	GË
Ï G	T ÚHÓ	T ç	ËËË F	GË
Ï H	UXÚF	Ý	ËËË I I	F
Ï I	UXÚF	Z	ËËË I I	F
Ï Í	UXÚF	T ç	€	F
Ï Î	UXÚG	Ý	ËËË I I	F
Ï Ï	UXÚG	Z	ËËË I I	F
Ï Ï	UXÚG	T ç	€	F

**A Ya Vyf'Dc]bhi@UXg'f6 @ ' , : '5 bhMbbUK a 'fi' '\$'8 Yf'Æ**

	T^ ( à^/Aæ^ )	Öä^&cā }	T æ ) æ à^ žaÈ Èeá	Š &cā } žaÈ á
F	T ÚI OE	Ý	ËËË FH	GË I
G	T ÚI OE	Z	ËËË G	GË I
H	T ÚI OE	T ç	ËËË F	GË I
I	T ÚI OE	Ý	ËËË FH	I
Í	T ÚI OE	Z	ËËË G	I
Î	T ÚI OE	T ç	ËËË F	I
Ï	T ÚI Ó	Ý	ËËË H	GË I
Ï	T ÚI Ó	Z	ËËË J I	GË I
J	T ÚI Ó	T ç	ËËË F	GË I
FE	T ÚI Ó	Ý	ËËË H	I
FF	T ÚI Ó	Z	ËËË J I	I
FG	T ÚI Ó	T ç	ËËË F	I
FH	T ÚI Ó	Ý	ËËË H	GË I
FI	T ÚI Ó	Z	ËËË I I	GË I
FÍ	T ÚI Ó	T ç	ËËË F	GË I
FÎ	T ÚI Ó	Ý	ËËË H	I
FÏ	T ÚI Ó	Z	ËËË I I	I
FÏ	T ÚI Ó	T ç	ËËË F	I
FJ	T ÚHË	Ý	ËËË J I	FË I
G€	T ÚHË	Z	ËËË I G	FË I
GF	T ÚHË	T ç	ËËË G	FË I
GG	T ÚHË	Ý	ËËË J I	I È
GH	T ÚHË	Z	ËËË I G	I È
G	T ÚHË	T ç	ËËË G	I È
G	T ÚHÓ	Ý	ËËË F	FË I
G	T ÚHÓ	Z	ËËË I	FË I
G	T ÚHÓ	T ç	ËËË	FË I
G	T ÚHÓ	Ý	ËËË F	I È

Ô{ }æ^ K T æ^/Ô{ }•~ |cā\*  
 Ô•ā) ^! K  
 R à^~{ à^! K Ú{ b&A&F i i € I OE  
 T [ à^/Aæ ^ K O c' } æ [ " } Oæ æ •ã

T as /ÆEÖEGF  
 JKHI ÆE  
 Ô@&^ã/Ô'K''''

**A Ya Vyf'Dc]bhi@UXg'f6 @ ", : '5 bhMbUK a 'fi' \$'8 Y] t'f' cb]bi YXL**

	T ^{ à^/Aæ^ }	Öä^&cā }	T æ } æ à^ žaB Eeá	Š &cā } ŽeA á
GJ	T ÚHÓ	Z	Ě Ě Ī	Í Ě
HE	T ÚHÓ	T ě	Ě Ě Ī	Í Ě
HF	T ÚHÓ	Ý	Ě Ě JH	FĚĚ
HG	T ÚHÓ	Z	Ě Ě GH	FĚĚ
HH	T ÚHÓ	T ě	Ě Ě EH	FĚĚ
HI	T ÚHÓ	Ý	Ě Ě JH	Í Ě
HÍ	T ÚHÓ	Z	Ě Ě GH	Í Ě
HĪ	T ÚHÓ	T ě	Ě Ě EH	Í Ě
HĪ	T ÚHŎ	Ý	Ě Ě JĪ	FĚĚ
HĪ	T ÚHŎ	Z	Ě Ě Ī G	FĚĚ
HJ	T ÚHŎ	T ě	Ě Ě Ī	FĚĚ
I €	T ÚHŎ	Ý	Ě Ě JĪ	Í Ě
IF	T ÚHŎ	Z	Ě Ě Ī G	Í Ě
IG	T ÚHŎ	T ě	Ě Ě Ī	Í Ě
IH	T ÚHÓ	Ý	Ě Ě EF	FĚĚ
IĪ	T ÚHÓ	Z	Ě Ě Ī	FĚĚ
IĪ	T ÚHÓ	T ě	Ě Ě EF	FĚĚ
IĪ	T ÚHÓ	Ý	Ě Ě EF	Í Ě
IĪ	T ÚHÓ	Z	Ě Ě Ī	Í Ě
IĪ	T ÚHÓ	T ě	Ě Ě EF	Í Ě
IJ	T ÚHÓ	Ý	Ě Ě JH	FĚĚ
I €	T ÚHŎ	Z	Ě Ě GH	FĚĚ
IF	T ÚHŎ	T ě	Ě Ě Ī	FĚĚ
IG	T ÚHŎ	Ý	Ě Ě JH	Í Ě
IH	T ÚHŎ	Z	Ě Ě GH	Í Ě
IĪ	T ÚHŎ	T ě	Ě Ě Ī	Í Ě
IĪ	T ÚGŎ	Ý	Ě Ě J	GĚ
IĪ	T ÚGŎ	Z	Ě Ě JĪ	GĚ
IĪ	T ÚGŎ	T ě	Ě Ě EF	GĚ
IĪ	T ÚGÓ	Ý	Ě Ě FĪ	GĚ
IJ	T ÚGÓ	Z	Ě Ě Ī Ī	GĚ
I €	T ÚGÓ	T ě	Ě Ě EF	GĚ
IF	T ÚGÓ	Ý	Ě Ě Ī Ī	GĚ
IG	T ÚGÓ	Z	Ě Ě Ī F	GĚ
IH	T ÚGÓ	T ě	Ě Ě G	GĚ
IĪ	T ÚHŎ	Ý	Ě Ě Ī F	GĚ
IĪ	T ÚHŎ	Z	Ě Ě Ī	GĚ
IĪ	T ÚHŎ	T ě	Ě Ě EF	GĚ
IĪ	T ÚHÓ	Ý	Ě Ě Ī Ī	GĚ
IĪ	T ÚHÓ	Z	Ě Ě Ī G	GĚ
IJ	T ÚHÓ	T ě	Ě Ě EF	GĚ
I €	T ÚHŎ	Ý	Ě Ě Ī G	GĚ
IF	T ÚHŎ	Z	Ě Ě Ī Ī	GĚ
IG	T ÚHŎ	T ě	Ě Ě EF	GĚ
IH	UXÚF	Ý	Ě Ě Ī G	F
IĪ	UXÚF	Z	Ě Ě Ī F	F
IĪ	UXÚF	T ě	€	F
IĪ	UXÚG	Ý	Ě Ě Ī G	F
IĪ	UXÚG	Z	Ě Ě Ī F	F
IĪ	UXÚG	T ě	€	F

Ô{ }æ^ K T æ^/Ä{ }• |cä\*  
 Ô• ä) ^! K  
 R ä Ä { à! K Ú{ b & Ä G f i i e l O E  
 T [ à^/Äæ ^ K O c ) æ [ ] c O æ • ä

T æ / F E Ö G F  
 J K H Ä E T  
 Ô @ & ^ ä Ä O K ' ' ' '

**A Ya Vyf'Dc]bh@UXg'f6 @ '+.:'@ %L**

	T^ ( à^/Äæ^)	Öä^&cä }	T æ ) æ à^ Ža E E é	Š ) &cä } Že Ä á
F	T I J	ÿ	Ě €	€

**A Ya Vyf'Dc]bh@UXg'f6 @ '+, :.'@ &L**

	T^ ( à^/Äæ^)	Öä^&cä }	T æ ) æ à^ Ža E E é	Š ) &cä } Že Ä á
F	T J G E	ÿ	Ě €	€

**A Ya Vyf'Dc]bh@UXg'f6 @ '+- :.'@ %L**

	T^ ( à^/Äæ^)	Öä^&cä }	T æ ) æ à^ Ža E E é	Š ) &cä } Že Ä á
F	T F I H O E	ÿ	Ě €	€

**A Ya Vyf'Dc]bh@UXg'f6 @ ', \$.:'@ &L**

	T^ ( à^/Äæ^)	Öä^&cä }	T æ ) æ à^ Ža E E é	Š ) &cä } Že Ä á
F	T F I H O E	ÿ	Ě €	Ä I €

**A Ya Vyf'8]gfi]vi hyx'@UXg'f6 @ '(\$:.'Gfi Wfi fy'8]L**

	T^ ( à^/Äæ^)	Öä^&cä }	Úcæo T æ ) æ à^ Ža E E é	á Ä T æ ) æ à^ Ža E E é	Úcæo Š ) &cä } Že Ä á	Ó) á Š ) &cä } Že Ä á
F	T HF	ÿ	Ě Ě I G	Ě Ě I G	€	Ä F E E
G	T HG	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
H	T HH	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
I	T HI	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
Í	T HÍ	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
Î	T HÎ	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
İ	T Hİ	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
Ì	T HÌ	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
J	T F I H	ÿ	Ě F Ě I	Ě F Ě I	€	Ä F E E
F€	T F I G E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
FF	T F G	ÿ	Ě Ě I G	Ě Ě I G	€	Ä F E E
FG	T F G	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
FH	T F G	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
FI	T F G I	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
FÍ	T F H E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
FÎ	T F H F	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
Fİ	T F H G	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
FÌ	T F H H	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
FJ	T F I I O E	ÿ	Ě Ě I G	Ě Ě I G	€	Ä F E E
G€	T F I J O E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
GF	T F I € O E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
GG	T F I F O E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
GH	T F I G O E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
G	T F I H O E	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
Ĝ	T F I I O E	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
Ĝ	T F I Í O E	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
Ĝ	T F I € O E	ÿ	Ě Ě I F	Ě Ě I F	€	Ä F E E
Ĝ	T F I F O E	ÿ	Ě Ě I F	Ě Ě I F	€	Ä F E E
GJ	T F I G O	ÿ	Ě Ě I F	Ě Ě I F	€	Ä F E E
H€	T F I H O E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
HF	T F I I O E	ÿ	Ě Ě H I	Ě Ě H I	€	Ä F E E
HG	T F I H O E	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E
HH	T F I G O E	ÿ	Ě Ě I I	Ě Ě I I	€	Ä F E E





























Ô{ } əˆ K T æ ʌ / ʌ Ō { } • ˆ | ǫ ˆ \*  
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 R ǎ ʌ ˆ { ǎ ˆ K Ú | [ b & ʌ / ʌ f i i ɛ | ɔ ɛ  
 T [ ǎ ˆ / ʌ ǎ ˆ K ɔ ɛ } ʌ ʌ [ ˆ ] ɔ ɛ ʌ ʌ • ǎ

