



Northeast Site Solutions
Denise Sabo
4 Angela's Way, Burlington CT 06013
203-435-3640
denise@northeastsitesolutions.com

September 15, 2021

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

RE: Tower Share Application
539 Plains Road, Haddam CT 06438
Latitude: 41.443056
Longitude: -72.506222
Site# 806478_Crown_Dish

Dear Ms. Bachman:

This letter and attachments are submitted on behalf of Dish Wireless LLC. Dish Wireless LLC plans to install antennas and related equipment to the tower site located at 539 Plains Road in Haddam, Connecticut.

Dish Wireless LLC proposes to install three (3) 600/1900 5G MHz antenna and six (6) RRUs, at the 140-foot level of the existing 180-foot monopole tower, one (1) Fiber cables will also be installed. Dish Wireless LLC equipment cabinets will be placed within 7x5 lease area. Included are plans by Infinigy, dated September 15, 2021 Exhibit C. Also included is a structural analysis prepared by Crown Castle, dated April 22, 2021, confirming that the existing tower is structurally capable of supporting the proposed equipment. Attached as Exhibit D. This facility was approved by the Connecticut Siting Council, Docket No. 58 on July 11, 1986. Please see attached Exhibit A.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies 16-50aa, of Dish Wireless LLC intent to share a telecommunications facility pursuant to R.C.S.A. 16-50j-88. In accordance with R.C.S.A., a copy of this letter is being sent to The Honorable Robert McGarry, First Selectman for the Town of Haddam, Gary Vivian, Building Official, as well as the tower owner (Crown Castle) and property owner (539 Plains Rd LLC c/o Crown Atlantic Co)

The planned modifications of the facility fall squarely within those activities explicitly provided for in R.C.S.A. 16-50j-89.

1. The proposed modification will not result in an increase in the height of the existing structure. The top of the tower is 180-feet; Dish Wireless LLC proposed antennas will be located at a center line height of 140-feet.
2. The proposed modifications will not result in the increase of the site boundary as depicted on the attached site plan.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed local and state criteria. The incremental effect of the proposed changes will be negligible.



4. The operation of the proposed antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard. As indicated in the attached power density calculations, the combined site operations will result in a total power density of 1.0% as evidenced by Exhibit F.

Connecticut General Statutes 16-50aa indicates that the Council must approve the shared use of a telecommunications facility provided it finds the shared use is technically, legally, environmentally, and economically feasible and meets public safety concerns. As demonstrated in this letter, Dish Wireless LLC respectfully indicates that the shared use of this facility satisfies these criteria.

A. Technical Feasibility. The existing monopole has been deemed structurally capable of supporting Dish Wireless LLC proposed loading. The structural analysis is included as Exhibit D.

B. Legal Feasibility. As referenced above, C.G.S. 16-50aa has been authorized to issue orders approving the shared use of an existing tower such as this support tower in Haddam. Under the authority granted to the Council, an order of the Council approving the requested shared use would permit Dish Wireless LLC to obtain a building permit for the proposed installation. Further, a Letter of Authorization is included as Exhibit G, authorizing Dish Wireless LLC to file this application for shared use.

C. Environmental Feasibility. The proposed shared use of this facility would have a minimal environmental impact. The installation of Dish Wireless LLC equipment at the 140-foot level of the existing 180-foot tower would have an insignificant visual impact on the area around the tower. Dish Wireless LLC ground equipment would be installed within the existing facility compound. Dish Wireless LLC shared use would therefore not cause any significant alteration in the physical or environmental characteristics of the existing site. Additionally, as evidenced by Exhibit F, the proposed antennas would not increase radio frequency emissions to a level at or above the Federal Communications Commission safety standard.

D. Economic Feasibility. Dish Wireless LLC will be entering into an agreement with the owner of this facility to mutually agreeable terms. As previously mentioned, the Letter of Authorization has been provided by the owner to assist Dish Wireless LLC with this tower sharing application.

E. Public Safety Concerns. As discussed above, the tower is structurally capable of supporting Dish Wireless LLC proposed loading. Dish Wireless LLC is not aware of any public safety concerns relative to the proposed sharing of the existing guyed tower. Dish Wireless LLC intentions of providing new and improved wireless service through the shared use of this facility is expected to enhance the safety and welfare of local residents and individuals traveling through Haddam.

Sincerely,

Denise Sabo

Denise Sabo
Mobile: 203-435-3640
Fax: 413-521-0558
Office: 4 Angela's Way, Burlington CT 06013
Email: denise@northeastsitesolutions.com



NSS

NORTHEAST
SITE SOLUTIONS

Turnkey Wireless Development

Attachments

cc: The Honorable Robert McGarry, First Selectman
Haddam Town Office Building
30 Field Park Drive Haddam, CT 06438

Gary Vivian, Building Official
Haddam Town Office Building
30 Field Park Drive Haddam, CT 06438

539 Plains Rd LLC
C/O Crown Atlantic Co
4017 Washington Road McMurry, PA 15317

Crown Castle - Tower Owner

Exhibit A

Original Facility Approval

DOCKET NO. 58

AN APPLICATION OF HARTFORD CELLULAR
COPANY FOR A CERTIFICATE OF
ENVIRONMENTAL COMPATIBILITY AND PUBLIC
NEED FOR THE CONSTRUCTION, MAINTENANCE,
AND OPERATION OF FACILITIES TO PROVIDE
CELLULAR SERVICE IN HARTFORD, TOLLAND AND
MIDDLESEX COUNTIES.

CONNECTICUT SITING
COUNCIL

July 11, 1986.

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

Pursuant to the foregoing opinion, the Connecticut Siting Council (Council) hereby directs that a Certificate of Environmental Compatibility and Public Need as provided by Section 16-50k of the General Statutes of Connecticut (CGS) be issued to the Hartford Cellular Company for the construction, maintenance, and operation of cellular mobile phone telecommunication towers and associated equipment in the towns of Glastonbury, Haddam, Hartford, Portland, Rocky Hill, Somers, Vernon, Windsor, and Willington subject to the conditions below.

- 1) The proposed Bloomfield and Middlefield sites are rejected without prejudice.
- 2) The antennas on the Glastonbury tower shall be mounted no higher than the 180' level of this existing tower.
- 3) The Portland and Rocky Hill towers shall be monopoles.
- 4) The towers shall be no taller than necessary to provide the proposed service, and in no event shall exceed total heights, including antennas, of
 - a) 193' at the Haddam site;
 - b) 173' at the Portland site;

- c) 153' at the Rocky Hill site;
- d) 173' at the Somers site;
- e) 173' at the Vernon site;
- f) 153' at the Willington site;
- g) 173' at the Windsor site.

5) The Hartford site receive antennas shall be mounted below the top of the high point of the building to preclude visibility.

6) Any future actions requiring the removal of the existing Glastonbury tower to be shared by the certificate holder shall also apply to the equipment mounted on that tower by the certificate holder, regardless of that equipment's status under Chapter 277a of the CGS.

7) The certificate holder shall submit a development and management (D&M) plan for the Haddam, Portland, Rocky Hill, Somers, Vernon and Windsor sites pursuant to Sections 16-50j-75 through 16-50j-77 of the Regulations of State Agencies (RSA), except that irrelevant items in Section 16-50j-76 need only be identified as such. In addition to the requirements of Section 16-50j-76, the D&M plan shall provide plans for evergreen screening around the fenced perimeter at the Haddam, Somers, Vernon, and Windsor sites. The D&M plan shall include a proposal for painting the approved monopole structures to blend with the sky. The D&M plan must be approved prior to facility construction. Any changes to specifications in the D&M plan must be approved by the Council prior to facility operation.

8) All certified facilities shall be constructed, operated, and maintained as specified in the Council's record and in the

site plan required by order number 7.

9) The certificate holder shall comply with any future radiofrequency (RF) standards promulgated by state or federal regulatory agencies. Upon the establishment of any new governmental RF standards, the facilities granted in this decision shall continue to be in compliance with such standards.

10) The certificate holder shall permit public or private entities to share space on the towers approved herein, for due consideration received, or shall provide any requesting entity with specific legal, technical, environmental, or economic reasons precluding such tower sharing. In addition to complying with Section 16-50j-73 of the RSA, the certificate holder shall notify the Council of the addition of any equipment to any approved tower.

11) A fence not lower than 8' shall surround each tower and associated equipment.

12) Unless necessary to comply with order 13, no lights shall be installed on any of these towers.

13) The facilities' construction and any future tower sharing shall be in accordance with all applicable federal, state, and municipal laws and regulations. Shared uses by entities not subject to jurisdiction pursuant to Section 16-50k of the CGS shall be subject to all applicable federal, state, and municipal laws and regulations.

14) Construction activities shall take place during daylight working hours.

15) This decision and order shall be void and the towers and associate equipment shall be dismantled and removed, or reapplication for any new use shall be made to the Council before any such new use is made, if the towers do not provide or permanently cease to provide cellular service following completion of construction.

16) This decision and order shall be void if all construction authorized herein is not completed within three years of the issuance of this decision, or within three years of the completion of any appeal if appeal of this decision is taken, unless otherwise approved by the Council.

Pursuant to CGS Section 16-50p, we hereby direct that a copy of the decision and order shall be served on each person listed below. A notice of the issuance shall be published in the Hartford Courant, Middletown Press, Manchester Journal Inquirer, and the Willimantic Chronicle.

The parties to the proceeding are:

Metro Mobile (applicant)
5 Eversley Avenue
Norwalk, Connecticut 06855
ATTN: Armand Mascioli
General Manager

Howard L. Slater, Esq. (its attorneys)
Scott A. Gursky, Esq.
Byrne, Slater, Sandler,
Shulman & Rouse, P.C.
111 Pearl Street
Hartford, Connecticut 06103

Richard Rubin, Esq.
Fleischman and Walsh, P.C.
1725 N Street, N.W.
Washington, D. C. 20036

Mr. William Wamester
1225 Randolph Road
Middletown, Connecticut 06457

The Southern New England Telephone Company
227 Church Street
New Haven, Connecticut 06506
ATTN: Peter J. Tyrrell, Esq.

Mr. James W. Tilney

represented by:
Patricia A. Ayars
Samuel Baily, Jr.
Robinson & Cole
One Commercial Plaza
Hartford, CT. 06103-3597

Mr. Samuel DuBosar, Chairman
Bessie Bennett, Esq.
Town Plan & Zoning Commission
P.O. Box 337
Bloomfield, Connecticut 06002

Town of Somers

represented by:

Mr. Robert F. Peters
Town Counsel
Tatoian, Devline, Peters
& Davis
11 South Road
P.O. Box 415
Somers, CT. 06071

Town of Haddam
represented by:

Lucy R. Petrella
Chairperson
Town Office Building
Route 9A
P.O. Box 87
Haddam, CT. 06438

Midstate Regional Planning Agency

represented by:

Thomas M. Gilligan
Regional Planner
P.O. Box 139
Middletown, CT. 06457

Dr. Donald P. LaSalle
Director
Talcott Mountain Science Center
Montevideo Road
Avon, Connecticut 06001

Barnard Tilson (service waived)
Secretary
Avon Planning and Zoning
60 West Main Street
Avon, Connecticut 06001

Alden Giddings
33 Privelege Road
Bloomfield, Connecticut 06002

Town of Bloomfield

represented by:

Joseph M. Suggs, Jr.
Deputy Mayor
Town Hall
880 Bloomfield Avenue
P.O. Box 337
Bloomfield, CT. 06002
(service waived)

Town of Middlefield

represented by:

David Silverstone, Esq.
Silverstone & Koontz
37 Lewis Street
Hartford, CT. 06103

with a copy to:

Geoffrey Colegrove
Midstate Regional Planning Agency
100 DeKoven Drive
Middletown, CT. 06457

Zoning Commission
Town of Somers

represented by:

Joseph A. Paradis
Chairman
Town Hall
600 Main Street
P.O. Box 803
Somers, CT. 06071

Barbara Sirwilo, Secretary (service waived)
Planning & Zoning Commission
Town of Rocky Hill
600 Old Main Street
P.O. Box 657
Rocky Hill, Connecticut 06067

H. Robert Goodrich (service waived)
Goodrich Lane
Portland, Connecticut 06480

The Honorable Richard P. Antonetti
State Representative (service waived)
5 Sachem Circle
Meriden, Connecticut 06450

John Hevrin
R.D. #1 - Plains Road
Haddam, Connecticut 06438

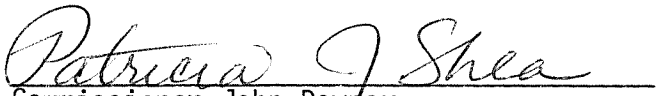



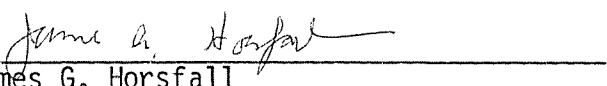
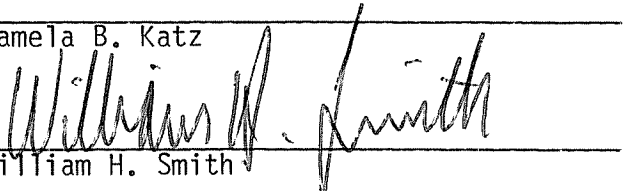
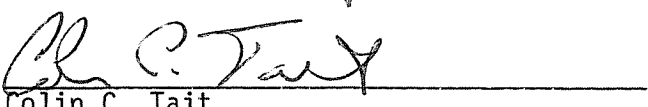
Norman and Darlene Manning (represented by)

Elizabeth Allen, Esq.
P.O. Box 467
Higganum, CT. 06441
(service waived)

C E R T I F I C A T I O N

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


Dated at New Britain, Connecticut, this 11th day of July, 1986.

<u>Council Members</u>	<u>Vote Cast</u>
_____) Gloria Dibble Pond Chairperson	Absent
 _____) Commissioner John Downey Designee: Patricia Shea	Yes
 _____) Commissioner Stanley Pac Designee: Christopher Cooper	Yes
 _____) Owen L. Clark	Yes
 _____) Mortimer A. Gelston	Yes
 _____) James G. Horsfall	Yes
_____) Pamela B. Katz	Absent
 _____) William H. Smith	Yes
 _____) Colin C. Tait	Yes

STATE OF CONNECTICUT)
 :
COUNTY OF HARTFORD) ss. New Britain, July 11, 1986

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

ATTEST:



Christopher S. Wood, Executive Director
Connecticut Siting Council

Petition No. 434
Docket 58
(Alternately, EM-CROWN-061-990927)
Crown Atlantic Company LLC
Staff Report
October 21, 1999

On October 8, 1999, Connecticut Siting Council (Council) Chairman Mortimer A. Gelston and Council staff Steve Levine conducted a field review of Crown Atlantic Company's (Crown) Turkey Hill communications tower in Haddam. Crown proposes to modify the tower to permit use by Omnipoint Communications, Inc. (Omnipoint), and is petitioning the Council for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need (Certificate) is required for the modification. Crown submits that the proposed modification will not have a substantial adverse environmental effect, but instead will reduce the unnecessary proliferation of telecommunications towers by utilizing an existing structure, and qualifies for an order of tower sharing pursuant to C.G.S. § 16-50aa.

The Turkey Hill tower is a 180-foot-tall lattice tower. In 1986, the Council approved a maximum height of 193 feet, *including antennas, in Docket 58*. According to a verbal communication from Crown's attorney in this matter, 13-foot antennas were originally mounted on this tower to a height of 193 feet, but were removed in the early 1990's. The tower presently supports antennas owned by Bell Atlantic Mobile, Springwich Cellular, and Sprint. The Council recently approved additional shared use of the tower by Nextel Communications. An engineering study submitted by Crown indicates the tower is capable of supporting all of these antennas and the proposed Omnipoint antennas as well.

Omnipoint would install three panel-type antennas in an accelerator unit mounted on a mast extending above the 180-foot top of the existing tower. The Omnipoint antennas would extend to a height of 189 feet above grade, four feet under the maximum height approved by the Council in 1986. Omnipoint's antennas would be held in place by a 4-inch diameter, 3-foot-long extension pipe mounted to the top of the tower. The antennas themselves are 19 inches in diameter and rise an additional six feet above the pipe to a total height of 189 feet. Omnipoint also plans to install a 5 x 7-foot equipment cabinet within existing fencing at the base of the tower.

The proposed antennas and associated equipment will not increase the noise levels at the existing site, under normal operating conditions, by six decibels or more. The worst case power density for the telecommunications operations at the site has been calculated to be 13.3% of the applicable standard for uncontrolled environments, including a contribution of 0.5% by Omnipoint. Crown asserts that the proposed installation will not cause a substantial adverse environmental effect, and for this reason would not require a Certificate.

Crown has given separate prior notice of this work as an exempt modification under R.C.S.A. § 16-50j-72(b)(2). See EM-CROWN-061-990927. This item was tabled at the October 8, 1999 Council meeting due to concerns that the pipe might be considered part of the tower, thereby increasing tower height and disqualifying this installation as an exempt modification. Crown would withdraw the Petition from further consideration if the Council chooses to acknowledge the addition of Omnipoint's antennas on the Turkey Hill tower as an exempt modification.

Exhibit B

Property Card

539 PLAINS RD

Location 539 PLAINS RD

Mblu 63/ 022/ C/ I

Acct# PT496400

Owner 539 PLAINS RD LLC

Assessment \$275,460

Appraisal \$393,510

PID 3240

Building Count 1

Current Value

Appraisal			
Valuation Year	Improvements	Land	Total
2016	\$206,010	\$187,500	\$393,510

Assessment			
Valuation Year	Improvements	Land	Total
2016	\$144,210	\$131,250	\$275,460

Owner of Record

Owner 539 PLAINS RD LLC

Sale Price \$325,000

Co-Owner C/O CROWN ATLANTIC CO

Certificate

Address PMB353 4017 WASHINGTON RD
MCMURRAY, PA 15317

Book & Page 347/ 725

Sale Date 10/25/2011

Instrument 00

Ownership History

Ownership History					
Owner	Sale Price	Certificate	Book & Page	Instrument	Sale Date
539 PLAINS RD LLC	\$325,000		347/ 725	00	10/25/2011
MICHAEL JACQUELINE A	\$0		330/ 411	29	06/26/2009
PIONEER ENTERPRISES LLC	\$0		308/ 256		12/21/2006
MICHAEL JACQUELINE	\$0		284/ 001		10/26/2004
MICHAEL JACK & JACQUELINE	\$0		90/ 198		12/02/1958

Building Information

Building 1 : Section 1

Year Built:

Building Photo


Living Area: 0
Replacement Cost: \$0
Building Percent Good:
Replacement Cost
Less Depreciation: \$0

Building Attributes	
Field	Description
Style	Outbuildings
Model	
Grade:	
Stories	
Occupancy	
Exterior Wall 1	
Exterior Wall 2	
Roof Structure	
Roof Cover	
Interior Wall 1	
Interior Wall 2	
Interior Flr 1	
Interior Flr 2	
Heat Fuel	
Heat Type:	
AC Type:	
Total Bedrooms:	
Full Bthrms:	
Half Baths:	
Extra Fixtures	
Total Rooms:	
Bath Style:	
Kitchen Style:	
Extra Kitchens	
Fireplace(s)	
Extra Opening(s)	
Gas Fireplace(s)	
Blocked FPL(s)	
Woodstove(s)	
Bsmt Garage(s)	
SF Fin Bsmt	
FBM Quality	
Whirlpool	
Hot Tub	
Sauna	



(<http://images.vgsi.com/photos2/HaddamCTPhotos/\00\00\57\59.JPG>)

Building Layout

 Building Layout

(http://images.vgsi.com/photos2/HaddamCTPhotos/Sketches/3240_3240.j)

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

Extra Features

Extra Features	<u>Legend</u>
No Data for Extra Features	

Land

Land Use

Use Code 350
Description Cell Tower
Zone R-2A
Neighborhood CELL
Alt Land Appr Category No

Land Line Valuation

Size (Acres) 0.25
Frontage
Depth
Assessed Value \$131,250
Appraised Value \$187,500

Outbuildings

Outbuildings						<u>Legend</u>
Code	Description	Sub Code	Sub Description	Size	Value	Bldg #
FN1	FENCE-4' CHAIN			1200 L.F.	\$10,800	1
SHDC	Cell Shed			315 S.F.	\$85,050	1
SHDC	Cell Shed			312 S.F.	\$84,240	1
SHDC	Cell Shed			96 S.F.	\$25,920	1

Valuation History

Appraisal			
Valuation Year	Improvements	Land	Total
2018	\$206,010	\$187,500	\$393,510
2017	\$206,010	\$187,500	\$393,510
2016	\$206,010	\$187,500	\$393,510

Assessment			
Valuation Year	Improvements	Land	Total
2018	\$144,210	\$131,250	\$275,460
2017	\$144,210	\$131,250	\$275,460
2016	\$144,210	\$131,250	\$275,460

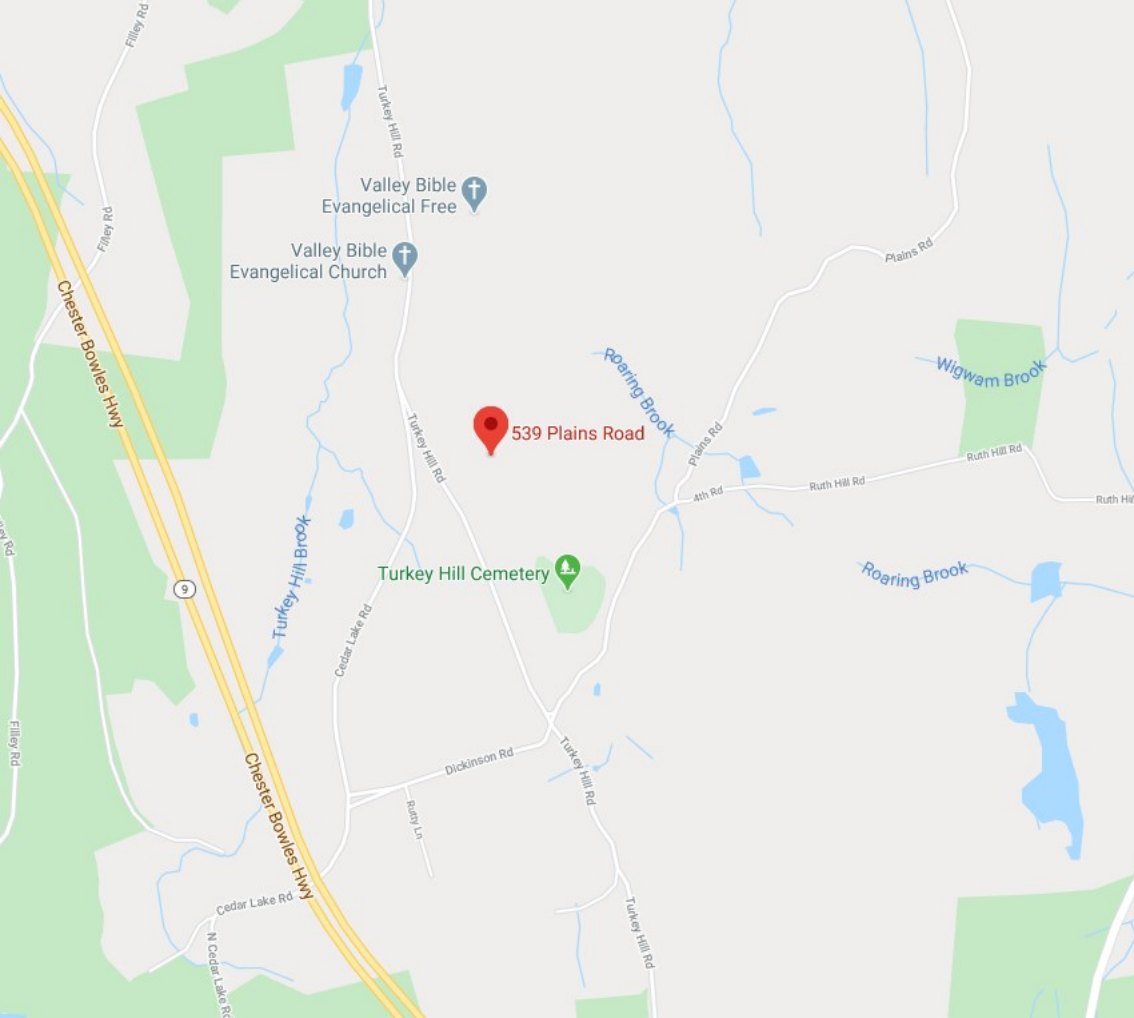


Exhibit C

Construction Drawings



DISH WIRELESS, LLC. SITE ID:

BOBDL00053A

DISH WIRELESS, LLC. SITE ADDRESS:

**539 PLAINS RD
HADDAM, CT 06438**

SCOPE OF WORK	
THIS IS NOT AN ALL INCLUSIVE LIST. CONTRACTOR SHALL UTILIZE SPECIFIED EQUIPMENT PART OR ENGINEER APPROVED EQUIVALENT. CONTRACTOR SHALL VERIFY ALL NEEDED EQUIPMENT TO PROVIDE A FUNCTIONAL SITE. THE PROJECT GENERALLY CONSISTS OF THE FOLLOWING:	
TOWER SCOPE OF WORK:	
<ul style="list-style-type: none"> • INSTALL (3) PROPOSED PANEL ANTENNAS (1 PER SECTOR) • INSTALL (3) PROPOSED ANTENNA MOUNTS (1 PER SECTOR) • INSTALL PROPOSED JUMPERS • INSTALL (6) PROPOSED RRUs (2 PER SECTOR) • INSTALL (1) PROPOSED OVER VOLTAGE PROTECTION DEVICE (OVP) • INSTALL (1) PROPOSED HYBRID CABLE 	
GROUND SCOPE OF WORK:	
<ul style="list-style-type: none"> • REMOVE EXISTING CONCRETE PAD • INSTALL (1) PROPOSED METAL PLATFORM • INSTALL (1) PROPOSED ICE BRIDGE • INSTALL (1) PROPOSED PPC CABINET • INSTALL (1) PROPOSED EQUIPMENT CABINET • INSTALL (1) PROPOSED POWER CONDUIT • INSTALL (1) PROPOSED TELCO CONDUIT • INSTALL (1) PROPOSED TELCO-FIBER BOX • INSTALL (1) PROPOSED GPS UNIT • INSTALL (1) PROPOSED SAFETY SWITCH (IF REQUIRED) • INSTALL (1) PROPOSED CIENA BOX (IF REQUIRED) • INSTALL (1) PROPOSED METER SOCKET 	

SITE INFORMATION	PROJECT DIRECTORY
PROPERTY OWNER: MICHAEL, JACQUELINE	APPLICANT: DISH WIRELESS, LLC. 5701 SOUTH SANTA FE DRIVE LITTLETON, CO 80120
ADDRESS: 4 PARK ROAD c/o ERIC POMERANTZ, ATTN. SHARON, MA 02067	TOWER OWNER: CROWN CASTLE USA INC. 2000 CORPORATE DRIVE CANONSBURG, PA 15317 (877) 486-9377
TOWER TYPE: SELF SUPPORT TOWER	SITE DESIGNER: INFINIGY 2500 W. HIGGINS RD. STE. 500 HOFFMAN ESTATES, IL 60169 (847) 648-4068
TOWER CO SITE ID: 806478	SITE ACQUISITION: NICHOLAS CURRY TBD
TOWER APP NUMBER: 553396	CONSTRUCTION MANAGER: JAVIER SOTO TBD
COUNTY: MIDDLESEX	RF ENGINEER: BOSSENER CHARLES
LATITUDE (NAD 83): 41° 26' 35.00" N 41.443056 N	
LONGITUDE (NAD 83): -72° 30' 22.40" W -72.506222 W	
ZONING JURISDICTION: CT - CONNECTICUT SITING COUNCIL	
ZONING DISTRICT: TBD	
PARCEL NUMBER: 63 022 2 A/K/A P0496410	
OCCUPANCY GROUP: U	
CONSTRUCTION TYPE: II-B	
POWER COMPANY: CONNECTICUT LIGHT & POWER	
TELEPHONE COMPANY: AT&T	



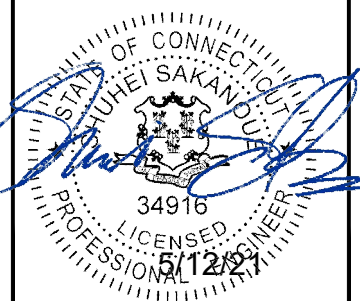
5701 SOUTH SANTA FE DRIVE
LITTLETON, CO 80120



2000 CORPORATE DRIVE
CANONSBURG, PA 15317



the solutions are endless
2500 W. HIGGINS RD. SUITE 500 |
HOFFMAN ESTATES, IL 60169
PHONE: 847-648-4068 | FAX: 518-690-0793
WWW.INFINIGY.COM