T ʌ / ʌ f i i ɔ ɛ f  
 J K H I ʌ ʌ T  
 Ô @ & ʌ ʌ Ō K ˆ ˆ ˆ ˆ

**A Ya Vyf'8 jgfi]Vi hYX'@ UXg'f6 @' (+: 'Gfi Wñ fY'K c'f% \$ 8 Y] ʌ f'f' cb]hbi YXL**

	T ʌ { ǎ ˆ / ʌ ǎ ˆ }	Ō ǎ ˆ ǎ ˆ }	Ú ɔ ɛ ʌ ʌ } ʌ ˆ ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ }	Ú ɔ ɛ ʌ ʌ } ʌ ˆ ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ }	Ú ɔ ɛ ʌ ʌ } ʌ ˆ ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ }	Ú ɔ ɛ ʌ ʌ } ʌ ˆ ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ }	Ú ɔ ɛ ʌ ʌ } ʌ ˆ ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ } ʌ ʌ ʌ ʌ ʌ ʌ }
I İ	T F I H O E	Y	€	€	€	€	À F E E
I Ì	T F I H O E	Z	H È J F	H È J F	€	€	À F E E
I J	T F I I O E	Y	€	€	€	€	À F E E
I €	T F I I O E	Z	G È I J	G È I J	€	€	À F E E
I F	T F I I O E	Y	€	€	€	€	À F E E
I G	T F I I O E	Z	F G H I	F G H I	€	€	À F E E
I H	T F I € O E	Y	€	€	€	€	À F E E
I I	T F I € O E	Z	F B I I	F B I I	€	€	À F E E
I Í	T F I F O E	Y	€	€	€	€	À F E E
I Î	T F I F O E	Z	I È G	I È G	€	€	À F E E
I Ï	T F I G O	Y	€	€	€	€	À F E E
I Ì	T F I G O	Z	F B I I	F B I I	€	€	À F E E
I J	T F I H O E	Y	€	€	€	€	À F E E
I €	T F I H O E	Z	F G H I I	F G H I I	€	€	À F E E
I F	T F I I O E	Y	€	€	€	€	À F E E
I G	T F I I O E	Z	H G F J	H G F J	€	€	À F E E
I H	T F I H O E	Y	€	€	€	€	À F E E
I I	T F I H O E	Z	H È G	H È G	€	€	À F E E
I Í	T F I G O E	Y	€	€	€	€	À F E E
I Î	T F I G O E	Z	H È G	H È G	€	€	À F E E
I Ï	T F I I O E	Y	€	€	€	€	À F E E
I Ì	T F I I O E	Z	F È I	F È I	€	€	À F E E
I J	T F I I O E	Y	€	€	€	€	À F E E
I €	T F I I O E	Z	F È H	F È H	€	€	À F E E
I F	T F I I O E	Y	€	€	€	€	À F E E
I G	T F I I O E	Z	F È H	F È H	€	€	À F E E
I H	T F I I Ó	Y	€	€	€	€	À F E E
I I	T F I I Ó	Z	I È I I	I È I I	€	€	À F E E
I Í	T Ú F O E	Y	€	€	€	€	À F E E
I Î	T Ú F O E	Z	J È I I	J È I I	€	€	À F E E
I Ï	T Ú G O E	Y	€	€	€	€	À F E E
I Ì	T Ú G O E	Z	J È I I	J È I I	€	€	À F E E
I J	T Ú H O E	Y	€	€	€	€	À F E E
I €	T Ú H O E	Z	J È I I	J È I I	€	€	À F E E
I F	T Ú I O E	Y	€	€	€	€	À F E E
I G	T Ú I O E	Z	J È I I	J È I I	€	€	À F E E
I H	T Ú F Ó	Y	€	€	€	€	À F E E
I I	T Ú F Ó	Z	J È I I	J È I I	€	€	À F E E
I Í	T Ú G Ó	Y	€	€	€	€	À F E E
I Î	T Ú G Ó	Z	J È I I	J È I I	€	€	À F E E
I Ï	T Ú H Ó	Y	€	€	€	€	À F E E
I Ì	T Ú H Ó	Z	J È I I	J È I I	€	€	À F E E
I J	T Ú I Ó	Y	€	€	€	€	À F E E
J €	T Ú I Ó	Z	J È I I	J È I I	€	€	À F E E
J F	T Ú F Ó	Y	€	€	€	€	À F E E
J G	T Ú F Ó	Z	J È I I	J È I I	€	€	À F E E
J H	T Ú G Ó	Y	€	€	€	€	À F E E
J I	T Ú G Ó	Z	J È I I	J È I I	€	€	À F E E
J Í	T Ú H Ó	Y	€	€	€	€	À F E E
J Î	T Ú H Ó	Z	J È I I	J È I I	€	€	À F E E
J Ï	T Ú I Ó	Y	€	€	€	€	À F E E
J Ì	T Ú I Ó	Z	J È I I	J È I I	€	€	À F E E





Ó({ ]æˆ K TæˆAÓ(}•~|cā\*  
 Ó•ā)ˆ! K  
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T æÁFÆÜGEF  
 JKHL ÁEF  
 Ó@&ˆAÁOˆKˆˆˆ

**A Ya Vyf'8]g]f]Vi hyX'@ UXg'f6 @ '(, : 'Gfi Wh fy'Kc'fB%\$ 8 Y] 4f7 cb]h]bi YXL**

	T ^{ àˆ/Áæˆ ^}	Oã^&ç̣)	ÙçæÁ a) æ á^ZaDm̃) áÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃
JH	T ÚGÓ	Ý	È È JH	È È JH	€	Á FEE		
Jl	T ÚGÓ	Z	Ì È Í	Ì È Í	€	Á FEE		
JÍ	T ÚHÓ	Ý	È È JH	È È JH	€	Á FEE		
JÎ	T ÚHÓ	Z	Ì È Í	Ì È Í	€	Á FEE		
JÏ	T ÚÍ Ó	Ý	È È JH	È È JH	€	Á FEE		
Jì	T ÚÍ Ó	Z	Ì È Í	Ì È Í	€	Á FEE		
JJ	T FFI	Ý	È È JG	È È JG	€	Á FEE		
FEE	T FFI	Z	Ì È Í	Ì È Í	€	Á FEE		
FEF	T FFÍ OE	Ý	È È HH	È È HH	€	Á FEE		
FEG	T FFÍ OE	Z	FF È Í	FF È Í	€	Á FEE		
FEH	UXÚF	Ý	È È EF	È È EF	€	Á FEE		
FEl	UXÚF	Z	Ì È H	Ì È H	€	Á FEE		
FÉ	UXÚG	Ý	È È EF	È È EF	€	Á FEE		
FÉl	UXÚG	Z	Ì È H	Ì È H	€	Á FEE		

**A Ya Vyf'8]g]f]Vi hyX'@ UXg'f6 @ '(- : 'Gfi Wh fy'Kc'fB(\$ 8 Y] 4f**

	T ^{ àˆ/Áæˆ ^}	Oã^&ç̣)	ÙçæÁ a) æ á^ZaDm̃) áÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃	ÙçæÁ a) æ á^ZaDm̃
F	THF	Ý	È È H	È È H	€	Á FEE		
G	THF	Z	H È Í	H È Í	€	Á FEE		
H	THG	Ý	È È G	È È G	€	Á FEE		
I	THG	Z	F È Í	F È Í	€	Á FEE		
Í	THH	Ý	È È G	È È G	€	Á FEE		
Î	THH	Z	F È Í	F È Í	€	Á FEE		
Ï	TH	Ý	È È Í	È È Í	€	Á FEE		
ì	TH	Z	F È Í	F È Í	€	Á FEE		
J	THÍ	Ý	È È Í	È È Í	€	Á FEE		
F€	THÍ	Z	F È Í	F È Í	€	Á FEE		
FF	THÊ	Ý	È È Í	È È Í	€	Á FEE		
FG	THÊ	Z	F È Í	F È Í	€	Á FEE		
FH	THÏ	Ý	È È F	È È F	€	Á FEE		
FI	THÏ	Z	F È Í	F È Í	€	Á FEE		
FÍ	THÌ	Ý	È È FEG	È È FEG	€	Á FEE		
FÎ	THÌ	Z	Ì È G	Ì È G	€	Á FEE		
FÏ	T FÌ H	Ý	È È J	È È J	€	Á FEE		
Fì	T FÌ H	Z	Ì È F	Ì È F	€	Á FEE		
FJ	T FÍ OE	Ý	È È Í	È È Í	€	Á FEE		
F€	T FÍ OE	Z	F È Í	F È Í	€	Á FEE		
GF	T FÊ	Ý	È È H	È È H	€	Á FEE		
GG	T FÊ	Z	H È Í	H È Í	€	Á FEE		
GH	T FÊ	Ý	È È G	È È G	€	Á FEE		
G	T FÊ	Z	F È Í	F È Í	€	Á FEE		
Ĝ	T FÊ	Ý	È È G	È È G	€	Á FEE		
Ĝ	T FÊ	Z	F È Í	F È Í	€	Á FEE		
Ğ	T FĜ	Ý	È È Í	È È Í	€	Á FEE		
Ĝ	T FĜ	Z	F È Í	F È Í	€	Á FEE		
GJ	T FHÈ	Ý	È È Í	È È Í	€	Á FEE		
H€	T FHÈ	Z	F È Í	F È Í	€	Á FEE		
HF	T FHF	Ý	È È FEG	È È FEG	€	Á FEE		
HG	T FHF	Z	Ì È G	Ì È G	€	Á FEE		
HH	T FHG	Ý	È È F	È È F	€	Á FEE		
HI	T FHG	Z	F È Í	F È Í	€	Á FEE		















Ó{ }æ^ K T æ^ÁÖ{ }• |cā\*  
 Ô•ā) ^! K  
 R àÁ~{ à^! K Ú{ }b&ÁÖf i i € I OE  
 T[ à^ÁÖæ ^ K Ö{ }æ [ ~ } cÜæ æ • ā

T æ^ÁÖÖGF  
 JKH ÁE  
 Ô@&^ÁÖK''''

**A Ya Vyf'8 jgfi]Vi hYX'@ UXg'f6 @ ) & : 'Gfi Wi fy'K c'fi ' \$ 8 Y] HfV cb]bi YXL**

	T ^{ à^ÁÖæ ^}	Öá^&ö{ }	ÚcæóÁ æ } ä á^ ŽaDfñÖ ) áÁ æ } ä á^ ŽaDfñÖ ÚcæóÁ &æö{ } ŽcĀ á	Ò) áÁ &æö{ } ŽcĀ á	€	À FEE
Í J	T F i i OE	Ý	Ě Ě F	Ě Ě F	€	À FEE
İ €	T F i i OE	Z	Ë Ě J	Ë Ě J	€	À FEE
Ī F	T F i i OE	Ý	Ě Ě F	Ě Ě F	€	À FEE
Ī G	T F i i OE	Z	Ë Ě J	Ë Ě J	€	À FEE
Ī H	T F i i Ó	Ý	Ě Ě JG	Ě Ě JG	€	À FEE
Ī I	T F i i Ó	Z	Ě Ě	Ě Ě	€	À FEE
Ī Ī	T Ú F OE	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
Ī Ī	T Ú F OE	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
Ī ĩ	T Ú G OE	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
Ī ï	T Ú G OE	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
Ī J	T Ú H OE	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
İ €	T Ú H OE	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
İ F	T Ú I OE	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
İ G	T Ú I OE	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
İ H	T Ú F Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
İ I	T Ú F Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
İ Ī	T Ú G Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
İ Ī	T Ú G Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
İ ĩ	T Ú H Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
İ ï	T Ú H Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
İ J	T Ú I Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
J €	T Ú I Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
J F	T Ú F Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
J G	T Ú F Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
J H	T Ú G Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
J I	T Ú G Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
J Ī	T Ú H Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
J Ī	T Ú H Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
J ĩ	T Ú I Ó	Ý	Ě Ě JH	Ě Ě JH	€	À FEE
J ï	T Ú I Ó	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
J J	T F F	Ý	Ě Ě H	Ě Ě H	€	À FEE
F €	T F F	Z	Ě F Ě Ī	Ě F Ě Ī	€	À FEE
F F	T F F OE	Ý	Ě Ě JG	Ě Ě JG	€	À FEE
F G	T F F OE	Z	Ě Ě	Ě Ě	€	À FEE
F H	UXUF	Ý	Ě Ě F	Ě Ě F	€	À FEE
F I	UXUF	Z	Ě Ě H	Ě Ě H	€	À FEE
F Ī	UXUG	Ý	Ě Ě F	Ě Ě F	€	À FEE
F ï	UXUG	Z	Ě Ě H	Ě Ě H	€	À FEE