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

DRAWN BY: RCD | CHECKED BY: SS | APPROVED BY: CJW

RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

CONNECTICUT CODE COMPLIANCE

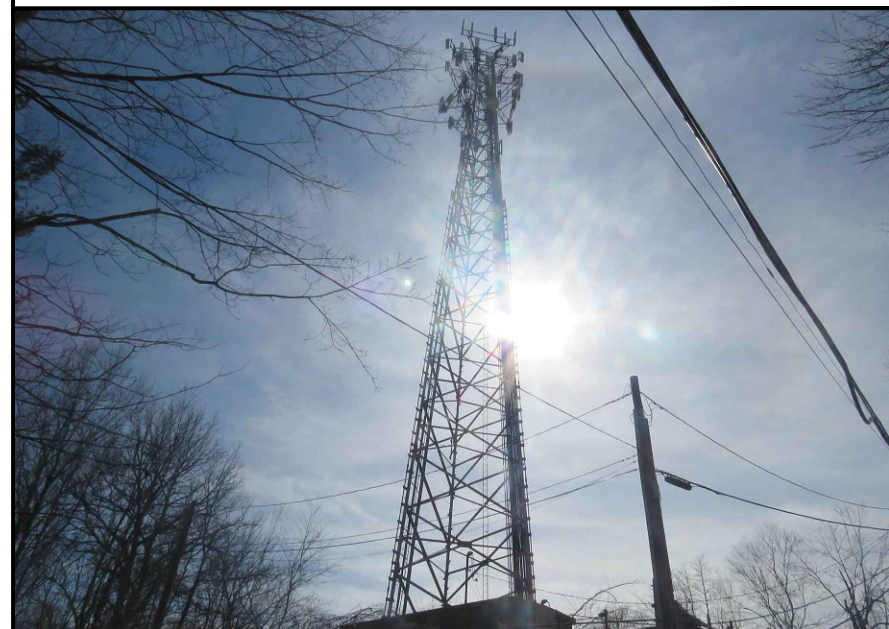
ALL WORK SHALL BE PERFORMED AND MATERIALS INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES:

CODE TYPE	CODE
BUILDING	2018 CT STATE BUILDING CODE/2015 IBC W/ CT AMENDMENTS
MECHANICAL	2018 CT STATE BUILDING CODE/2015 IMC W/ CT AMENDMENTS
ELECTRICAL	2018 CT STATE BUILDING CODE/2017 NEC W/ CT AMENDMENTS

SHEET INDEX

SHEET NO.	SHEET TITLE
T-1	TITLE SHEET
A-1	OVERALL AND ENLARGED SITE PLAN
A-2	ELEVATION, ANTENNA LAYOUT AND SCHEDULE
A-3	EQUIPMENT PLATFORM AND H-FRAME DETAILS
A-4	EQUIPMENT DETAILS
A-5	EQUIPMENT DETAILS
A-6	EQUIPMENT DETAILS
E-1	ELECTRICAL ROUTE PLAN AND NOTES
E-2	ELECTRICAL DETAILS
E-3	ELECTRICAL ONE-LINE, FAULT CALCS & PANEL SCHEDULE
G-1	GROUNDING PLANS AND NOTES
G-2	GROUNDING DETAILS
G-3	GROUNDING DETAILS
RF-1	RF CABLE COLOR CODE
RF-2	RF PLUMBING DIAGRAM
GN-1	LEGEND AND ABBREVIATIONS
GN-2	GENERAL NOTES
GN-3	GENERAL NOTES
GN-4	GENERAL NOTES

SITE PHOTO



UNDERGROUND SERVICE ALERT CBYD 811
UTILITY NOTIFICATION CENTER OF CONNECTICUT
(800) 922-4455
WWW.CBYD.COM
CALL 2 WORKING DAYS UTILITY NOTIFICATION PRIOR TO CONSTRUCTION



GENERAL NOTES

THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. A TECHNICIAN WILL VISIT THE SITE AS REQUIRED FOR ROUTINE MAINTENANCE. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE. NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.

11"x17" PLOT WILL BE HALF SCALE UNLESS OTHERWISE NOTED

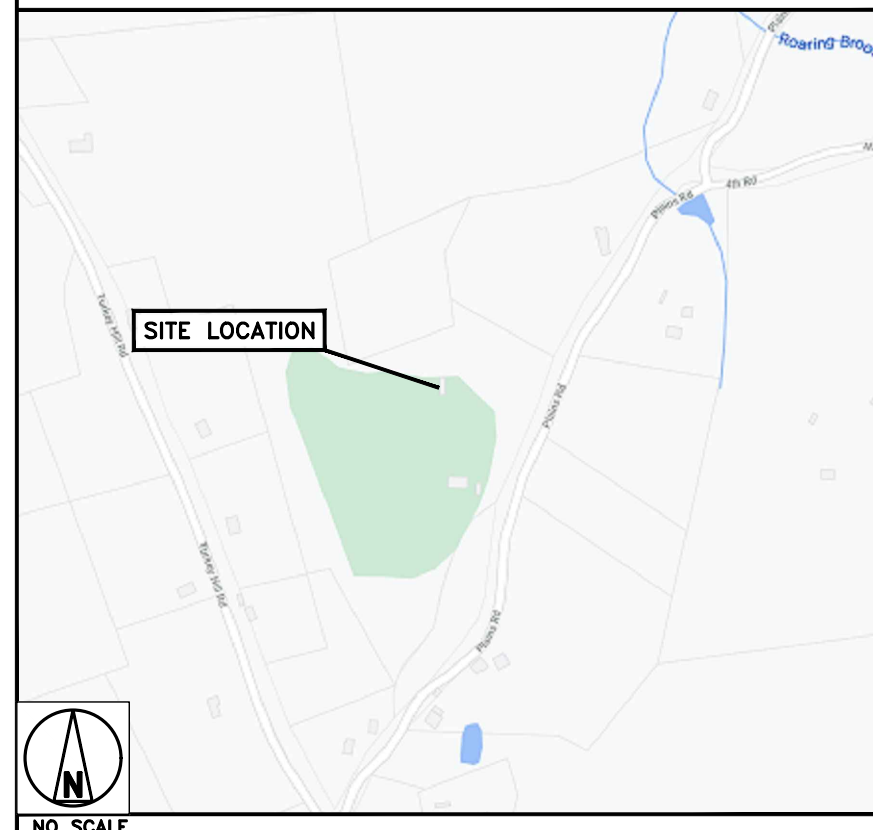
CONTRACTOR SHALL VERIFY ALL PLANS, EXISTING DIMENSIONS, AND CONDITIONS ON THE JOB SITE, AND SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.

DIRECTIONS

DIRECTIONS FROM ORLANDO SANFORD INTERNATIONAL AIRPORT:

HEAD NORTHWEST ON CHESTER AIRPORT TOWARD CROSS RD, TURN RIGHT ONTO CT-145 / WINTHROP RD, TURN RIGHT ONTO CT-148 / W MAIN ST, TURN LEFT ONTO WIG HILL RD, TURN LEFT ONTO TURKEY HILL RD, ROAD NAME CHANGES TO WIG HILL RD, TURN RIGHT ONTO PLAINS RD, UNPAVED ROAD, ARRIVE AT 539 PLAINS RD, HADDAM, CT 06438

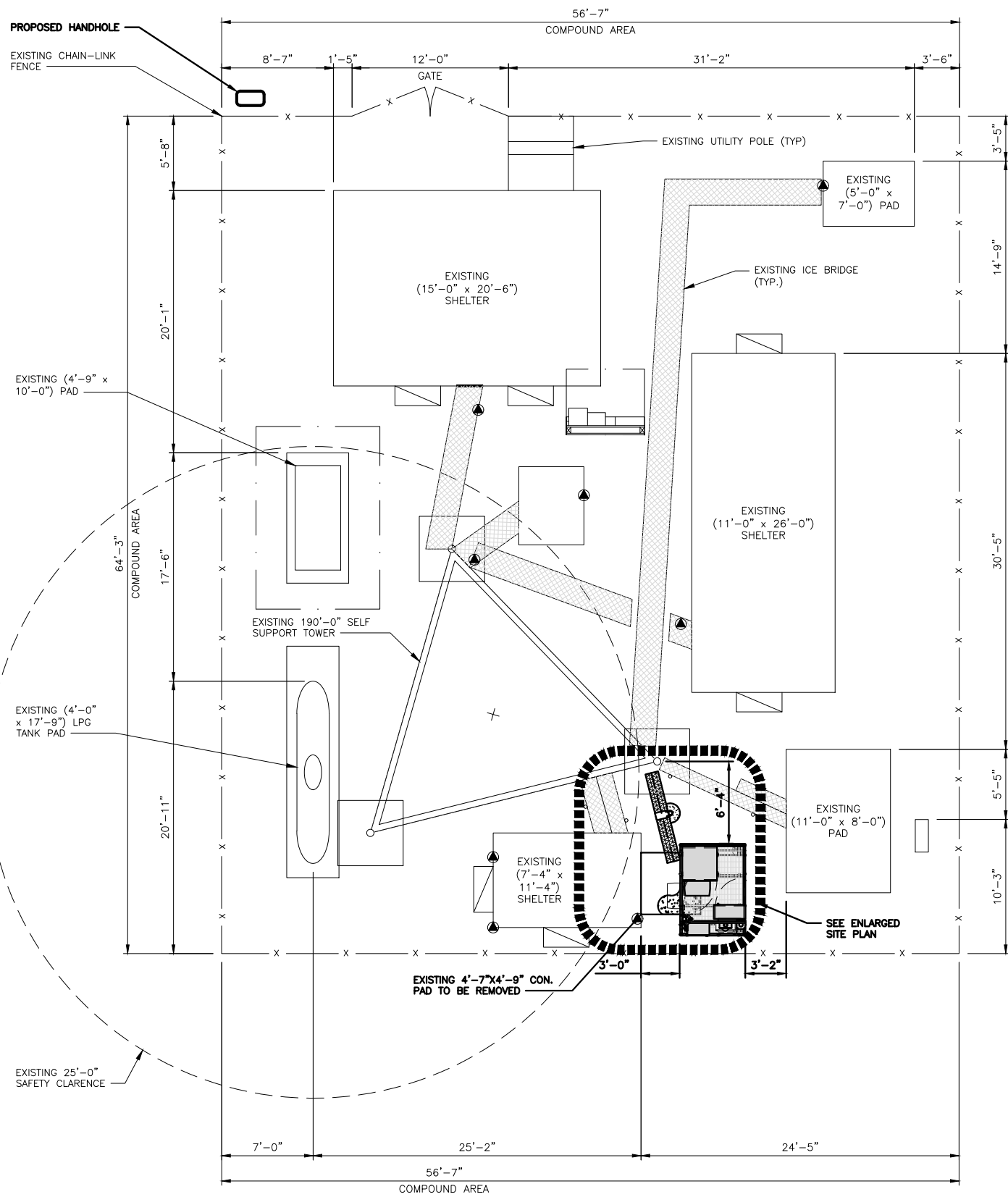
VICINITY MAP



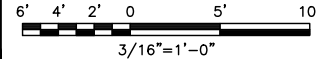
NO SCALE

NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. ANTENNAS AND MOUNTS OMITTED FOR CLARITY.



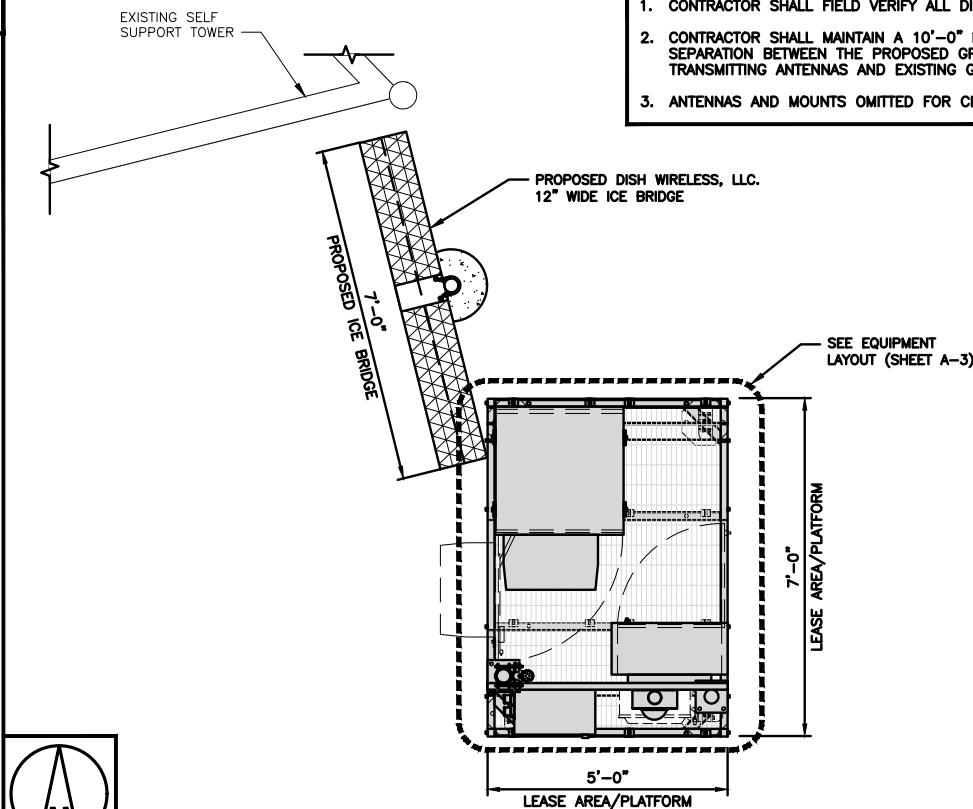
COMPOUND PLAN



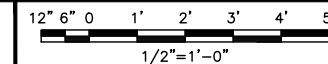
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NOTES

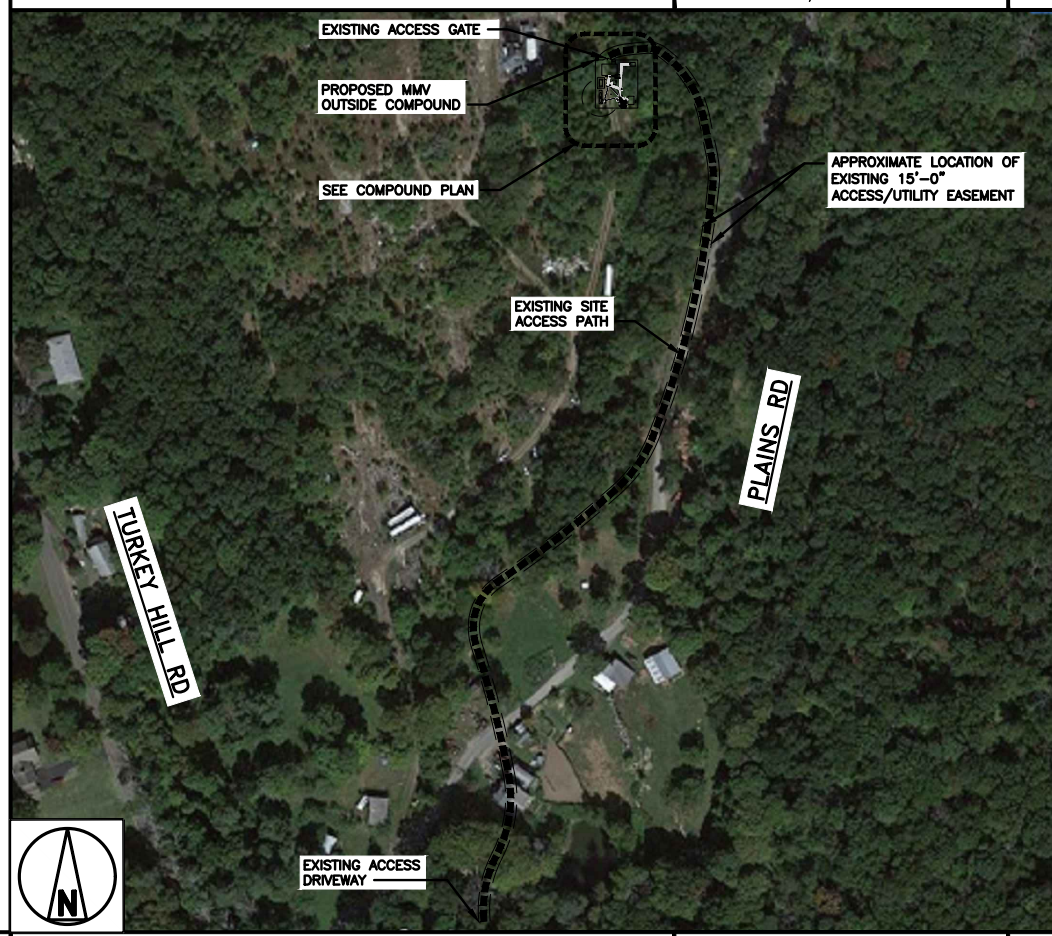
1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. CONTRACTOR SHALL MAINTAIN A 10'-0" MINIMUM SEPARATION BETWEEN THE PROPOSED GPS UNIT, TRANSMITTING ANTENNAS AND EXISTING GPS UNITS.
3. ANTENNAS AND MOUNTS OMITTED FOR CLARITY.