**A Ya Vyf'8 jgfi]Vi hYX'@ UXg'f6 @ ) ' : 'Gfi Wi fy'K ]'f6 8 Y] H**

	T ^{ à^ÁÖæ ^}	Öá^&ö{ }	ÚcæóÁ æ } ä á^ ŽaDfñÖ ) áÁ æ } ä á^ ŽaDfñÖ ÚcæóÁ &æö{ } ŽcĀ á	Ò) áÁ &æö{ } ŽcĀ á	€	À FEE
F	T H F	Ý	€	€	€	À FEE
G	T H F	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
H	T H G	Ý	€	€	€	À FEE
I	T H G	Z	Ě Ě F	Ě Ě F	€	À FEE
Í	T H H	Ý	€	€	€	À FEE
İ	T H H	Z	Ě Ě F	Ě Ě F	€	À FEE
Ī	T H	Ý	€	€	€	À FEE
Ī	T H	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE
J	T H	Ý	€	€	€	À FEE
F €	T H	Z	Ě Ě Ī	Ě Ě Ī	€	À FEE





Ó( { ]æ^ K T æ^!Å[ ] • |cá\*  
Ó• á) ^! K  
R á Á^ { à^! K Ú! [ b&Å[ fí ] í ] é ] oE  
T [ á^! Åæ ^ K Oé c' ) æÁ [ ' ) cÚæ æ • á

T æ/ÆÉÖEGF  
JKH ÅEΓ  
Ò@&^!ÅÖK''''

**A Ya Vvf'8 ]gfh]Vi hyx'@ Uxg'f6 @' )( : Gfi Wh fy'k ]"fi \$'8 Yf tL'f7 cb]jbi YXL**

	T ^ ( à^! Åæ ^	Oã^&ç )	ÚcæA æ ) æ à^ ŽaD(Ö) áA æ ) æ à^ ŽaD(Ö) ÚcæA(Ö &æç ) ŽcA á	O) áA(Ö &æç ) ŽcA á		
í	THH	Y	€	€	€	Å FEE
î	THH	Z	€	€	€	Å FEE
ï	TH	Y	€	€	€	Å FEE
ì	TH	Z	€	€	€	Å FEE
J	TH	Y	€	€	€	Å FEE
F€	TH	Z	€	€	€	Å FEE
FF	TH	Y	FÈÏ	FÈÏ	€	Å FEE
FG	TH	Z	FÈÏ	FÈÏ	€	Å FEE
FH	TH	Y	€	€	€	Å FEE
FI	TH	Z	€	€	€	Å FEE
FÍ	TH	Y	FÈÏ	FÈÏ	€	Å FEE
FÌ	TH	Z	FÈÏ	FÈÏ	€	Å FEE
FÏ	T FÌ H	Y	FÈFG	FÈFG	€	Å FEE
FÌ	T FÌ H	Z	FÈFG	FÈFG	€	Å FEE
FJ	T FÌ GOE	Y	€	€	€	Å FEE
G€	T FÌ GOE	Z	€	€	€	Å FEE
GF	T FG	Y	ÈÏ J	ÈÏ J	€	Å FEE
GG	T FG	Z	È H	È H	€	Å FEE
GH	T FG	Y	FÈF	FÈF	€	Å FEE
G	T FG	Z	FÈF	FÈF	€	Å FEE
GÍ	T FG	Y	FÈF	FÈF	€	Å FEE
GÌ	T FG	Z	FÈF	FÈF	€	Å FEE
GÏ	T FGJ	Y	FÈJ	FÈJ	€	Å FEE
GÌ	T FGJ	Z	FÈJ	FÈJ	€	Å FEE
GJ	T FHE	Y	FÈJ	FÈJ	€	Å FEE
H€	T FHE	Z	FÈJ	FÈJ	€	Å FEE
HF	T FHF	Y	FÈH	FÈH	€	Å FEE
HG	T FHF	Z	FÈG	FÈG	€	Å FEE
HH	T FHG	Y	FÈH	FÈH	€	Å FEE
HI	T FHG	Z	FÈGG	FÈGG	€	Å FEE
HÍ	T FHH	Y	FÈH	FÈH	€	Å FEE
HÌ	T FHH	Z	FÈH	FÈH	€	Å FEE
HÏ	T FÌ O E	Y	ÈÏ J	ÈÏ J	€	Å FEE
HÌ	T FÌ O E	Z	È H	È H	€	Å FEE
HJ	T FÌ J O E	Y	FÈF	FÈF	€	Å FEE
I€	T FÌ J O E	Z	FÈF	FÈF	€	Å FEE
I F	T FÌ € O E	Y	FÈF	FÈF	€	Å FEE
I G	T FÌ € O E	Z	FÈF	FÈF	€	Å FEE
I H	T FÌ F O E	Y	FÈJ	FÈJ	€	Å FEE
I I	T FÌ F O E	Z	FÈJ	FÈJ	€	Å FEE
IÍ	T FÌ G O E	Y	FÈJ	FÈJ	€	Å FEE
IÏ	T FÌ G O E	Z	FÈJ	FÈJ	€	Å FEE
IÏ	T FÌ H O E	Y	FÈH	FÈH	€	Å FEE
IÌ	T FÌ H O E	Z	FÈH	FÈH	€	Å FEE
I J	T FÌ O E	Y	FÈH	FÈH	€	Å FEE
I €	T FÌ O E	Z	FÈGG	FÈGG	€	Å FEE
I F	T FÌ O E	Y	FÈH	FÈH	€	Å FEE
I G	T FÌ O E	Z	FÈG	FÈG	€	Å FEE
I H	T FÌ € O E	Y	€	€	€	Å FEE
I I	T FÌ € O E	Z	€	€	€	Å FEE
IÍ	T FÌ F O E	Y	FÈH	FÈH	€	Å FEE
IÏ	T FÌ F O E	Z	FÈH	FÈH	€	Å FEE















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T aÁ FēĪGēF  
 JKĪĪ ÁĒT  
 Ó@&^ÁÁÓK''''

**A Ya Vyf'8 jgfv]vi hyx'@ Uxg'f6 @' )+ : 'Gfi Wñ fy'K]''fp&\$'8 Yl'f7 cb]bi yxl**

	T^{\ à^/Áā^}	Öā^&ā}	ÚĉĉÁ â } â à^ ŽaDm̂) aÁ â } â à^ ŽaDm̂) ÚĉĉÁ &ā } Žā Á á	ÚĉĉÁ &ā } Žā Á á	Ò) aÁ &ā } Žā Á á	
JH	T ÚGÓ	Ý	HĚ Ĩ Ĩ	HĚ Ĩ Ĩ	€	Ă FĚĚ
JI	T ÚGÓ	Z	GĚGH	GĚGH	€	Ă FĚĚ
JÍ	T ÚHÓ	Ý	HĚ Ĩ Ĩ	HĚ Ĩ Ĩ	€	Ă FĚĚ
JĪ	T ÚHÓ	Z	GĚGH	GĚGH	€	Ă FĚĚ
JĪ	T ÚÍ Ó	Ý	HĚ Ĩ Ĩ	HĚ Ĩ Ĩ	€	Ă FĚĚ
JĪ	T ÚÍ Ó	Z	GĚGH	GĚGH	€	Ă FĚĚ
JJ	T FFI	Ý	HĚ Ĩ Ĩ	HĚ Ĩ Ĩ	€	Ă FĚĚ
FĚĚ	T FFI	Z	FĚ HU	FĚ HU	€	Ă FĚĚ
FĚF	T FFI ĆE	Ý	FĚ HU	FĚ HU	€	Ă FĚĚ
FĚG	T FFI ĆE	Z	Ě Ĩ J	Ě Ĩ J	€	Ă FĚĚ
FĚH	UXÚF	Ý	GĚ FĪ	GĚ FĪ	€	Ă FĚĚ
FĚĪ	UXÚF	Z	FĚ Ĝ	FĚ Ĝ	€	Ă FĚĚ
FĚĪ	UXÚG	Ý	GĚ FĪ	GĚ FĪ	€	Ă FĚĚ
FĚĪ	UXÚG	Z	FĚ Ĝ	FĚ Ĝ	€	Ă FĚĚ

**A Ya Vyf'8 jgfv]vi hyx'@ Uxg'f6 @' ), : 'Gfi Wñ fy'K]''fp&\$'8 Yl'f7**

	T^{\ à^/Áā^}	Öā^&ā}	ÚĉĉÁ â } â à^ ŽaDm̂) aÁ â } â à^ ŽaDm̂) ÚĉĉÁ &ā } Žā Á á	ÚĉĉÁ &ā } Žā Á á	Ò) aÁ &ā } Žā Á á	
F	THF	Ý	Ě Ĩ J	Ě Ĩ J	€	Ă FĚĚ
G	THF	Z	Ě H	Ě H	€	Ă FĚĚ
H	THG	Ý	FĚ Ĩ F	FĚ Ĩ F	€	Ă FĚĚ
I	THG	Z	GĚ Ĩ Ī	GĚ Ĩ Ī	€	Ă FĚĚ
Í	THH	Ý	FĚ Ĩ F	FĚ Ĩ F	€	Ă FĚĚ
Ī	THH	Z	GĚ Ĩ Ī	GĚ Ĩ Ī	€	Ă FĚĚ
Ī	THI	Ý	FĚ Ĝ	FĚ Ĝ	€	Ă FĚĚ
Ī	THI	Z	GĚ J	GĚ J	€	Ă FĚĚ
J	THÍ	Ý	FĚ Ĝ	FĚ Ĝ	€	Ă FĚĚ
FĚ	THÍ	Z	GĚ J	GĚ J	€	Ă FĚĚ
FF	THĪ	Ý	FĚ Ĩ H	FĚ Ĩ H	€	Ă FĚĚ
FG	THĪ	Z	GĚ Ĝ	GĚ Ĝ	€	Ă FĚĚ
FH	THĪ	Ý	FĚ Ĩ H	FĚ Ĩ H	€	Ă FĚĚ
FI	THĪ	Z	GĚGG	GĚGG	€	Ă FĚĚ
FĪ	THĪ	Ý	Ī ^Ě	Ī ^Ě	€	Ă FĚĚ
FĪ	THĪ	Z	FĚ ^Ě	FĚ ^Ě	€	Ă FĚĚ
FĪ	TFĪH	Ý	FĚ FG	FĚ FG	€	Ă FĚĚ
FĪ	TFĪH	Z	HĚFG	HĚFG	€	Ă FĚĚ
FJ	TFĪĆE	Ý	FĚ Ĩ Ī	FĚ Ĩ Ī	€	Ă FĚĚ
GĚ	TFĪĆE	Z	HĚFG	HĚFG	€	Ă FĚĚ
GF	TFĪ	Ý	Ě Ĩ J	Ě Ĩ J	€	Ă FĚĚ
GG	TFĪ	Z	Ě H	Ě H	€	Ă FĚĚ
GH	TFĪ	Ý	FĚ Ĩ F	FĚ Ĩ F	€	Ă FĚĚ
G	TFĪ	Z	GĚ Ĩ Ī	GĚ Ĩ Ī	€	Ă FĚĚ
Ĝ	TFĪ	Ý	FĚ Ĩ F	FĚ Ĩ F	€	Ă FĚĚ
Ĝ	TFĪ	Z	GĚ Ĩ Ī	GĚ Ĩ Ī	€	Ă FĚĚ
Ĝ	TFĪ	Ý	FĚ Ĝ	FĚ Ĝ	€	Ă FĚĚ
Ĝ	TFĪ	Z	GĚ J	GĚ J	€	Ă FĚĚ
GJ	TFĪĚ	Ý	FĚ Ĝ	FĚ Ĝ	€	Ă FĚĚ
HĚ	TFĪĚ	Z	GĚ J	GĚ J	€	Ă FĚĚ
HF	TFĪF	Ý	Ī ^Ě	Ī ^Ě	€	Ă FĚĚ
HG	TFĪF	Z	FĚ ^Ě	FĚ ^Ě	€	Ă FĚĚ
HH	TFĪG	Ý	FĚ Ĩ H	FĚ Ĩ H	€	Ă FĚĚ
HI	TFĪG	Z	GĚGG	GĚGG	€	Ă FĚĚ





