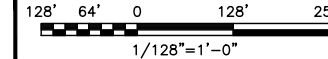
ENLARGED SITE PLAN



2



SITE PLAN



3

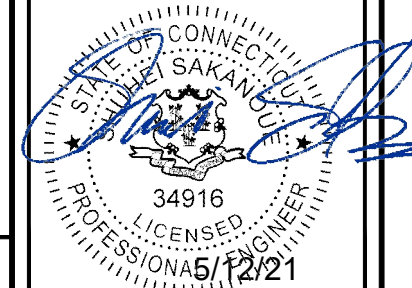
dish wireless.

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DRAWN BY: CHECKED BY: APPROVED BY:
RCD SS CJW

RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

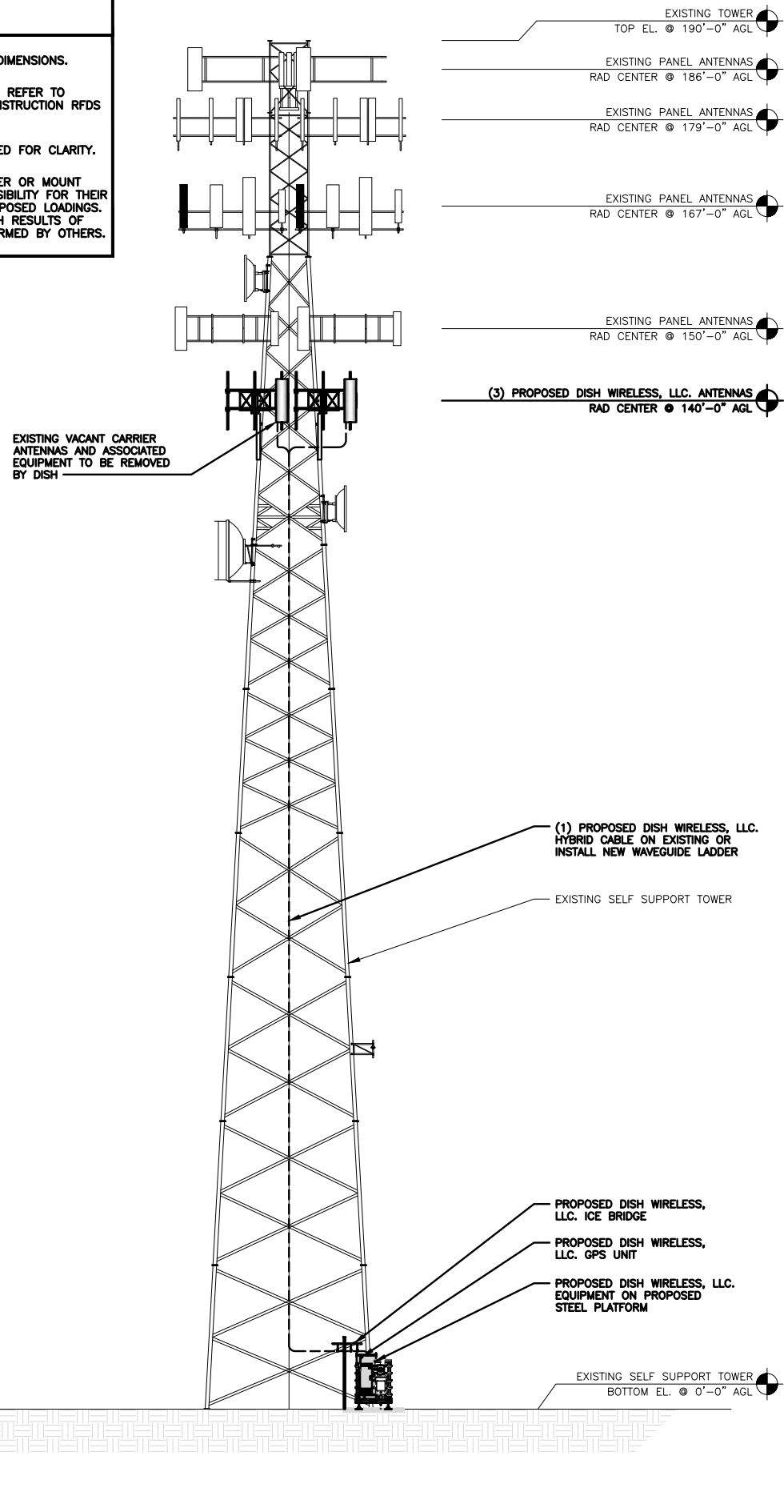
SHEET TITLE
OVERALL AND ENLARGED
SITE PLAN

SHEET NUMBER

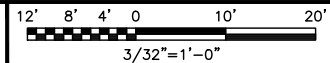
A-1

NOTES

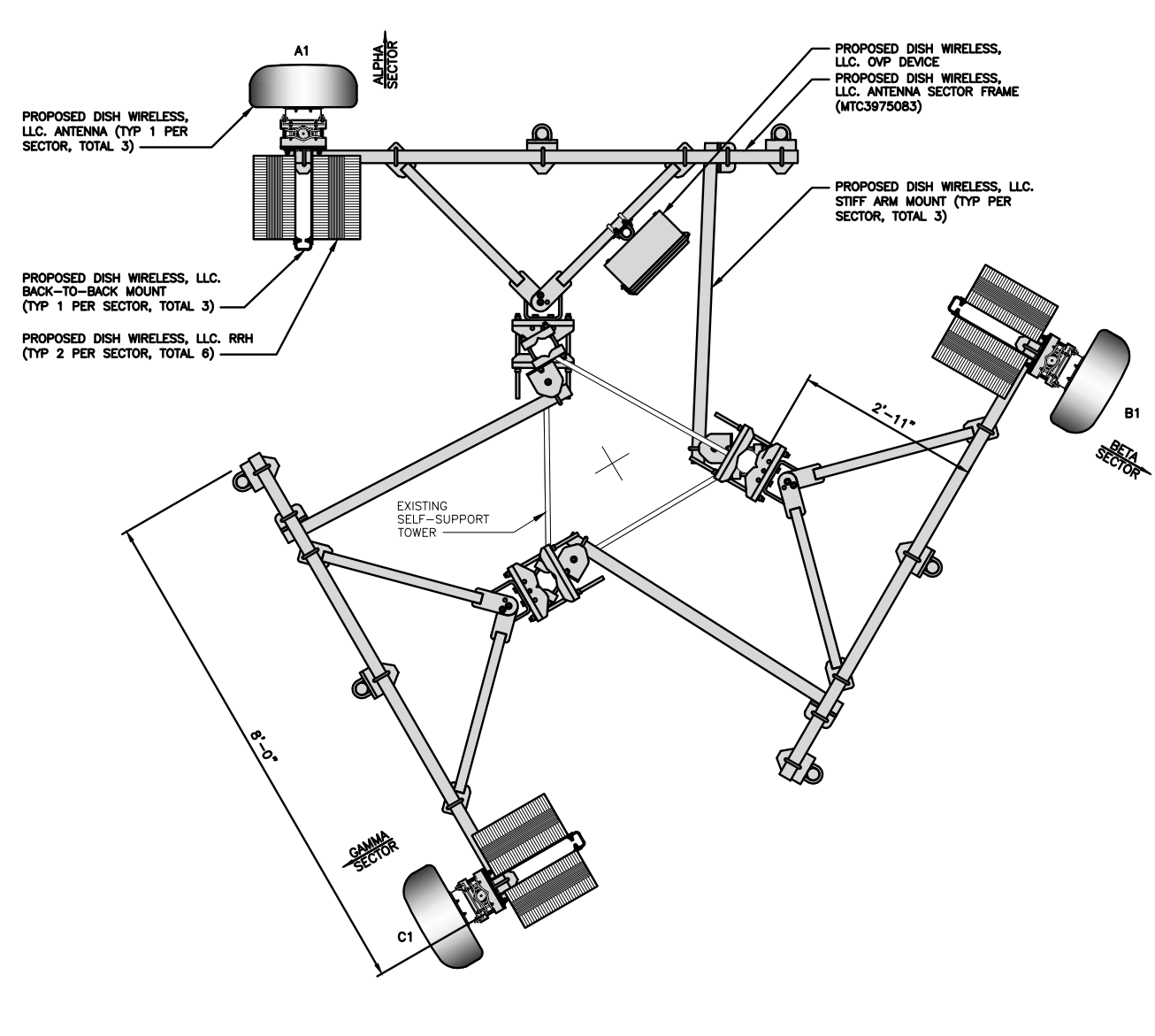
1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. ANTENNA AND MW DISH SPECIFICATIONS REFER TO ANTENNA SCHEDULE AND TO FINAL CONSTRUCTION RFDS FOR ALL RF DETAILS
3. EXISTING EQUIPMENT AND FENCE OMITTED FOR CLARITY.
4. INFINIGY HAS NOT EVALUATED THE TOWER OR MOUNT STRUCTURE AND ASSUMES NO RESPONSIBILITY FOR THEIR STRUCTURAL INTEGRITY REGARDING PROPOSED LOADINGS. FINAL INSTALLATION SHALL COMPLY WITH RESULTS OF PASSING STRUCTURAL ANALYSES PERFORMED BY OTHERS.



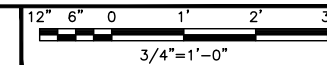
PROPOSED SOUTH ELEVATION



1



ANTENNA LAYOUT



2

SECTOR	POSITION	ANTENNA						TRANSMISSION CABLE
		EXISTING OR PROPOSED	MANUFACTURER - MODEL NUMBER	TECHNOLOGY	SIZE (HxW)	AZMUTH	RAD CENTER	FEED LINE TYPE AND LENGTH
ALPHA	A1	PROPOSED	JMA WIRELESS - MX08FRO665-20	5G	72.0" x 20.0"	0°	140'-0"	(1) HIGH-CAPACITY HYBRID CABLE (190' LONG)
BETA	B1	PROPOSED	JMA WIRELESS - MX08FRO665-20	5G	72.0" x 20.0"	120°	140'-0"	
GAMMA	C1	PROPOSED	JMA WIRELESS - MX08FRO665-20	5G	72.0" x 20.0"	240°	140'-0"	

- NOTES**
1. CONTRACTOR TO REFER TO FINAL CONSTRUCTION RFDS FOR ALL RF DETAILS.
 2. ANTENNA OR RRH MODELS MAY CHANGE DUE TO EQUIPMENT AVAILABILITY. ALL EQUIPMENT CHANGES MUST BE APPROVED AND REMAIN IN COMPLIANCE WITH THE PROPOSED DESIGN AND STRUCTURAL ANALYSES.

SECTOR	POSITION	RRH		NOTES
		MANUFACTURER - MODEL NUMBER	TECHNOLOGY	
ALPHA	A1	FUJITSU - TA08025-B604	5G	1. CONTRACTOR TO REFER TO FINAL CONSTRUCTION RFDS FOR ALL RF DETAILS. 2. ANTENNA AND RRH MODELS MAY CHANGE DUE TO EQUIPMENT AVAILABILITY. ALL EQUIPMENT CHANGES MUST BE APPROVED AND REMAIN IN COMPLIANCE WITH THE PROPOSED DESIGN AND STRUCTURAL ANALYSES.
	A1	FUJITSU - TA08025-B605	5G	
BETA	B1	FUJITSU - TA08025-B604	5G	
	B1	FUJITSU - TA08025-B605	5G	
GAMMA	C1	FUJITSU - TA08025-B604	5G	
	C1	FUJITSU - TA08025-B605	5G	

ANTENNA SCHEDULE

NO SCALE

3



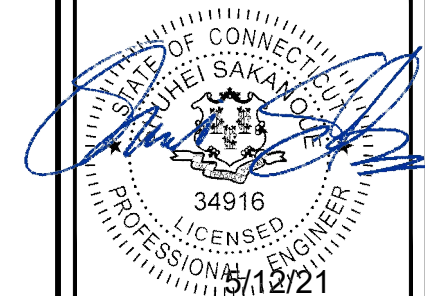
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RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

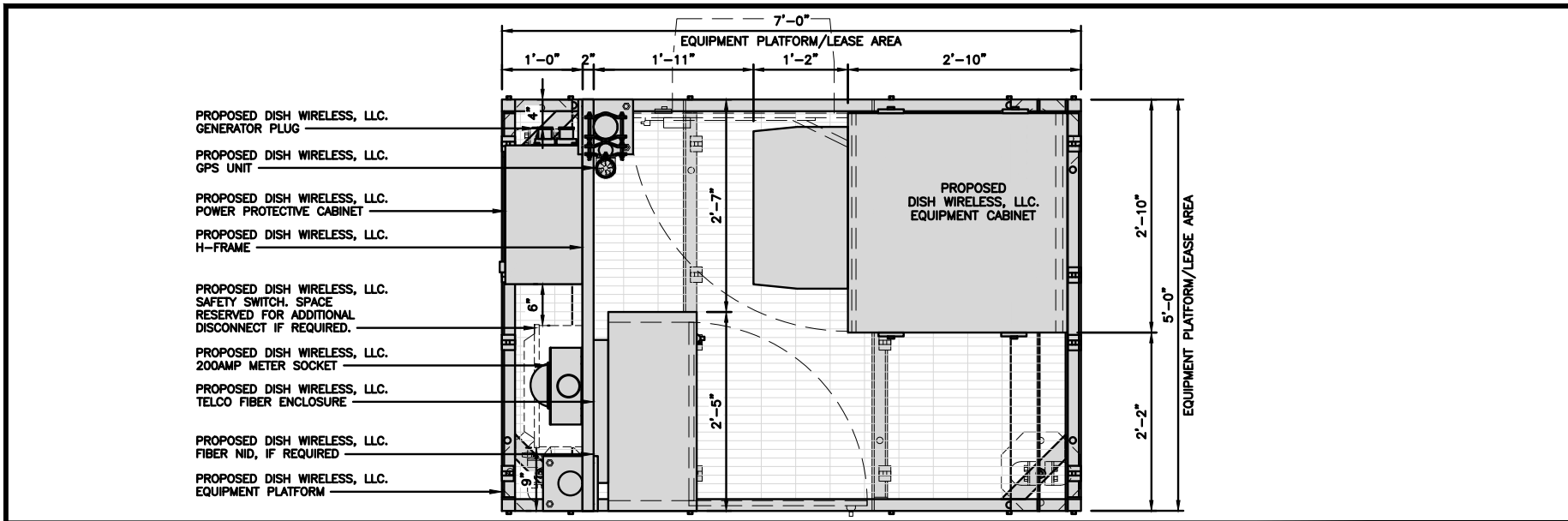
A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

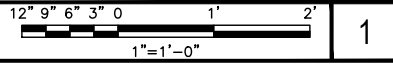
SHEET TITLE
ELEVATION, ANTENNA
LAYOUT AND SCHEDULE

SHEET NUMBER

A-2

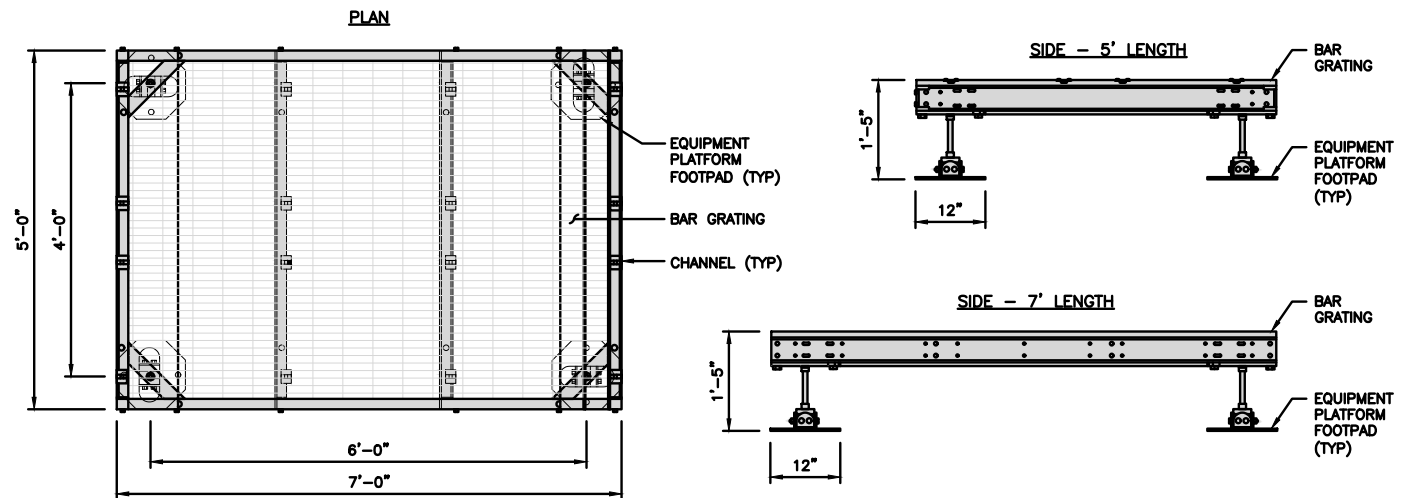


PLATFORM EQUIPMENT PLAN



COMMSCOPE MTC4045LP 5X7 PLATFORM	
DIMENSIONS (HxWxD)	16"x84"x60"
TOTAL WEIGHT	423 LBS

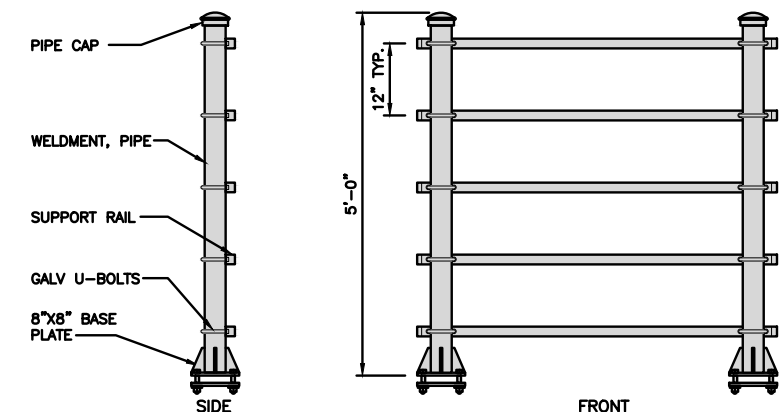
NOTE:
GC TO PROVIDE EXTENDED
THREAD FOR PLATFORM IF
REQUIRED HEIGHT EXCEEDS 17"



PLATFORM DETAIL

NO SCALE 2

KENWOOD T1701KT5-5S H-FRAME	
UNISTRUT/SUPPORT RAIL	5
WEIGHT/ VOLUME	173.6 LBS

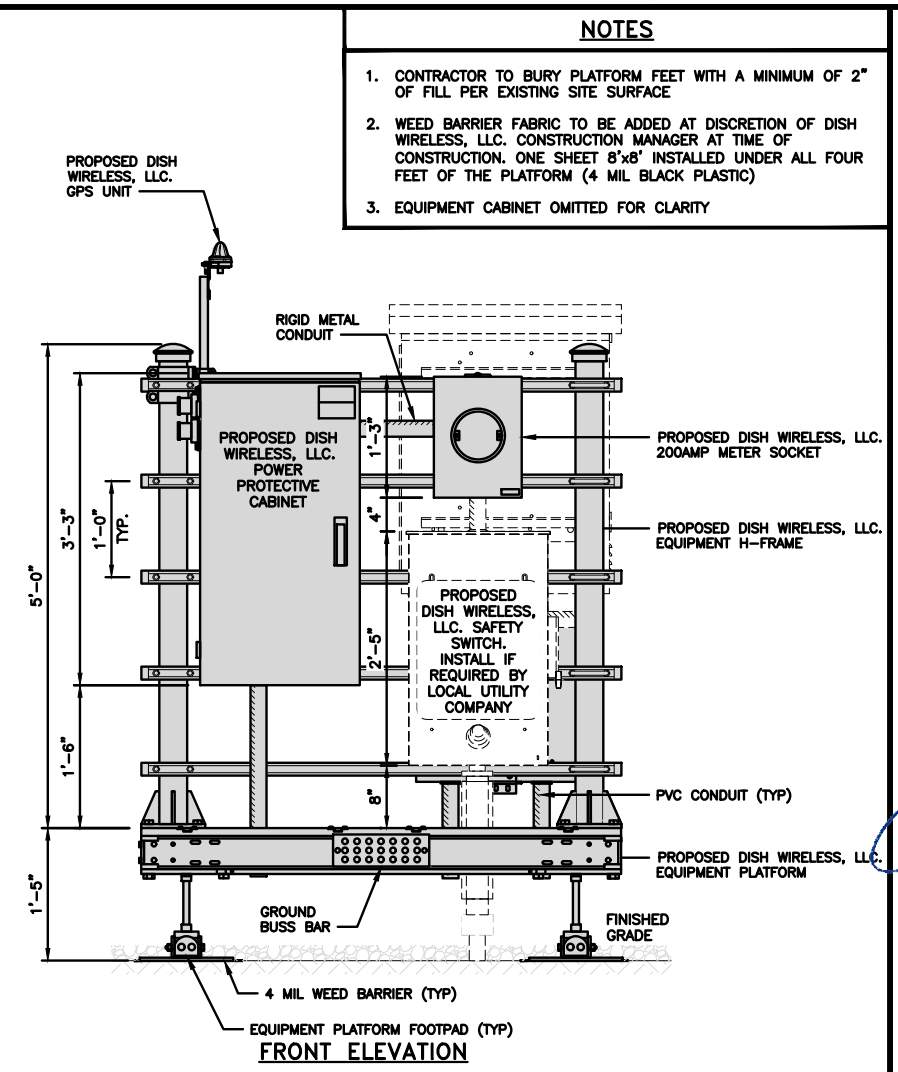


H-FRAME DETAIL

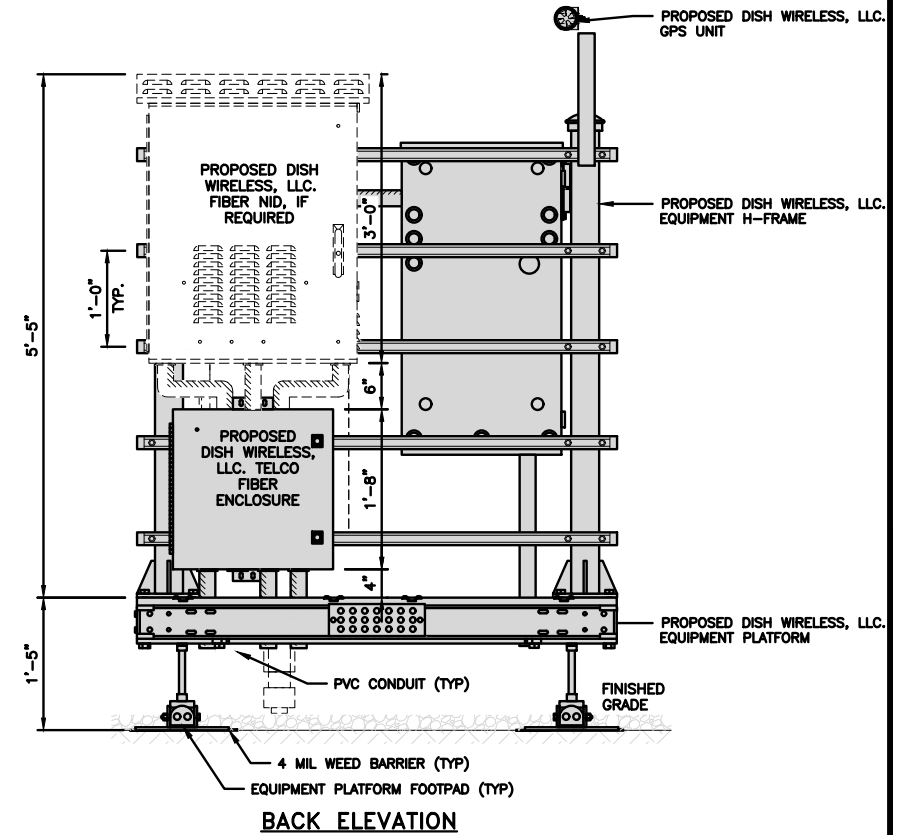
NO SCALE 3

NOT USED

NO SCALE 4

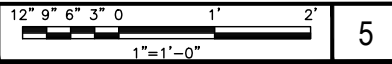


FRONT ELEVATION



BACK ELEVATION

H-FRAME EQUIPMENT ELEVATION



- NOTES**
- CONTRACTOR TO BURY PLATFORM FEET WITH A MINIMUM OF 2" OF FILL PER EXISTING SITE SURFACE
 - WEED BARRIER FABRIC TO BE ADDED AT DISCRETION OF DISH WIRELESS, LLC. CONSTRUCTION MANAGER AT TIME OF CONSTRUCTION. ONE SHEET 8'x8' INSTALLED UNDER ALL FOUR FEET OF THE PLATFORM (4 MIL BLACK PLASTIC)
 - EQUIPMENT CABINET OMITTED FOR CLARITY



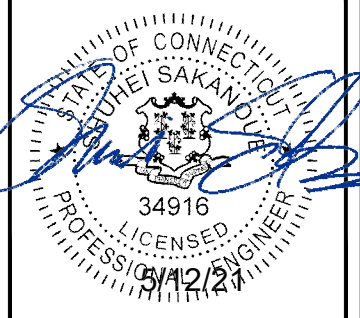
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RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

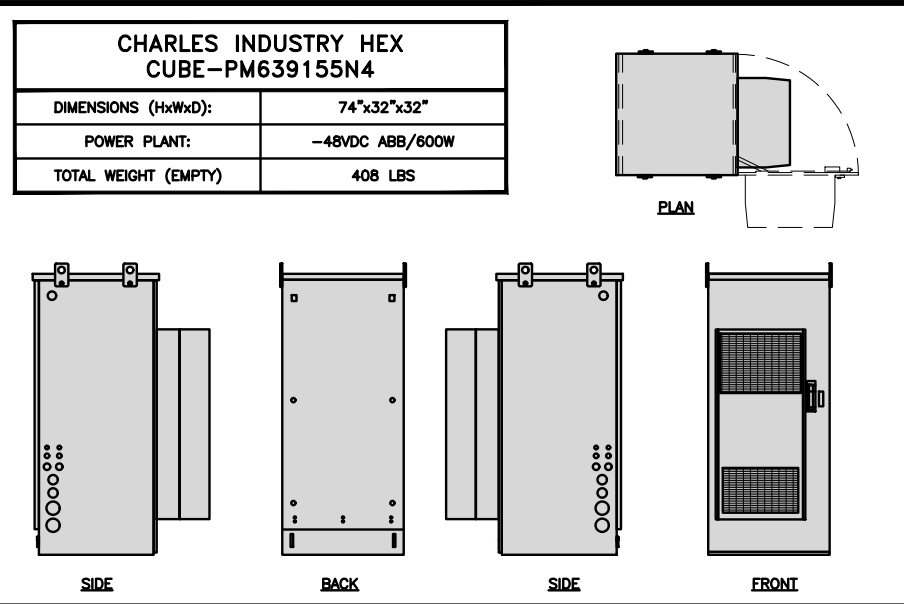
SUBMITTALS		
REV	DATE	DESCRIPTION
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A&E PROJECT NUMBER
2039-Z5555C