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**A Ya Vyf'8 ]glf]Vi hYX' @ UXg'f6 @' \*' : ' Ghf i Wh fy'K ]'fi \$\$'8 Yl tL'f7 c bh]bi YXL**

	T Λ { à^/Áæ^	Öā^&ç  }	ÜçæóÁ æ^ ) æ^ á^ ŽaDæ( ) á Á æ^ ) æ^ á^ ŽaDæ( ) ÜçæóÁ ( &æ^ ) ŽæÁ á	ÜçæóÁ ( &æ^ ) ŽæÁ á	ÜçæóÁ ( &æ^ ) ŽæÁ á	ÜçæóÁ ( &æ^ ) ŽæÁ á
Í	THH	Y	ÊÈÏ	ÊÈÏ	€	Å FEE
Î	THH	Z	ÊÈĞ	ÊÈĞ	€	Å FEE
Ī	TH	Y	ÊĜÏ	ÊĜÏ	€	Å FEE
Ĭ	TH	Z	ÊÈĖ	ÊÈĖ	€	Å FEE
J	THĪ	Y	ÊĜÏ	ÊĜÏ	€	Å FEE
F€	THĪ	Z	ÊÈĖ	ÊÈĖ	€	Å FEE
FF	THĪ	Y	ÊĚFG	ÊĚFG	€	Å FEE
FG	THĪ	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
FH	THĪ	Y	ÊĜĪH	ÊĜĪH	€	Å FEE
FI	THĪ	Z	ÊÈĚ	ÊÈĚ	€	Å FEE
FÍ	THĪ	Y	ÊĚFG	ÊĚFG	€	Å FEE
FĪ	THĪ	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
FĬ	T FĪ H	Y	ÊÈĚFG	ÊÈĚFG	€	Å FEE
FÌ	T FĪ H	Z	ÊÈĚFG	ÊÈĚFG	€	Å FEE
FJ	T FĪ GOE	Y	ÊÈÏ	ÊÈÏ	€	Å FEE
GE	T FĪ GOE	Z	ÊĜÏ	ÊĜÏ	€	Å FEE
GF	T FĪ G	Y	ÊĜĪF	ÊĜĪF	€	Å FEE
GG	T FĪ G	Z	ÊÈĚ	ÊÈĚ	€	Å FEE
GH	T FĪ G	Y	ÊĚJG	ÊĚJG	€	Å FEE
G	T FĪ G	Z	ÊĚÏ	ÊĚÏ	€	Å FEE
GÍ	T FĪ G	Y	ÊĚJG	ÊĚJG	€	Å FEE
GĪ	T FĪ G	Z	ÊĚÏ	ÊĚÏ	€	Å FEE
GĬ	T FĪ G	Y	ÊĚĪ	ÊĚĪ	€	Å FEE
GÌ	T FĪ G	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
GJ	T FĪ H	Y	ÊĚĪ	ÊĚĪ	€	Å FEE
H€	T FĪ H	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
HF	T FĪ H	Y	ÊĚĪF	ÊĚĪF	€	Å FEE
HG	T FĪ H	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
HH	T FĪ H	Y	ÊĚĪF	ÊĚĪF	€	Å FEE
HI	T FĪ H	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
HÍ	T FĪ H	Y	ÊÈĚ	ÊÈĚ	€	Å FEE
HĪ	T FĪ H	Z	ÊĜÏ	ÊĜÏ	€	Å FEE
HĬ	T FĪ Ī OE	Y	ÊĜĪF	ÊĜĪF	€	Å FEE
HÌ	T FĪ Ī OE	Z	ÊÈĚ	ÊÈĚ	€	Å FEE
HJ	T FĪ Ī OE	Y	ÊĚJG	ÊĚJG	€	Å FEE
I€	T FĪ Ī OE	Z	ÊĚÏ	ÊĚÏ	€	Å FEE
IF	T FĪ Ī OE	Y	ÊĚJG	ÊĚJG	€	Å FEE
IG	T FĪ Ī OE	Z	ÊĚÏ	ÊĚÏ	€	Å FEE
IH	T FĪ Ī OE	Y	ÊĚĪ	ÊĚĪ	€	Å FEE
II	T FĪ Ī OE	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
IÍ	T FĪ Ī OE	Y	ÊĚĪ	ÊĚĪ	€	Å FEE
IÎ	T FĪ Ī OE	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
IĪ	T FĪ Ī OE	Y	ÊÈĚ	ÊÈĚ	€	Å FEE
IÌ	T FĪ Ī OE	Z	ÊĜÏ	ÊĜÏ	€	Å FEE
IJ	T FĪ Ī OE	Y	ÊĚĪF	ÊĚĪF	€	Å FEE
I€	T FĪ Ī OE	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
Iƒ	T FĪ Ī OE	Y	ÊĚĪF	ÊĚĪF	€	Å FEE
Iƒ	T FĪ Ī OE	Z	ÊĚĞ	ÊĚĞ	€	Å FEE
IĤ	T FĪ Ī OE	Y	ÊÈĚ	ÊÈĚ	€	Å FEE
IÌ	T FĪ Ī OE	Z	ÊĚĪ	ÊĚĪ	€	Å FEE
IÎ	T FĪ Ī OE	Y	ÊĚÏ	ÊĚÏ	€	Å FEE
IÏ	T FĪ Ī OE	Z	ÊĚÏ	ÊĚÏ	€	Å FEE







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**A Ya VYf'8 ]g]f ]Vi hYX' @ UXg'f6 @ \* ( : 'Gfi Wñ fY'K ]'fl ' \$'8 Y] Ț'f c b]bi YXL**

	T ^ ( à^/Á aē ^	Oā^&cā }	Ú cē O' Á aē } aē à^ Ž a Dē Oē ) á Á aē } aē à^ Ž a Dē Oē Ú cē O' Á aē } aē à^ Ž a Dē Oē ) Ž cā á	Ú cē O' Á aē } aē à^ Ž a Dē Oē ) á Á aē } aē à^ Ž a Dē Oē Ú cē O' Á aē } aē à^ Ž a Dē Oē ) Ž cā á	Ú cē O' Á aē } aē à^ Ž a Dē Oē ) á Á aē } aē à^ Ž a Dē Oē Ú cē O' Á aē } aē à^ Ž a Dē Oē ) Ž cā á	Ó ) á Á aē } aē à^ Ž a Dē Oē ) Ž cā á
Fé	UXÚG	Ý	ĚĚ Ę	ĚĚ Ę	€	Ā FEE
Fē	UXÚG	Z	ĚĚ Fí	ĚĚ Fí	€	Ā FEE

**A Ya VYf'8 ]g]f ]Vi hYX' @ UXg'f6 @ \* ) : 'Gfi Wñ fY'K a ''f6'8 Y] Ț**

	T ^ ( à^/Á aē ^	Oā^&cā }	Ú cē O' Á aē } aē à^ Ž a Dē Oē ) á Á aē } aē à^ Ž a Dē Oē Ú cē O' Á aē } aē à^ Ž a Dē Oē ) Ž cā á	Ú cē O' Á aē } aē à^ Ž a Dē Oē ) á Á aē } aē à^ Ž a Dē Oē Ú cē O' Á aē } aē à^ Ž a Dē Oē ) Ž cā á	Ú cē O' Á aē } aē à^ Ž a Dē Oē ) á Á aē } aē à^ Ž a Dē Oē Ú cē O' Á aē } aē à^ Ž a Dē Oē ) Ž cā á	Ó ) á Á aē } aē à^ Ž a Dē Oē ) Ž cā á
F	THF	Ý	€	€	€	Ā FEE
G	THF	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
H	THG	Ý	€	€	€	Ā FEE
I	THG	Z	ĚĚ H	ĚĚ H	€	Ā FEE
Í	THH	Ý	€	€	€	Ā FEE
Ī	THH	Z	ĚĚ H	ĚĚ H	€	Ā FEE
Ī	TH	Ý	€	€	€	Ā FEE
Ì	TH	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
J	TH	Ý	€	€	€	Ā FEE
F€	TH	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
FF	TH	Ý	€	€	€	Ā FEE
FG	TH	Z	ĚĚ Fí	ĚĚ Fí	€	Ā FEE
FH	TH	Ý	€	€	€	Ā FEE
FI	TH	Z	ĚĚ H	ĚĚ H	€	Ā FEE
FÍ	TH	Ý	€	€	€	Ā FEE
FĪ	TH	Z	ĚĚ H	ĚĚ H	€	Ā FEE
FĪ	T FĪ H	Ý	€	€	€	Ā FEE
FÌ	T FĪ H	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
FJ	T FĪ G O E	Ý	€	€	€	Ā FEE
G€	T FĪ G O E	Z	ĚĚ Fí	ĚĚ Fí	€	Ā FEE
GF	T FĪ	Ý	€	€	€	Ā FEE
GG	T FĪ	Z	€	€	€	Ā FEE
GH	T FĪ	Ý	€	€	€	Ā FEE
G	T FĪ	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
Ĝ	T FĪ	Ý	€	€	€	Ā FEE
Ĝ	T FĪ	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
Ĝ	T FĪ	Ý	€	€	€	Ā FEE
Ĝ	T FĪ	Z	ĚĚ H	ĚĚ H	€	Ā FEE
GJ	T FĪ H E	Ý	€	€	€	Ā FEE
H€	T FĪ H E	Z	ĚĚ H	ĚĚ H	€	Ā FEE
HF	T FĪ H	Ý	€	€	€	Ā FEE
HG	T FĪ H	Z	ĚĚ Fí	ĚĚ Fí	€	Ā FEE
HH	T FĪ H	Ý	€	€	€	Ā FEE
HI	T FĪ H	Z	ĚĚ Fí	ĚĚ Fí	€	Ā FEE
HÍ	T FĪ H	Ý	€	€	€	Ā FEE
HĪ	T FĪ H	Z	ĚĚ Fí	ĚĚ Fí	€	Ā FEE
HĪ	T FĪ H	Ý	€	€	€	Ā FEE
HÌ	T FĪ H	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
HJ	T FĪ H	Ý	€	€	€	Ā FEE
I€	T FĪ H	Z	ĚĚ H	ĚĚ H	€	Ā FEE
IF	T FĪ H	Ý	€	€	€	Ā FEE
IG	T FĪ H	Z	ĚĚ H	ĚĚ H	€	Ā FEE
IH	T FĪ H	Ý	€	€	€	Ā FEE
II	T FĪ H	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE
IÍ	T FĪ H	Ý	€	€	€	Ā FEE
IĪ	T FĪ H	Z	ĚĚ Í	ĚĚ Í	€	Ā FEE















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**A Ya Vyf'8]ghf]Vi hYX'@UXg'f6 @'\*, :.Gfi Wi fy'Ka ''fi \$'8 Yl Lf'f' cbl]bi YXL**