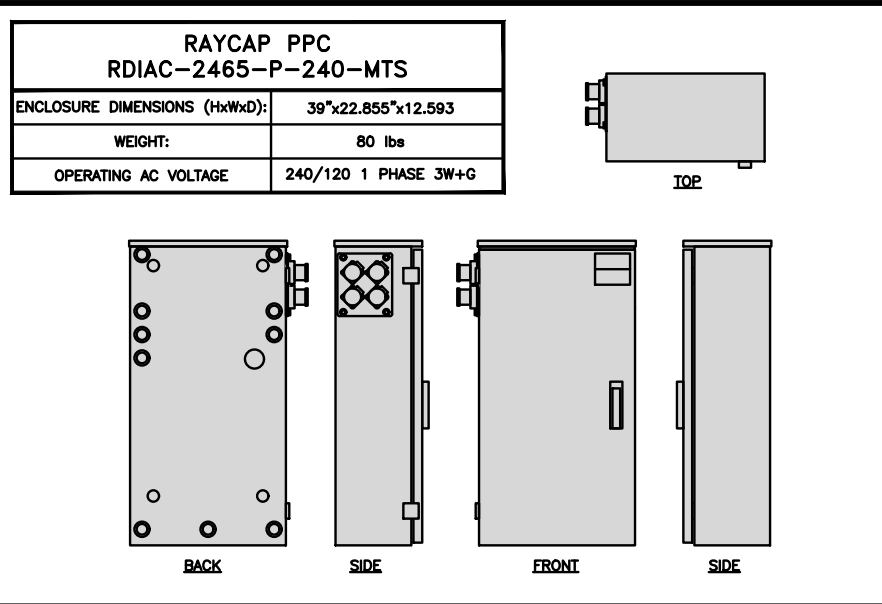
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT PLATFORM AND
H-FRAME DETAILS

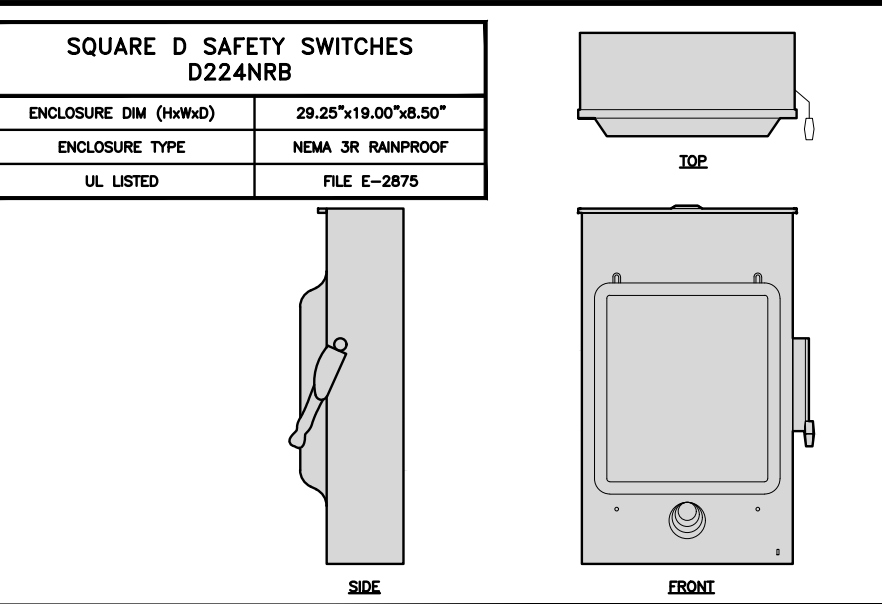
SHEET NUMBER
A-3



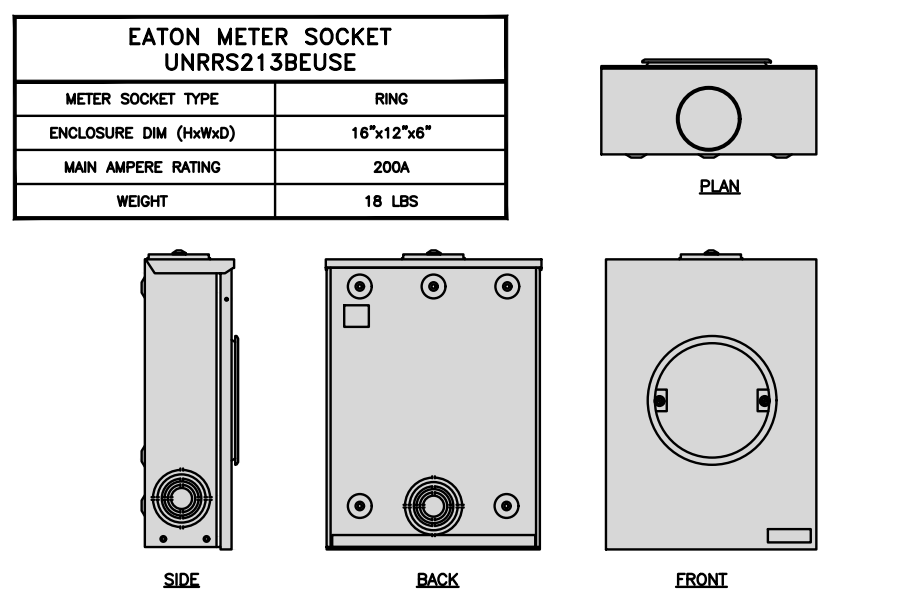
CABINET DETAIL NO SCALE 1



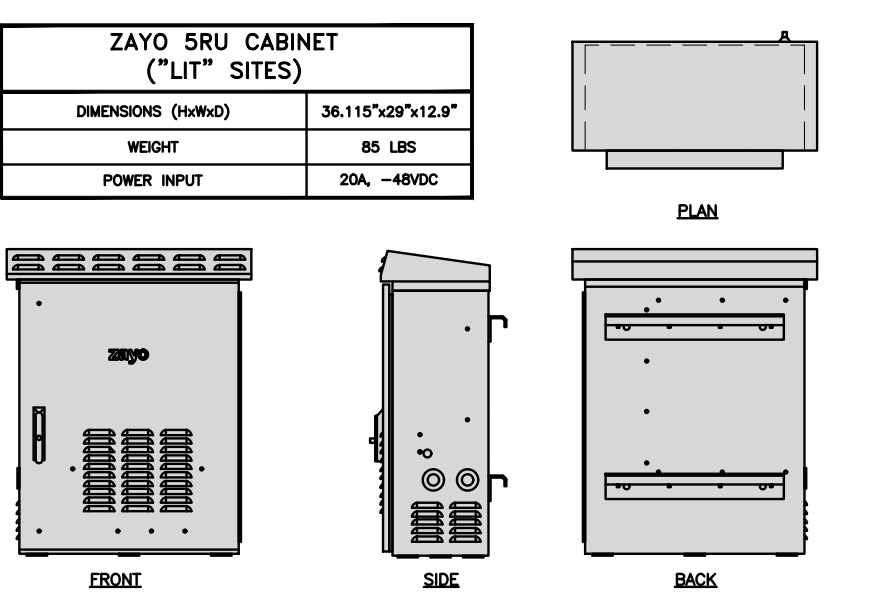
POWER PROTECTION CABINET (PPC) DETAIL NO SCALE 2



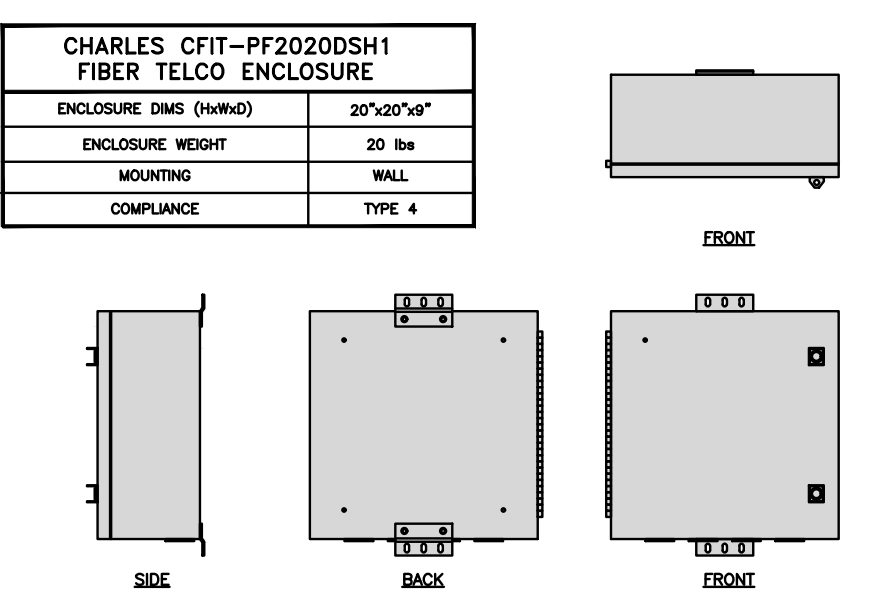
SAFETY SWITCH DETAIL NO SCALE 3



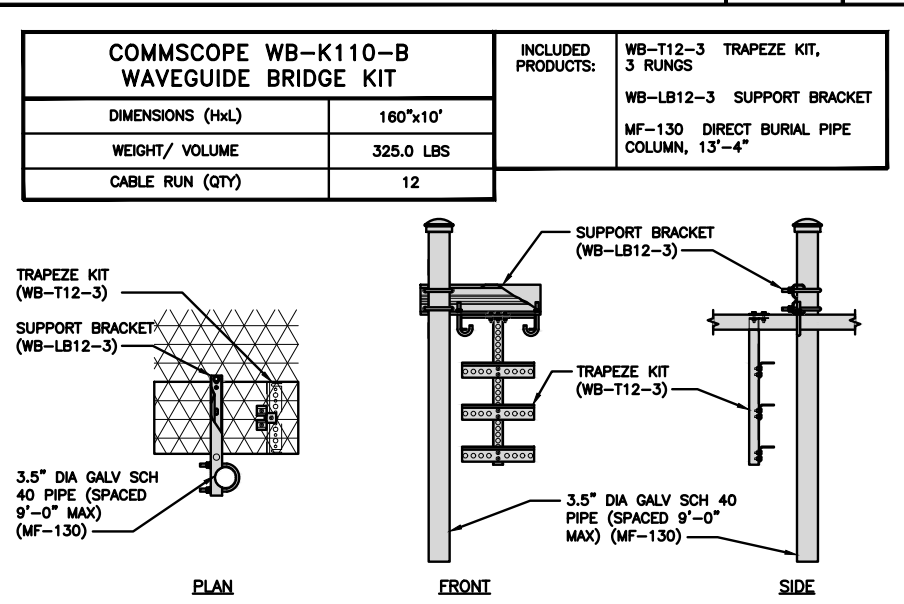
METER SOCKET DETAIL NO SCALE 4



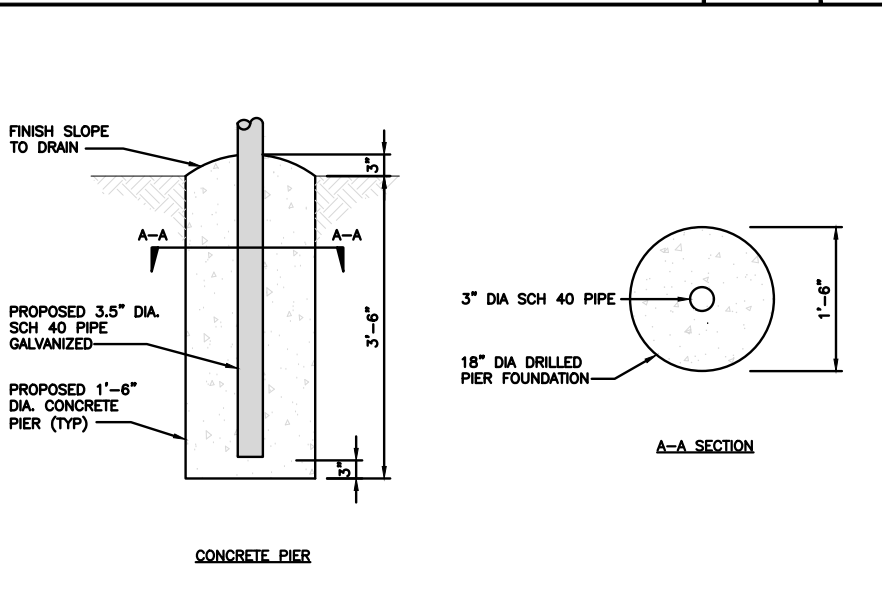
NETWORK INTERFACE UNIT DETAIL NO SCALE 5



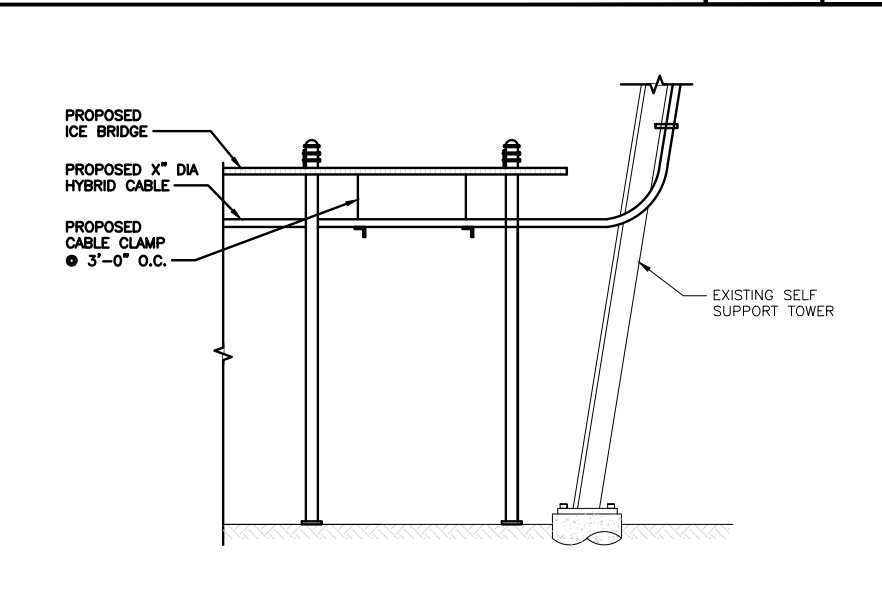
FIBER TELCO ENCLOSURE DETAIL NO SCALE 6



ICE BRIDGE DETAIL NO SCALE 7



TYPICAL ICE BRIDGE CONCRETE PIER DETAIL NO SCALE 8



HYBRID CABLE RUN NO SCALE 9

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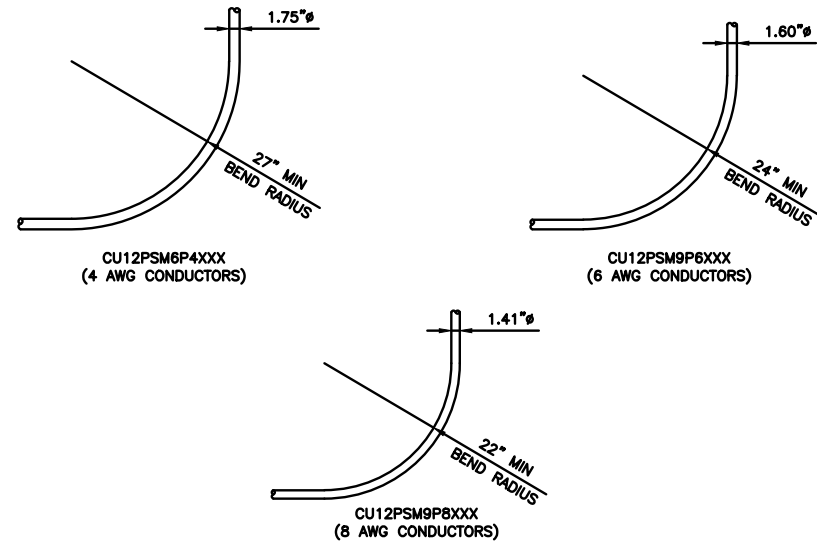
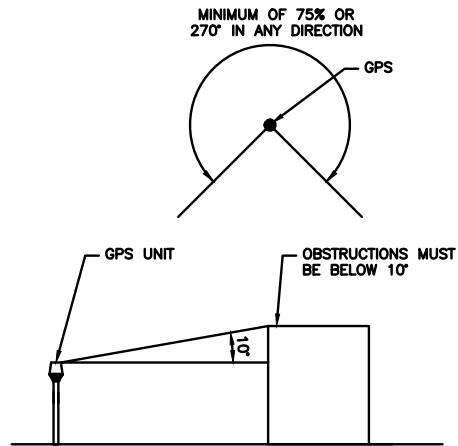
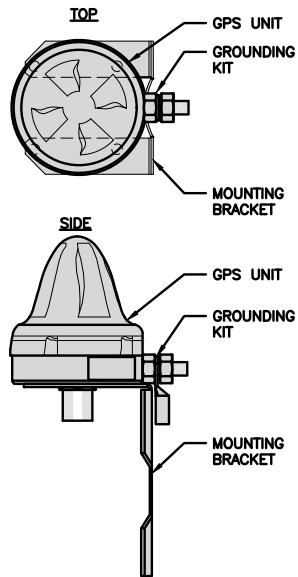
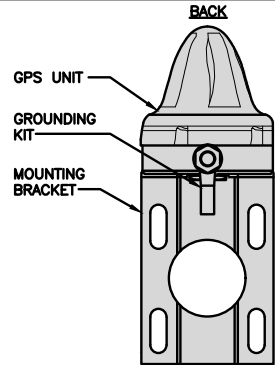
A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL0053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT DETAILS

SHEET NUMBER
A-4

ROSENBERGER GPSGLONASS-36-N-S	
DIMENSION (DIA x H)	69mm x 98.5mm
WEIGHT (WITH ACCESSORIES)	515.74g
CONNECTOR	N-FEMALE
FREQUENCY RANGE	1559 MHz ~ 1610.5MHz



GPS ANTENNA DETAIL

NO SCALE 1

GPS MINIMUM SKY VIEW REQUIREMENTS

NO SCALE 2

CABLES UNLIMITED HYBRID CABLE
MINIMUM BEND RADIUS

NO SCALE 3

NOT USED

NO SCALE 4

NOT USED

NO SCALE 5

NOT USED

NO SCALE 6

NOT USED

NO SCALE 7

NOT USED

NO SCALE 8

NOT USED

NO SCALE 9

dish
wireless.

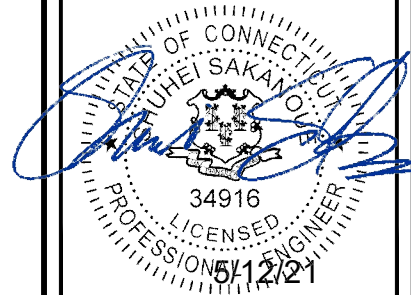
5701 SOUTH SANTA FE DRIVE
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**CROWN
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RCD SS CJW

RFDS REV #: N/A

**CONSTRUCTION
DOCUMENTS**

SUBMITTALS		
REV	DATE	DESCRIPTION
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2039-Z5555C

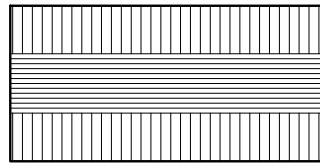
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT DETAILS

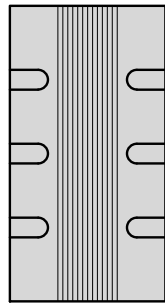
SHEET NUMBER

A-5

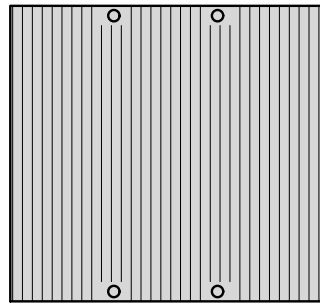
FUJITSU TA08025-B604 RRH	
DIMENSIONS (HxWxD) (KG/IN)	380x400x200/14.9"x15.7"x7.8"
WEIGHT(KG,LB)/ VOLUME	29kg,63.9lb/ 30L
POWER SUPPLY	DC-58~-36V



PLAN



SIDE



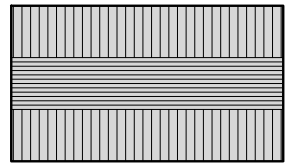
FRONT

REMOTE RADIO HEAD DETAIL

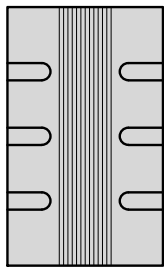
NO SCALE

1

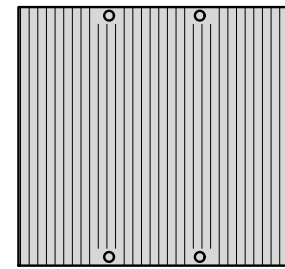
FUJITSU TA08025-B605 RRH	
DIMENSIONS (HxWxD) (KG/IN)	380x400x230/14.9"x15.7"x9.0"
WEIGHT(KG,LB)/ VOLUME	34kg,74.9lb/ 35L
POWER SUPPLY	DC-58~-36V



PLAN



SIDE



FRONT

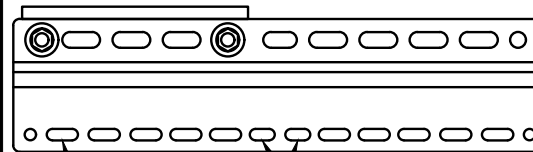
REMOTE RADIO HEAD DETAIL

NO SCALE

2

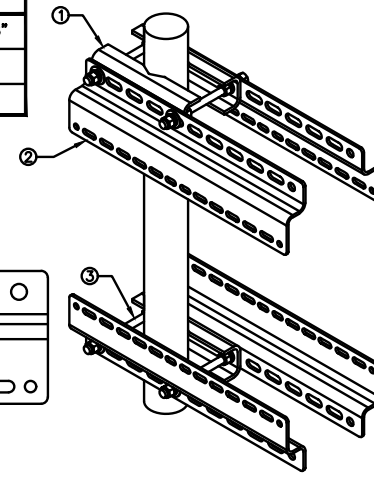
SABRE INDUSTRIES RRU BRACKET MOUNT C10123155	
DIMENSIONS (HxWxD) (1 BRACKET)	5"x20"x1-13/16"
WEIGHT (FULL ASSEMBLY)	35.79 lbs
PACKAGE QUANTITY	4

ITEM#	DESCRIPTION
1	PLATE, CHANNEL BRACKET
2	RRH Z BRACKET, 3/16"
3	THREADED ROD ASSEMBLY 1/2"x12"



11MM x 30MM SLOTS
40MM ON CENTER

11MM x 24MM SLOTS



REMOTE RADIO MOUNT DETAIL

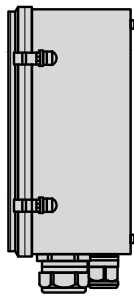
NO SCALE

3

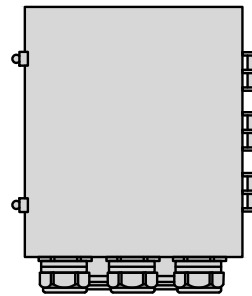
RAYCAP RDIDC-9181-PF-48 DC SURGE PROTECTION	
DIMENSIONS (HxWxD)	18.98"x14.39"x8.15"
WEIGHT	21.82 LBS



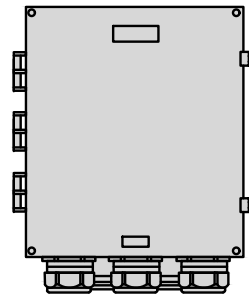
PLAN



SIDE



BACK



FRONT

SURGE SUPPRESSION DETAIL

NO SCALE

4

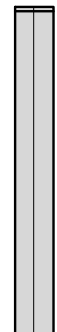
JMA WIRELESS MX08FR0665-20 ANTENNA	
DIMENSIONS (HxWxD)	72.0"x20.0"x8.0"
TOTAL WEIGHT	54 LB
RF PORTS, CONNECTOR TYPE	8 x 4.3-10 FEMALE



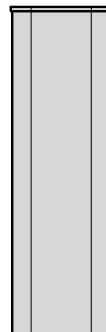
PLAN



BACK



SIDE



FRONT

ANTENNA DETAIL

NO SCALE

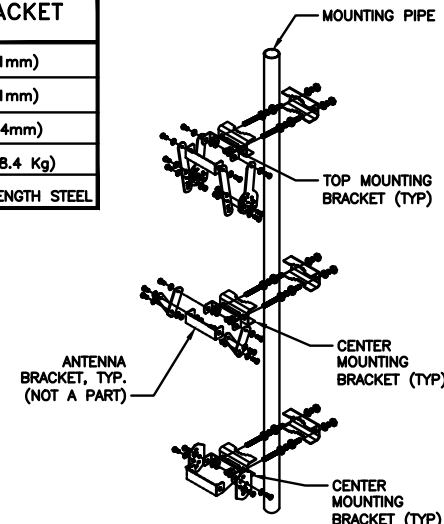
5

NOTES

FINAL ANTENNA SPECIFICATIONS
TO BE CONFIRMED BY GC

JMA 91900318 MOUNTING BRACKET

WIDTH	8.3" (211mm)
DEPTH	7.5" (191mm)
HEIGHT	11.2" (284mm)
TOTAL WEIGHT (WITH BRACKETS)	18.5 LBS (8.4 Kg)
HOUSING MATERIAL	GALV. HIGH STRENGTH STEEL

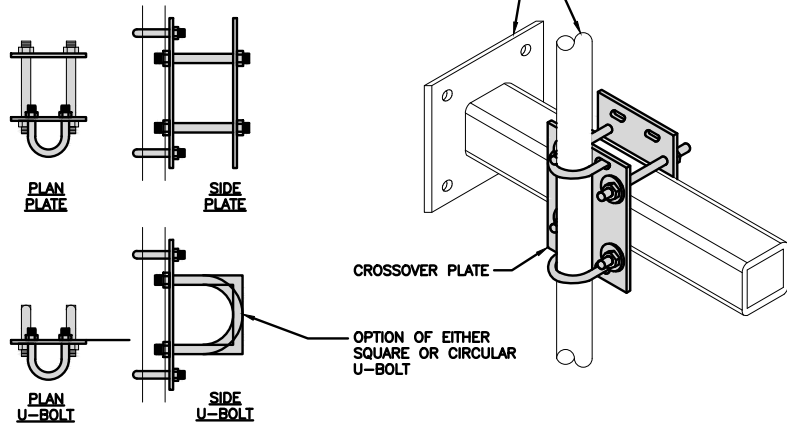


ANTENNA MOUNTING DETAIL

NO SCALE

6

COMMSCOPE XP-2040 CROSSOVER PLATE	
DIMENSIONS (HxW)	10"x12"
WEIGHT	11.023 LBS

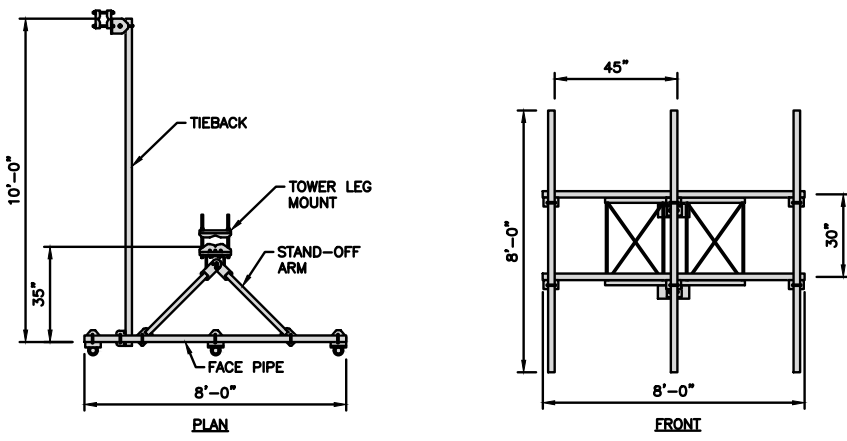


RRH/OVP MOUNT DETAIL

NO SCALE

7

COMMSCOPE V-FRAME MTC3975083	
FACE SIZE	8'-0"
WEIGHT	352.136 lbs



ANTENNA FRAME DETAIL

NO SCALE

8

NOT USED

NO SCALE

9

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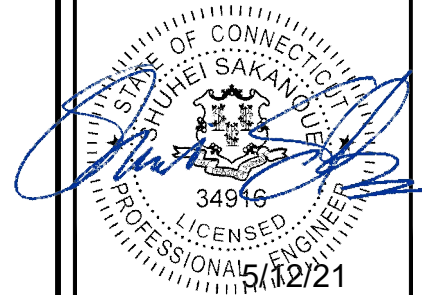
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RFDS REV #: N/A

CONSTRUCTION
DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL0053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT DETAILS