	T^{\ à^/Äæ^}	Öä^&çj}	ÚçæÖ'Ä æ') æ' à^ZaDççj) äÄ' æ') æ' à^ZaDççj) ÚçæÖ'Ä &ççj) ŽçÄ' á	Ò) äÄ' &ççj) ŽçÄ' á		
ì F	T ÚI OE	Ý	È GG	È GG	€	Ä FEE
ì G	T ÚI OE	Z	€	€	€	Ä FEE
ì H	T ÚFÔ	Ý	È GG	È GG	€	Ä FEE
ì I	T ÚFÔ	Z	€	€	€	Ä FEE
ì Í	T ÚGÔ	Ý	È GG	È GG	€	Ä FEE
ì Î	T ÚGÔ	Z	€	€	€	Ä FEE
ì Ï	T ÚHÔ	Ý	È GG	È GG	€	Ä FEE
ì Ì	T ÚHÔ	Z	€	€	€	Ä FEE
ì J	T ÚI Ô	Ý	È GG	È GG	€	Ä FEE
J€	T ÚI Ô	Z	€	€	€	Ä FEE
JF	T ÚFÓ	Ý	È GG	È GG	€	Ä FEE
JG	T ÚFÓ	Z	€	€	€	Ä FEE
JH	T ÚGÓ	Ý	È GG	È GG	€	Ä FEE
JI	T ÚGÓ	Z	€	€	€	Ä FEE
JÍ	T ÚHÓ	Ý	È GG	È GG	€	Ä FEE
JÎ	T ÚHÓ	Z	€	€	€	Ä FEE
JÏ	T ÚI Ó	Ý	È GG	È GG	€	Ä FEE
JÌ	T ÚI Ó	Z	€	€	€	Ä FEE
JJ	T FF	Ý	È HH	È HH	€	Ä FEE
F€€	T FF	Z	€	€	€	Ä FEE
F€F	T FF ÇE	Ý	È HH	È HH	€	Ä FEE
F€G	T FF ÇE	Z	€	€	€	Ä FEE
F€H	UXUF	Ý	È EJ	È EJ	€	Ä FEE
F€I	UXUF	Z	€	€	€	Ä FEE
F€Í	UXUG	Ý	È EJ	È EJ	€	Ä FEE
F€Ì	UXUG	Z	€	€	€	Ä FEE

**A Ya Vyf'8]ghf]Vi hYX'@UXg'f6 @'\*- :.Gfi Wi fy'Ka ''fV&\$'8 Yl Lf**

	T^{\ à^/Äæ^}	Öä^&çj}	ÚçæÖ'Ä æ') æ' à^ZaDççj) äÄ' æ') æ' à^ZaDççj) ÚçæÖ'Ä &ççj) ŽçÄ' á	Ò) äÄ' &ççj) ŽçÄ' á		
F	T HF	Ý	€	€	€	Ä FEE
G	T HF	Z	€	€	€	Ä FEE
H	T HG	Ý	È Î Î	È Î Î	€	Ä FEE
I	T HG	Z	È G	È G	€	Ä FEE
Í	T HH	Ý	È Î Î	È Î Î	€	Ä FEE
Î	T HH	Z	È G	È G	€	Ä FEE
Ï	T H	Ý	È È	È È	€	Ä FEE
Ì	T H	Z	È JF	È JF	€	Ä FEE
J	T H	Ý	È È	È È	€	Ä FEE
J€	T H	Z	È JF	È JF	€	Ä FEE
FF	T H	Ý	È Î	È Î	€	Ä FEE
FG	T H	Z	È CH	È CH	€	Ä FEE
FH	T H	Ý	È Î H	È Î H	€	Ä FEE
FI	T H	Z	È G	È G	€	Ä FEE
FÍ	T H	Ý	È Î	È Î	€	Ä FEE
FÎ	T H	Z	È CH	È CH	€	Ä FEE
FÏ	T F H	Ý	È Î J	È Î J	€	Ä FEE
FÌ	T F H	Z	È H	È H	€	Ä FEE
FJ	T F ÇE	Ý	È EJ	È EJ	€	Ä FEE
J€	T F ÇE	Z	È EJ	È EJ	€	Ä FEE
JF	T F G	Ý	È CH	È CH	€	Ä FEE
JG	T F G	Z	È CH	È CH	€	Ä FEE



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### A Ya Vyf'8 ]gfi ]Vi hYX' @ UXg'f6 @ ' \*- : : Gfi Wh fy'Ka "fl & \$'8 Yf ç fl'7 cbh ]bi YXL

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ïí	T ÚFOE	Ý	ÈHU	ÈHU	€	Å FEE
ïï	T ÚFOE	Z	ÈFF	ÈFF	€	Å FEE
ïî	T ÚGØE	Ý	ÈHU	ÈHU	€	Å FEE
ïì	T ÚGØE	Z	ÈFF	ÈFF	€	Å FEE
ïj	T ÚHOE	Ý	ÈHU	ÈHU	€	Å FEE
ï€	T ÚHOE	Z	ÈFF	ÈFF	€	Å FEE
ïf	T ÚIOE	Ý	ÈHU	ÈHU	€	Å FEE
ïg	T ÚIOE	Z	ÈFF	ÈFF	€	Å FEE
ïh	T ÚFÔ	Ý	ÈHU	ÈHU	€	Å FEE
ïl	T ÚFÔ	Z	ÈFF	ÈFF	€	Å FEE
ïí	T ÚGÔ	Ý	ÈHU	ÈHU	€	Å FEE
ïî	T ÚGÔ	Z	ÈFF	ÈFF	€	Å FEE
ïï	T ÚHÔ	Ý	ÈHU	ÈHU	€	Å FEE
ïì	T ÚHÔ	Z	ÈFF	ÈFF	€	Å FEE
ïj	T ÚIO	Ý	ÈHU	ÈHU	€	Å FEE
j€	T ÚIO	Z	ÈFF	ÈFF	€	Å FEE
jf	T ÚFO	Ý	ÈHU	ÈHU	€	Å FEE
yg	T ÚFO	Z	ÈFF	ÈFF	€	Å FEE
yh	T ÚGÓ	Ý	ÈHU	ÈHU	€	Å FEE
yl	T ÚGÓ	Z	ÈFF	ÈFF	€	Å FEE
yí	T ÚHÓ	Ý	ÈHU	ÈHU	€	Å FEE
yî	T ÚHÓ	Z	ÈFF	ÈFF	€	Å FEE
yï	T ÚIO	Ý	ÈHU	ÈHU	€	Å FEE
yì	T ÚIO	Z	ÈFF	ÈFF	€	Å FEE
yy	T FF	Ý	ÈIF	ÈIF	€	Å FEE
f€	T FF	Z	ÈI	ÈI	€	Å FEE
fç	T FF Æ	Ý	ÈIG	ÈIG	€	Å FEE
fçg	T FF Æ	Z	ÈGÍ	ÈGÍ	€	Å FEE
fçh	UXUF	Ý	ÈI	ÈI	€	Å FEE
fçl	UXUF	Z	ÈG I	ÈG I	€	Å FEE
fçí	UXUG	Ý	ÈI	ÈI	€	Å FEE
fçî	UXUG	Z	ÈG I	ÈG I	€	Å FEE

### A Ya Vyf'8 ]gfi ]Vi hYX' @ UXg'f6 @ '+ \$ : : Gfi Wh fy'Ka "fl & \$'8 Yf ç

	T ^ { à ^ / ä ç ^ }	O ä ^ & ç )	Û ç ø Ä ç ) ç à ^ ç ä ð ç ð ç ) ä Ä ç ) ç à ^ ç ä ð ç ð ç Û ç ø Ç } & ç ç } ç ç Ä á	Ò ) ä Ç } & ç ç } ç ç Ä á		
F	THF	Ý	ÈI	ÈI	€	Å FEE
G	THF	Z	ÈHI	ÈHI	€	Å FEE
H	THG	Ý	ÈG Í	ÈG Í	€	Å FEE
I	THG	Z	ÈG	ÈG	€	Å FEE
Í	THH	Ý	ÈG Í	ÈG Í	€	Å FEE
Î	THH	Z	ÈG	ÈG	€	Å FEE
ï	THI	Ý	ÈG J	ÈG J	€	Å FEE
ì	THI	Z	ÈI Ì	ÈI Ì	€	Å FEE
J	THÍ	Ý	ÈG J	ÈG J	€	Å FEE
f€	THÍ	Z	ÈI Ì	ÈI Ì	€	Å FEE
FF	THÍ	Ý	ÈEÍ	ÈEÍ	€	Å FEE
FG	THÍ	Z	ÈHF	ÈHF	€	Å FEE
FH	THİ	Ý	ÈG I	ÈG I	€	Å FEE
FI	THİ	Z	ÈGH	ÈGH	€	Å FEE
FÍ	THI	Ý	F^È	F^È	€	Å FEE
FÎ	THI	Z	G^È	G^È	€	Å FEE







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**A Ya Vyf'8 ]gf ]Vi hYX' @ UXg'f6 @ ' +& : 'Gfi Wh fY'Ka ''f% \$'8 Y] ɛɛfɛ cbi]bi YXL**

	T ^ { à ^ ! Á æ ^ }	O ä ^ & ç ! }	Ù ç æ O Á æ } ā ā Ĥ ā D ç Ĭ } ā Á æ } ā ā Ĥ ā D ç Ĭ Ë Ë Ü ç æ O Ě } & ç æ } Ž č Ā á	Ò) á Ě } & ç æ } Ž č Ā á		
ÎH	T FÌ HOE	Ý	€	€	€	Ă FEE
ÏI	T FÌ HOE	Z	ĚGJ	ĚGJ	€	Ă FEE
ÎÍ	T FÌ GOE	Ý	€	€	€	Ă FEE
ÏÏ	T FÌ GOE	Z	ĚGJ	ĚGJ	€	Ă FEE
ÏÎ	T FÌ Í OE	Ý	€	€	€	Ă FEE
ÎÎ	T FÌ Í OE	Z	ĚFÌ	ĚFÌ	€	Ă FEE
ÏJ	T FÌ Í OE	Ý	€	€	€	Ă FEE
Ï€	T FÌ Í OE	Z	ĚÌ	ĚÌ	€	Ă FEE
ÏF	T FÌ Ì OE	Ý	€	€	€	Ă FEE
ÏG	T FÌ Ì OE	Z	ĚÌ	ĚÌ	€	Ă FEE
ÏH	T FÌ Ì Ó	Ý	€	€	€	Ă FEE
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ÏÍ	T ÚFOE	Ý	€	€	€	Ă FEE
ÏÏ	T ÚFOE	Z	ĚGG	ĚGG	€	Ă FEE
ÏÏ	T ÚGÖE	Ý	€	€	€	Ă FEE
ÏÌ	T ÚGÖE	Z	ĚGG	ĚGG	€	Ă FEE
ÏJ	T ÚHOE	Ý	€	€	€	Ă FEE
Ï€	T ÚHOE	Z	ĚGG	ĚGG	€	Ă FEE
ÏF	T ÚÍ OE	Ý	€	€	€	Ă FEE
ÏG	T ÚÍ OE	Z	ĚGG	ĚGG	€	Ă FEE
ÏH	T ÚFŎ	Ý	€	€	€	Ă FEE
ÏI	T ÚFŎ	Z	ĚGG	ĚGG	€	Ă FEE
ÏÍ	T ÚGÓ	Ý	€	€	€	Ă FEE
ÏÏ	T ÚGÓ	Z	ĚGG	ĚGG	€	Ă FEE
ÏÏ	T ÚHŎ	Ý	€	€	€	Ă FEE
ÏÌ	T ÚHŎ	Z	ĚGG	ĚGG	€	Ă FEE
ÏJ	T ÚÍ Ŏ	Ý	€	€	€	Ă FEE
J€	T ÚÍ Ŏ	Z	ĚGG	ĚGG	€	Ă FEE
JF	T ÚFÓ	Ý	€	€	€	Ă FEE
JG	T ÚFÓ	Z	ĚGG	ĚGG	€	Ă FEE
JH	T ÚGÓ	Ý	€	€	€	Ă FEE
JI	T ÚGÓ	Z	ĚGG	ĚGG	€	Ă FEE
JÍ	T ÚHÓ	Ý	€	€	€	Ă FEE
JÎ	T ÚHÓ	Z	ĚGG	ĚGG	€	Ă FEE
JÏ	T ÚÍ Ó	Ý	€	€	€	Ă FEE
JÌ	T ÚÍ Ó	Z	ĚGG	ĚGG	€	Ă FEE
JJ	T FFI	Ý	€	€	€	Ă FEE
F€€	T FFI	Z	ĚÌ	ĚÌ	€	Ă FEE
F€F	T FFÍ OE	Ý	€	€	€	Ă FEE
F€G	T FFÍ OE	Z	ĚÌ	ĚÌ	€	Ă FEE
F€H	UXÚF	Ý	€	€	€	Ă FEE
F€I	UXÚF	Z	Ě€J	Ě€J	€	Ă FEE
F€Í	UXÚG	Ý	€	€	€	Ă FEE
F€Ì	UXÚG	Z	Ě€J	Ě€J	€	Ă FEE

**A Ya Vyf'8 ]gf ]Vi hYX' @ UXg'f6 @ ' +& : 'Gfi Wh fY'Ka ''f%\$'8 Y] ɛɛ**

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H	THG	Ý	€	€	€	Ă FEE
I	THG	Z	€	€	€	Ă FEE



























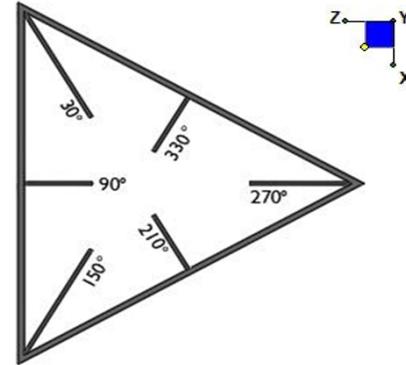




## I. Mount-to-Tower Connection Check

### RISA Model Data

Nodes (labeled per RISA)	Orientation (per graphic of typical platform)
N235	30
N201A	270
N49	150

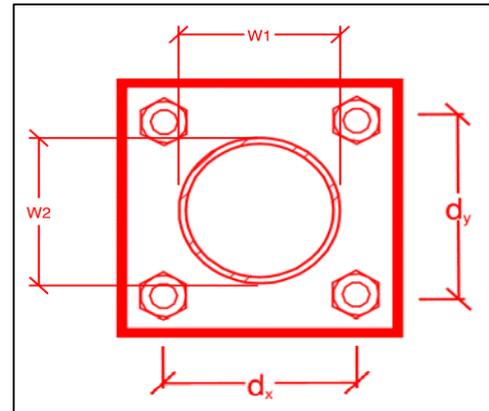


TYPICAL PLATFORM

### Tower Connection Bolt Checks

Any moment resistance?:  
 Bolt Quantity per Reaction:  
 $d_x$  (in) (Delta X of typ. bolt config. sketch) :  
 $d_y$  (in) (Delta Y of typ. bolt config. sketch) :  
 Bolt Type:  
 Bolt Diameter (in):  
 Required Tensile Strength (kips):  
 Required Shear Strength (kips):  
 Tensile Strength / bolt (kips):  
 Shear Strength / bolt (kips):  
 Tensile Capacity Overall:  
 Shear Capacity Overall:

yes
4
8.5
8.5
A325N
0.625
8.1
3.1
20.7
12.4
<b>9.7%*</b>
<b>6.2%</b>



\*Note: Tension reduction not required if tension or shear capacity < 30%

### Tower Connection Plate and Weld Check

Connecting Standoff Member Shape:  
 Plate Width (in):  
 Plate Height (in):  
 $W_1$  (in):  
 $W_2$  (in):  
 $F_y$  (ksi, plate):  
 $t_{plate}$  (in):  
 Weld Size (1/16 in):  
 $\Phi * R_n$  (kip/in):  
 Required Weld Strength (kip/in):  
 Plate Bending Capacity:  
 Weld Capacity:

Rect
11.5
11.5
6
3
36
0.5
3
4.18
1.05
<b>34.3%</b>
<b>25.2%</b>

### Max Plate Bending Strengths

$M_{u_{xx}}$ (kip-in) :	8.0
$\Phi * M_{n_{xx}}$ (kip-in) :	23.3
$M_{u_{yy}}$ (kip-in) :	0.0
$\Phi * M_{n_{yy}}$ (kip-in) :	23.3

## Mount Desktop – Post Modification Inspection (PMI) Report Requirements

### Documents & Photos Required from Contractor – **Passing Mount Analysis**

---

**Purpose** – to provide Maser Consulting Connecticut the proper documentation in order to complete the required Mount Desktop review of the Post Modification Inspection Report.

- Contractor is responsible for making certain the photos provided as noted below provide confirmation that the installation was completed in accordance with this Passing Mount Analysis.
- Contractor shall relay any data that can impact the performance of the mount, this includes safety issues.

#### **Base Requirements:**

- Any special photos outside of the standard requirements will be indicated on the passing MA
- Verification that loading is as communicated in the Passing Mount Analysis. NOTE If loading is different than what is conveyed contact Maser Consulting Connecticut immediately.
- Each photo should be time and date stamped
- Photos should be high resolution and submitted in a Zip File and should be organized in the file structure as depicted in Schedule A attached.
- Contractor shall ensure that the safety climb wire rope is supported and not adversely impacted by the install of the modification components. This may involve the install of wire rope guides, or other items to protect the wire rope.
- The photos in the file structure should be uploaded to <https://pmi.vzsmart.com> as depicted on the drawings

#### **Photo Requirements:**

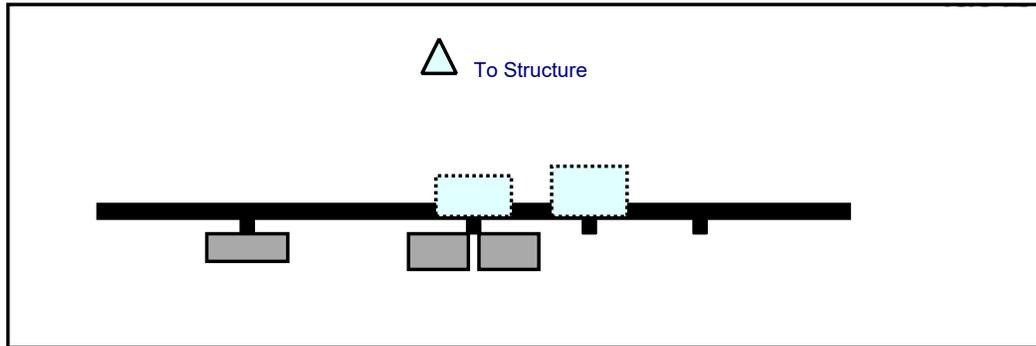
- Base and “During Installation Photos”
  - Base pictures include
    - Photo of Gate Signs showing the tower owner, site name, and number
    - Photo of carrier shelter showing the carrier site name and number if available
    - Photos of the galvanizing compound and/or paint used (if applicable), clearly showing the label and name
  - “During Installation Photos if provided – must be placed only in this folder
- Photos taken at ground level
  - Overall tower structure before and after installation of the equipment modifications
  - Photos of the appropriate mount before and after installation of the modifications; if the mounts are at different rad elevations, pictures must be provided for all elevations that the modifications were installed
- Photos taken at Mount Elevation
  - Photos showing each individual sector before and also after installation of equipment.



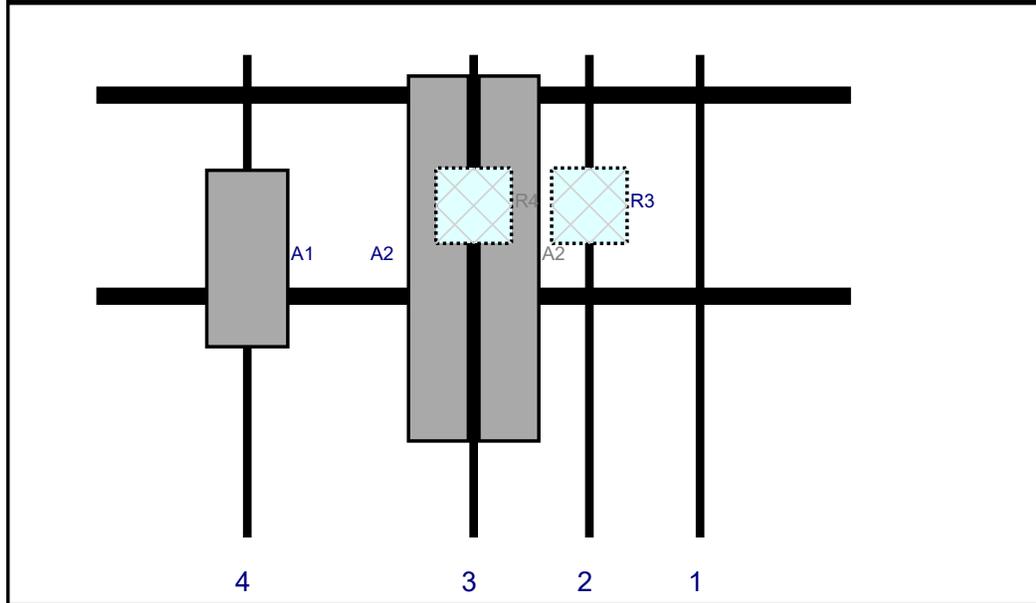
### **Schedule A – Photo & Document File Structure**

-  VzW Site Number / Name
  -  Base & “During Installation” Photos
  -  Pre-Installation Photos
    -  Alpha
    -  Beta
    -  Gamma
    -  Ground Level
    -  Tape Drop
  -  Post-Installation Photos
    -  Alpha
    -  Beta
    -  Gamma
    -  Ground Level
    -  Tape Drop
    -  Photos of climbing facility and safety climb – If Present
-  Certifications – Submission of this document including certifications
-  Specific Required Additional Photos

Plan View

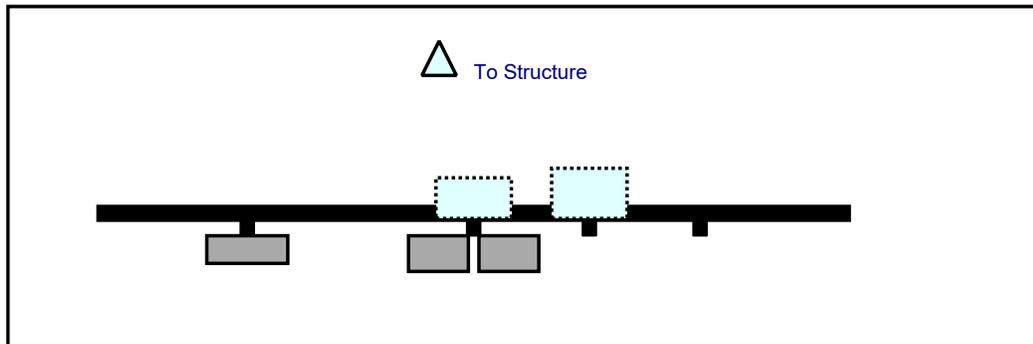


Front View  
Looking at Structure

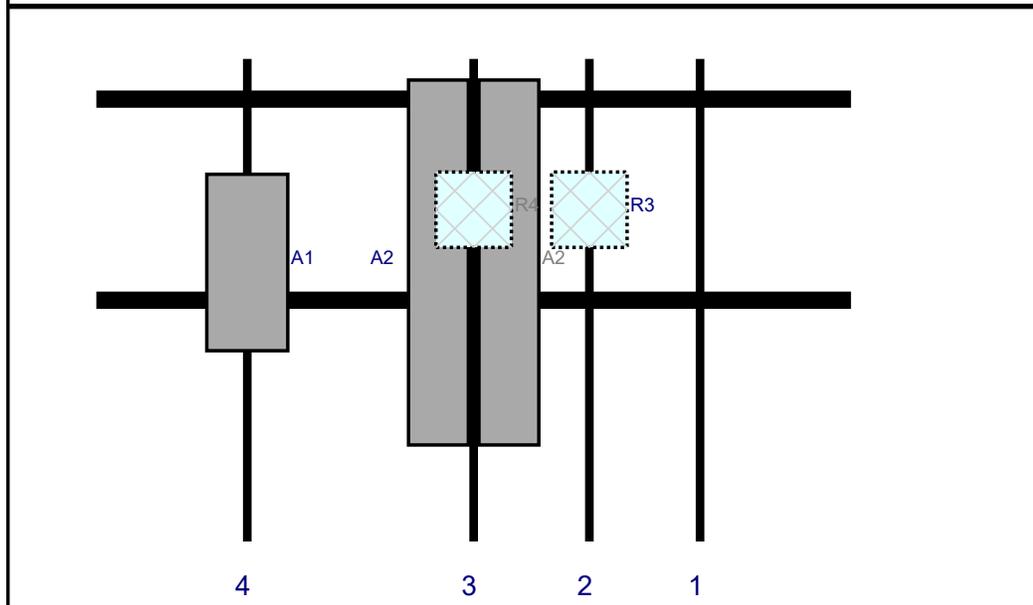


Ref#	Model	Height (in)	Width (in)	H Dist Frm L.	Pipe #	Pipe Pos V	Ant Pos	C. Ant Frm T.	Ant H Off	Status	Validation
R3	B2/B66A RRH-BR049	15	15	98	2	a	Behind	30	0	Added	
A2	SBNHH-1D65B	72.6	11.9	75	3	a	Front	40.5	7	Retained	02/25/2021
A2	SBNHH-1D65B	72.6	11.9	75	3	b	Front	40.5	-7	Retained	02/25/2021
R4	B5/B13 RRH-BR04C	15	15	75	3	a	Behind	30	0	Added	
A1	VZS01	35.1	16.1	30	4	a	Front	40.5	0	Added	

Plan View

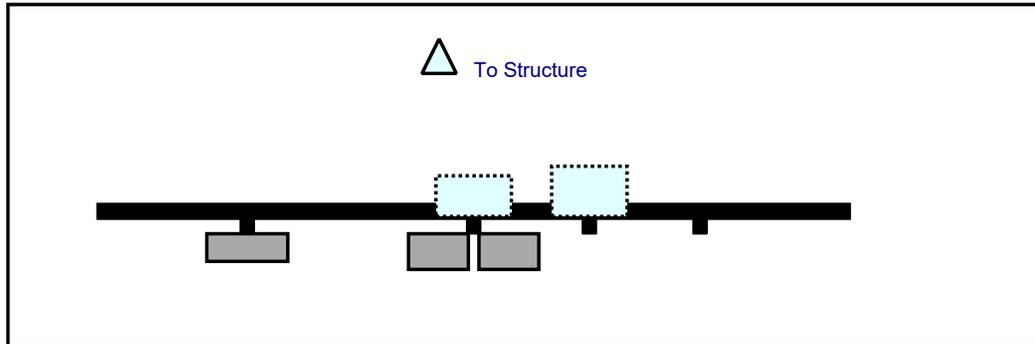


Front View  
Looking at Structure

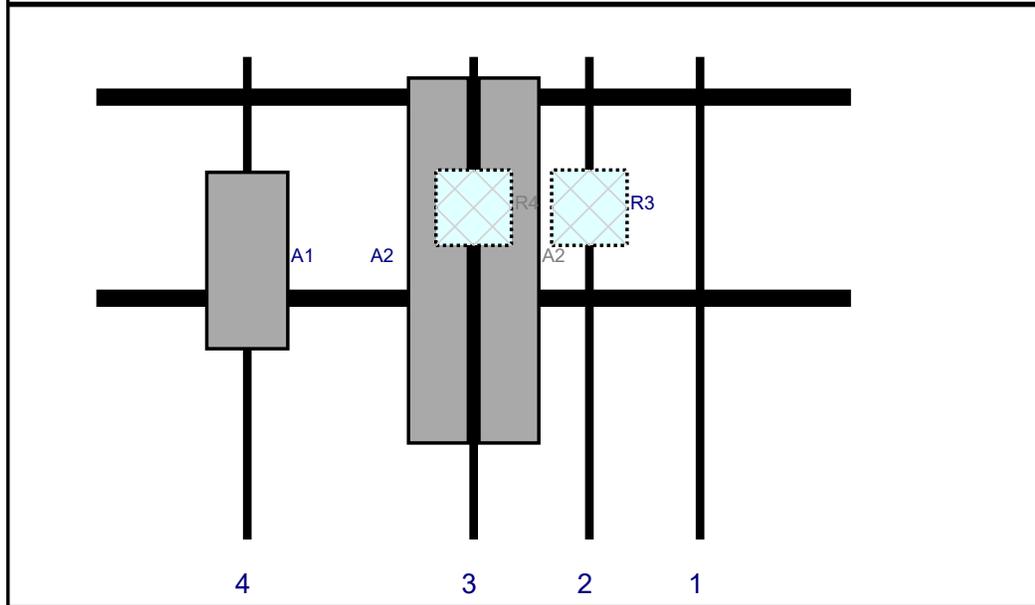


Ref#	Model	Height (in)	Width (in)	H Dist Frm L.	Pipe #	Pipe Pos V	Ant Pos	C. Ant Frm T.	Ant H Off	Status	Validation
R3	B2/B66A RRH-BR049	15	15	98	2	a	Behind	30	0	Added	
A2	SBNHH-1D65B	72.6	11.9	75	3	a	Front	40.5	7	Retained	02/25/2021
A2	SBNHH-1D65B	72.6	11.9	75	3	b	Front	40.5	-7	Retained	02/25/2021
R4	B5/B13 RRH-BR04C	15	15	75	3	a	Behind	30	0	Added	
A1	VZS01	35.1	16.1	30	4	a	Front	40.5	0	Added	

Plan View



Front View  
Looking at Structure



Ref#	Model	Height (in)	Width (in)	H Dist Frm L.	Pipe #	Pipe Pos V	Ant Pos	C. Ant Frm T.	Ant H Off	Status	Validation
R3	B2/B66A RRH-BR049	15	15	98	2	a	Behind	30	0	Added	
A2	SBNHH-1D65B	72.6	11.9	75	3	a	Front	40.5	7	Retained	02/25/2021
A2	SBNHH-1D65B	72.6	11.9	75	3	b	Front	40.5	-7	Retained	02/25/2021
R4	B5/B13 RRH-BR04C	15	15	75	3	a	Behind	30	0	Added	
A1	VZS01	35.1	16.1	30	4	a	Front	40.5	0	Added	

# Maser Consulting Connecticut

**Subject**

TIA-222-H Usage

**Site Information**

Site ID: 470423-VZW / Coventry North West CT - A

Site Name: Coventry North West CT - A

Carrier Name: Verizon Wireless

Address: Folly Lane

Coventry, Connecticut 06238

Tolland County

Latitude: 41.82399722°

Longitude: -72.34826111°

**Structure Information**

Tower Type: 139.50-Ft Monopole

Mount Type: 12.50-Ft Platform

To Whom It May Concern,

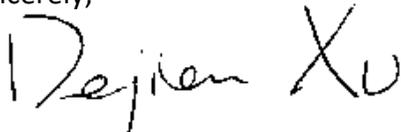
We respectfully submit the above referenced Antenna Mount Structural Analysis report in conformance with ANSI/TIA-222-H, Structural Standard for Antenna Supporting Structures and Antennas and Small Wind Turbine Support Structures.

The 2015 International Building Code states that, in Section 3108, telecommunication towers shall be designed and constructed in accordance with the provisions of TIA-222. The TIA-222-H is the latest revision of the TIA-222 Standard, effective as of January 01, 2018.

As with all ANSI standards and engineering best practice is to apply the most current revision of the standard. This ensures the engineer is applying all updates. As an example, the TIA-222-H standard includes updates to bring it in line with the latest AISC and ACI standards and it also incorporates the latest wind speed maps by ASCE 7 based on updated studies of the wind data.

The TIA-222-H standard clarifies these specific requirements for the antenna mount analysis such as modeling methods, seismic analysis, 30-degree increment wind directions and maintenance loading. Therefore, it is our opinion that TIA-222-H is the most appropriate standard for antenna mount structural analysis and is acceptable for use at this site to ensure the engineer is taking into account the most current engineering standard available.

Sincerely,



Dejian Xu, PE

Technical Specialist



Andrew Leone  
Construction Manager  
118 Flanders Rd, Third Floor  
Westborough, MA 01581  
VERIZON WIRELESS  
Email: [ALeone@structureconsulting.net](mailto:ALeone@structureconsulting.net)

April 12, 2021

**RE:** CT Siting Council Letter – LS6 Projects (Coventry Northwest CT)

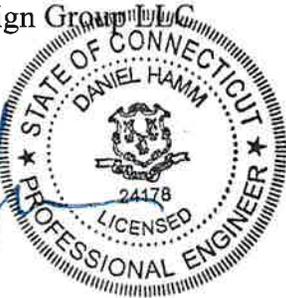
**Project:** Coventry Northwest CT  
Folly Lane  
Coventry, CT 06238

**Engineer:** Daniel P. Hamm, P.E.  
Hudson Design Group LLC  
45 Beechwood Drive  
North Andover, MA 01845

Dear Connecticut Siting Council,

This letter is to confirm that the Samsung 64T64R MMU antenna was considered in the above referenced project's structural analysis report dated March 16, 2021 prepared by Hudson Design Group, LLC for a 140' monopole located at Folly Lane, Coventry, CT 06238 at the coordinates of N41° 49' 26.39" W72° 20' 53.74".

Respectfully Submitted,  
Hudson Design Group LLC



Daniel P. Hamm, P.E.  
Principal

March 29, 2021

Mr. Andrew Leone  
Verizon Wireless  
20 Alexander Dr.  
Wallingford, CT 06492

**Re:** Verizon Wireless antenna Model Clarification for CT Siting Council

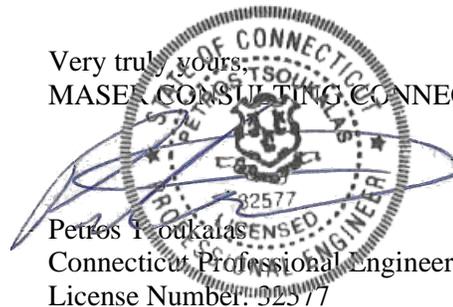
Dear Mr. Leone,

This letter is intended to clarify and confirm the antenna naming convention used by Verizon Wireless as a part of an antenna upgrade project on numerous wireless facilities.

The antenna naming convention “Licensed Sub-6, L-Sub6, nL-Sub6, VZS01” and any other slight variants refer to the 64T64RMMU antenna manufactured by Samsung Electronics. These names are interchangeable and are used in various documents, including but not limited to the “Antenna Mount Analysis”.

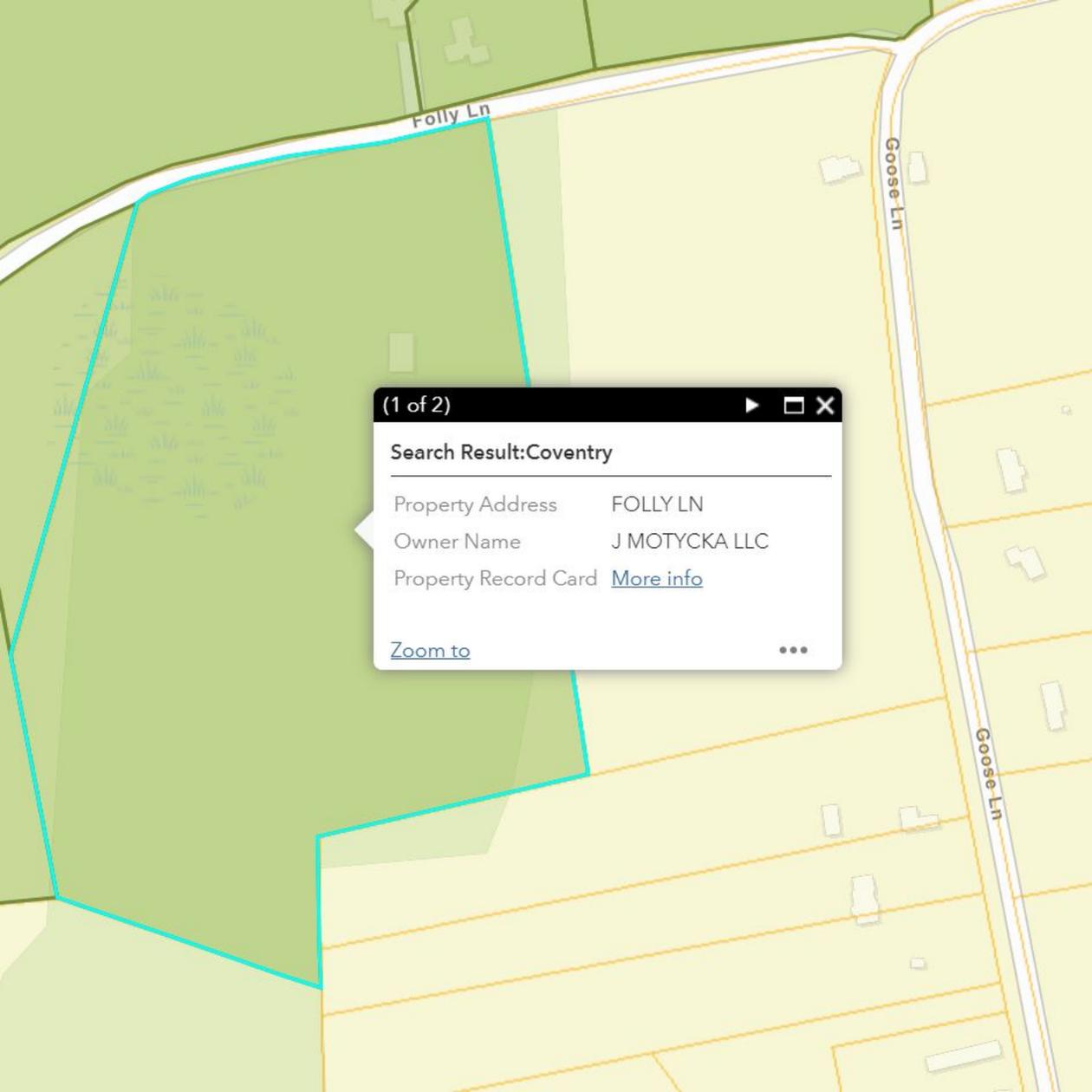
If you have any questions or comments, or require additional information, please do not hesitate to contact me.

Very truly yours,  
MASER CONSULTING CONNECTICUT



Petros I. Ioukalis  
Connecticut Professional Engineer  
License Number: 32577

# Attachment 5



(1 of 2) ▶ □ ✕

**Search Result:Coventry**

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Property Address FOLLY LN

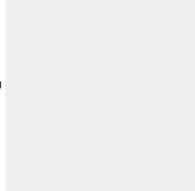
Owner Name J MOTYCKA LLC

Property Record Card [More info](#)

[Zoom to](#) ⋮



# Coventry, CT



FOLLY LN

**Location**

FOLLY LN

**Mblu**

07 / / 148 / /

**Acct#**

R04013

**Owner**

J MOTYCKA LLC

**PBN**

**Assessment**

\$352,900

**Appraisal**

\$504,200

**PID**

3831

**Building Count**

1

Current Value

**Appraisal**

Valuation Year	Improvements	Land	Total
2019	\$67,200	\$437,000	\$504,200

**Assessment**

Valuation Year	Improvements	Land	Total
2019	\$47,000	\$305,900	\$352,900

**Owner of Record****Owner** J MOTYCKA LLC**Co-Owner****Address** 62 FOLLY LN  
COVENTRY, CT 06238**Sale Price** \$0**Certificate****Book & Page** 1252/0648**Sale Date** 12/18/2017**Instrument** 79

## Ownership History

**Ownership History**

Owner	Sale Price	Certificate	Book & Page	Instrument	Sale Date
J MOTYCKA LLC	\$0		1252/0648	79	12/18/2017
MOTYCKA JOHN	\$0		0215/0068	29	09/12/1979

## Building Information

Building 1 : Section 1

**Year Built:** 2000**Living Area:** 2,400**Replacement Cost:** \$78,096**Building Percent Good:** 86**Replacement Cost****Less Depreciation:** \$67,200**Building Attributes**

Field	Description
Style	Pre-Eng Garage
Model	Comm/Ind
Grade	C
Stories:	1
Occupancy	1.00

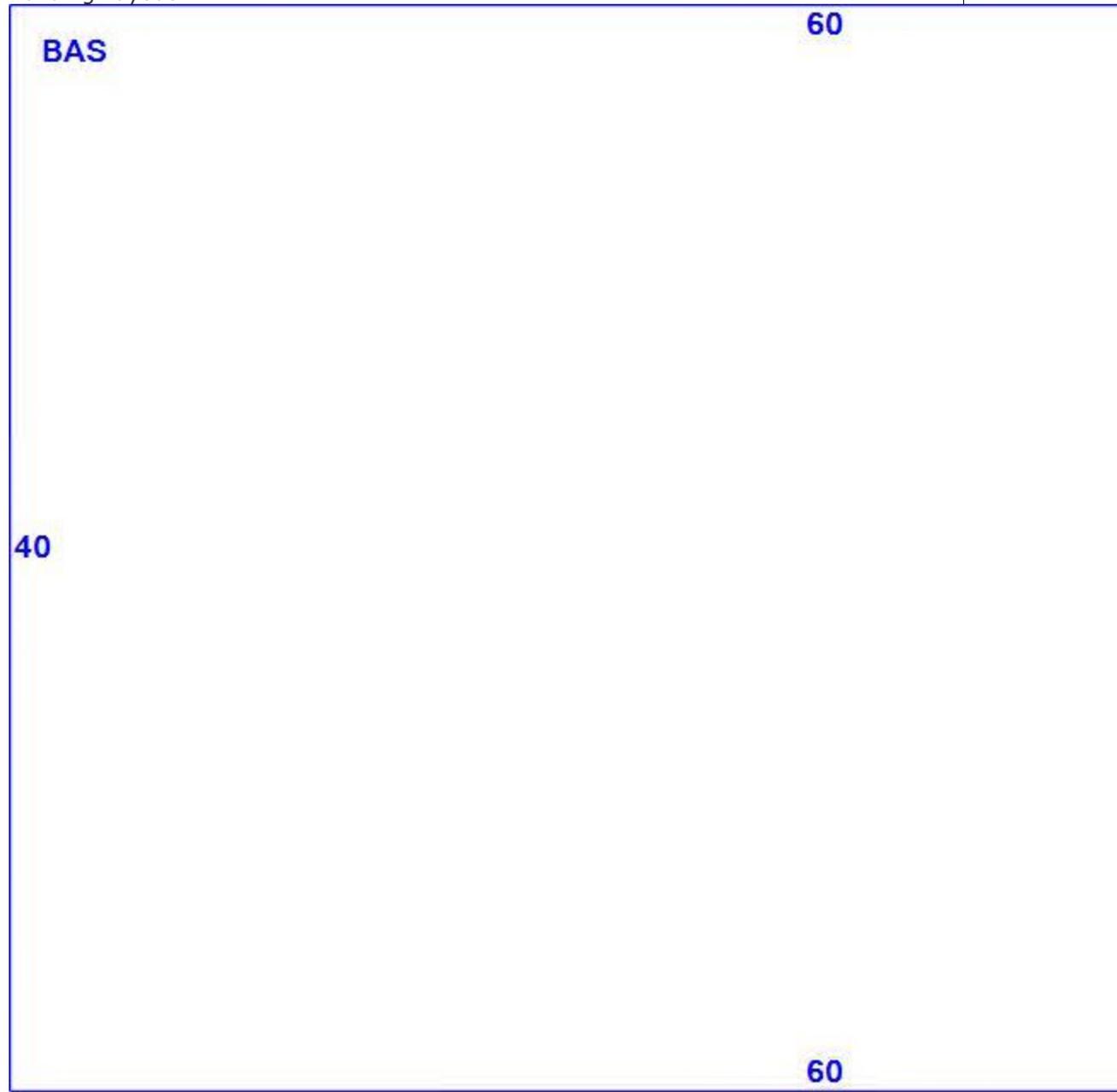
Exterior Wall 1	Pre-finish Metl
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Metal/Tin
Interior Wall 1	Minimum
Interior Wall 2	
Interior Floor 1	Cement
Interior Floor 2	
Heating Fuel	None
Heating Type	None
AC Type	None/partial
Struct Class	
Bldg Use	Commercial Improv
Total Rooms	
Usrflid 216	
Total Baths	
Usrflid 218	
Usrflid 219	
1st Floor Use:	
Heat/AC	HEAT ONLY
Frame Type	STEEL
Baths/Plumbing	NONE
Ceiling/Wall	CEIL & MIN WL
Rooms/Prtns	AVERAGE
Wall Height	10.00
% Comn Wall	
Usrflid 100	

Usrflid 302	
Usrflid 301	
Usrflid 303	
Usrflid 103	
Usrflid 107	
Usrflid 304	
Usrflid 104	
Usrflid 105	
Usrflid 101	
Usrflid 225	
Usrflid 300	
Usrflid 220	
Usrflid 221	
Usrflid 102	
Usrflid 701	
Usrflid 106	
Usrflid 305	
Usrflid 900	No
Usrflid 901	No

| Building Photo |



Building Layout



**Building Sub-Areas (sq ft) Legend**

Code	Description	Gross Area	Living Area
BAS	First Floor	2,400	2,400
		2,400	2,400

Extra Features

**Extra Features Legend**

No Data for Extra Features

Land

Land Use

**Use Code** 201

**Description** Commercial Improv

**Zone** GR80

**Neighborhood** C

**Alt Land Appr** No

**Category**

Land Line Valuation

**Size (Acres)** 27.60

**Frontage**

**Depth**

**Assessed Value** \$305,900

**Appraised Value** \$437,000

Outbuildings

**Outbuildings Legend**

No Data for Outbuildings

Valuation History

**Appraisal**

Valuation Year	Improvements	Land	Total
2018	\$54,600	\$146,600	\$201,200
2018	\$54,600	\$146,600	\$201,200
2017	\$54,600	\$146,600	\$201,200

**Assessment**

Valuation Year	Improvements	Land	Total
----------------	--------------	------	-------

2018	\$38,200	\$102,600	\$140,800
2018	\$38,200	\$102,600	\$140,800
2017	\$38,200	\$102,600	\$140,800

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closecloseclose

# Attachment 6



**Certificate of Mailing — Firm**

Name and Address of Sender	TOTAL NO. of Pieces Listed by Sender	TOTAL NO. of Pieces Received at Post Office™	Affix Stamp Here Postmark with Date of Receipt.			
Kenneth C. Baldwin Robinson & Cole LLP 28 Trumbull Street Hartford, CT 06103-3597	3	3	<div style="text-align: center;"> </div>			
USPS® Tracking Number Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)		Postage	Fee	Special Handling	Parcel Airlift
1.	John Elsesser, Town Manager Town of Coventry 1742 Main Street Coventry, CT 06238					
2.	Eric Trott, Director of Land Use Town of Coventry 1712 Main Street Coventry, CT 06238					
3.	J Motycka LLC 62 Folly Lane Coventry, CT 06238					
4.						
5.						
6.						