SHEET NUMBER

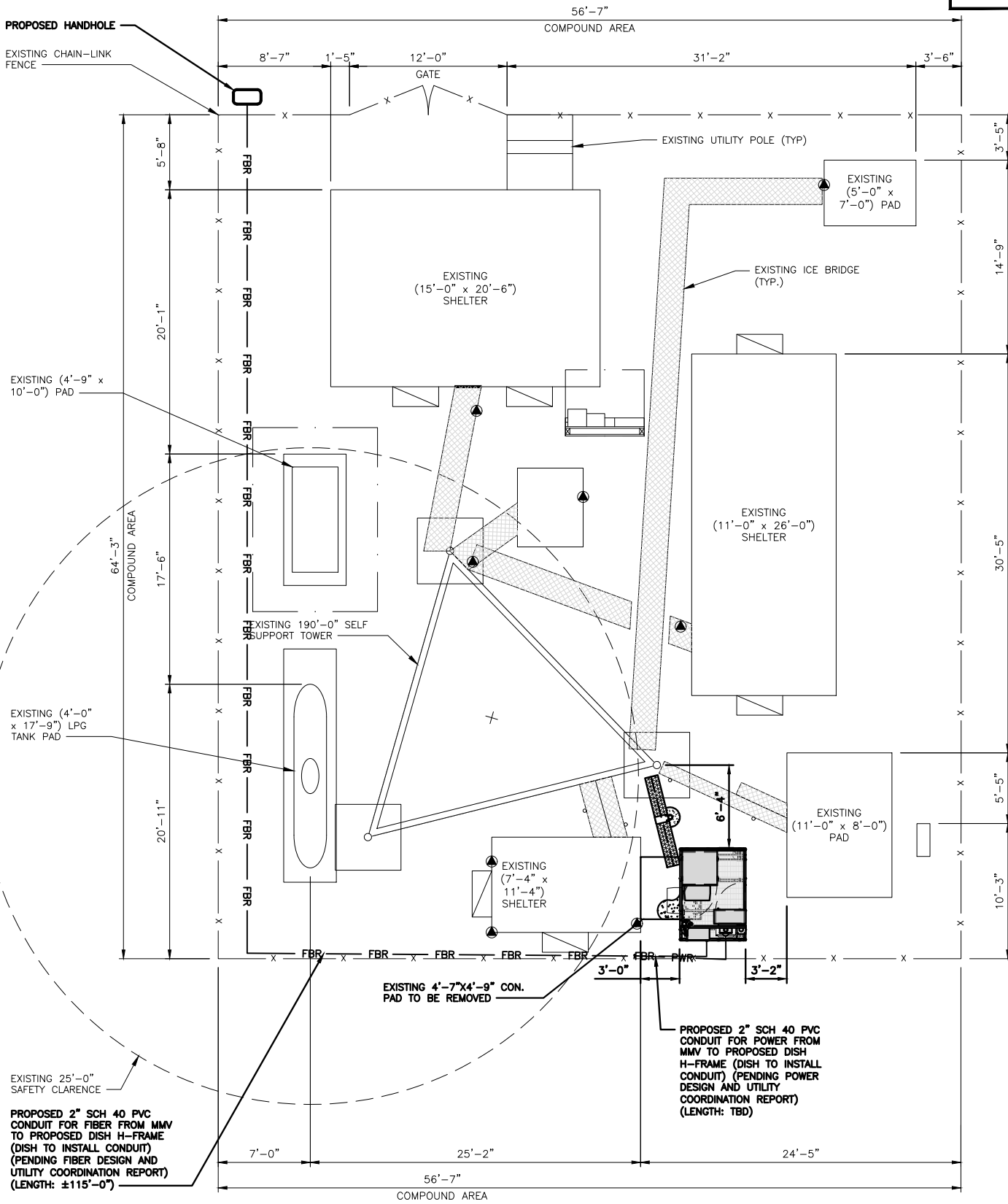
A-6

NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL PROPOSED UNDERGROUND UTILITY CONDUIT ROUTE.
2. ANTENNAS AND MOUNTS OMITTED FOR CLARITY.

DC POWER WIRING SHALL BE COLOR CODED AT EACH END FOR IDENTIFYING +24V AND -48V CONDUCTORS. RED MARKINGS SHALL IDENTIFY +24V AND BLUE MARKINGS SHALL IDENTIFY -48V.

1. CONTRACTOR SHALL INSPECT THE EXISTING CONDITIONS PRIOR TO SUBMITTING A BID. ANY QUESTIONS ARISING DURING THE BID PERIOD IN REGARDS TO THE CONTRACTOR'S FUNCTIONS, THE SCOPE OF WORK, OR ANY OTHER ISSUE RELATED TO THIS PROJECT SHALL BE BROUGHT UP DURING THE BID PERIOD WITH THE PROJECT MANAGER FOR CLARIFICATION, NOT AFTER THE CONTRACT HAS BEEN AWARDED.
2. ALL ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH CURRENT NATIONAL ELECTRICAL CODES AND ALL STATE AND LOCAL CODES, LAWS, AND ORDINANCES. PROVIDE ALL COMPONENTS AND WIRING SIZES AS REQUIRED TO MEET NEC STANDARDS.
3. LOCATION OF EQUIPMENT, CONDUIT AND DEVICES SHOWN ON THE DRAWINGS ARE APPROXIMATE AND SHALL BE COORDINATED WITH FIELD CONDITIONS PRIOR TO CONSTRUCTION.
4. CONDUIT ROUGH-IN SHALL BE COORDINATED WITH THE MECHANICAL EQUIPMENT TO AVOID LOCATION CONFLICTS. VERIFY WITH THE MECHANICAL EQUIPMENT CONTRACTOR AND COMPLY AS REQUIRED.
5. CONTRACTOR SHALL PROVIDE ALL BREAKERS, CONDUITS AND CIRCUITS AS REQUIRED FOR A COMPLETE SYSTEM.
6. CONTRACTOR SHALL PROVIDE PULL BOXES AND JUNCTION BOXES AS REQUIRED BY THE NEC ARTICLE 314.
7. CONTRACTOR SHALL PROVIDE ALL STRAIN RELIEF AND CABLE SUPPORTS FOR ALL CABLE ASSEMBLIES. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.
8. ALL DISCONNECTS AND CONTROLLING DEVICES SHALL BE PROVIDED WITH ENGRAVED PHENOLIC NAMEPLATES INDICATING EQUIPMENT CONTROLLED, BRANCH CIRCUITS INSTALLED ON, AND PANEL FIELD LOCATIONS FED FROM.
9. INSTALL AN EQUIPMENT GROUNDING CONDUCTOR IN ALL CONDUITS PER THE SPECIFICATIONS AND NEC 250. THE EQUIPMENT GROUNDING CONDUCTORS SHALL BE BONDED AT ALL JUNCTION BOXES, PULL BOXES, AND ALL DISCONNECT SWITCHES, AND EQUIPMENT CABINETS.
10. ALL NEW MATERIAL SHALL HAVE A U.L. LABEL.
11. PANEL SCHEDULE LOADING AND CIRCUIT ARRANGEMENTS REFLECT POST-CONSTRUCTION EQUIPMENT.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR AS-BUILT PANEL SCHEDULE AND SITE DRAWINGS.
13. FIBER ROUTE IS PRELIMINARY, FINAL FIBER ROUTE TO BE DETERMINED ONCE UCR (UTILITY COORDINATION REPORT) HAS BEEN FINALIZED.



ELECTRICAL NOTES

2



OVERALL UTILITY ROUTE PLAN

3

UTILITY ROUTE PLAN

1



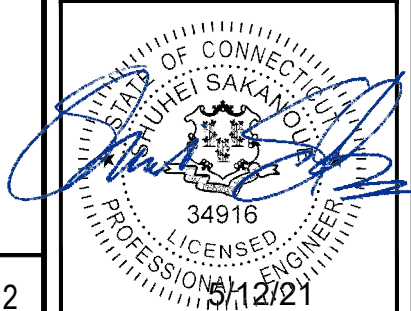
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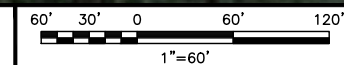
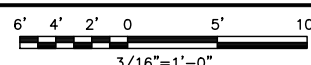
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REV	DATE	DESCRIPTION
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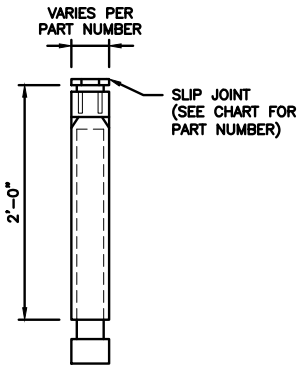
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
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HADDAM, CT 06438

SHEET TITLE
ELECTRICAL/FIBER ROUTE
PLAN AND NOTES

SHEET NUMBER
E-1



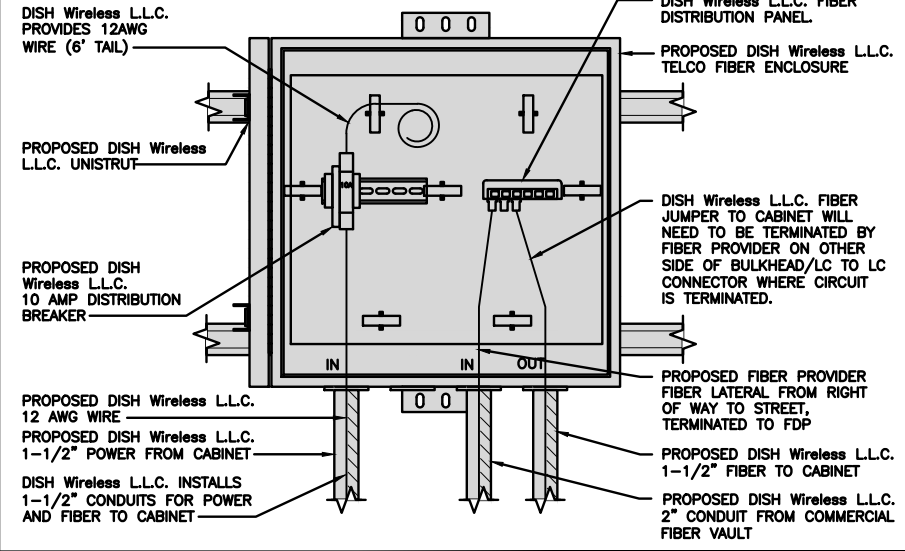
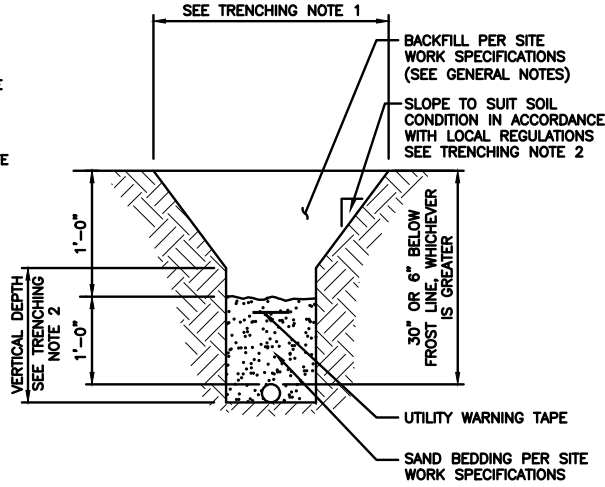
CARLON EXPANSION FITTINGS				
COUPLING END PART#	MALE TERMINAL ADAPTER END PART#	SIZE	STD CTN QTY.	TRAVEL LENGTH
E945D	E945DX	1/2"	20	4"
E945E	E945EX	3/4"	15	4"
E945F	E945FX	1"	10	4"
E945G	E945GX	1 1/4"	5	4"
E945H	E945HX	1 1/2"	5	4"
E945J	E945JX	2"	15	8"
E945K	E945KX	2 1/2"	10	8"
E945L	E945LX	3"	10	8"
E945M	E945MX	3 1/2"	5	8"
E945N	E945NX	4"	5	8"
E945P	E945PX	5"	1	8"
E945R	E945RX	6"	1	8"



NOTE: CONTRACTOR TO INSTALL EXPANSION FITTING SLIP JOINT AT METER CENTER CONDUIT TERMINATION, AS PER LOCAL UTILITY POLICY, ORDINANCE AND/OR SPECIFIED REQUIREMENT.

TRENCHING NOTES

- CONTRACTOR SHALL RESTORE THE TRENCH TO ITS ORIGINAL CONDITIONS BY EITHER SEEDING OR SODDING GRASS AREAS, OR REPLACING ASPHALT OR CONCRETE AREAS TO ITS ORIGINAL CROSS SECTION.
- TRENCHING SAFETY; INCLUDING, BUT NOT LIMITED TO SOIL CLASSIFICATION, SLOPING, AND SHORING, SHALL BE GOVERNED BY THE CURRENT OSHA TRENCHING AND EXCAVATION SAFETY STANDARDS.
- ALL CONDUITS SHALL BE INSTALLED IN COMPLIANCE WITH THE CURRENT NATIONAL ELECTRIC CODE (NEC) OR AS REQUIRED BY THE LOCAL JURISDICTION, WHICHEVER IS THE MOST STRINGENT.



EXPANSION JOINT DETAIL

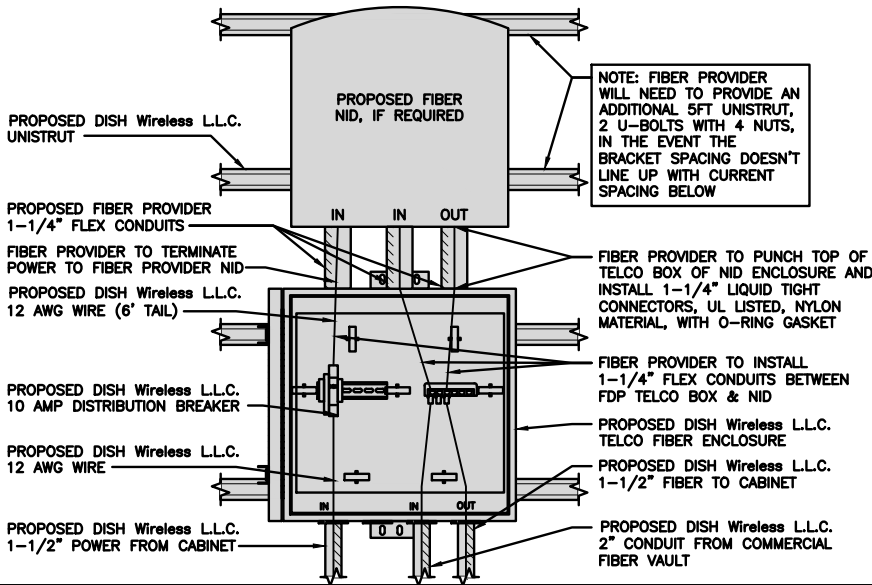
NO SCALE 1

TYPICAL UNDERGROUND TRENCH DETAIL

NO SCALE 2

DARK TELCO BOX – INTERIOR WIRING LAYOUT

NO SCALE 3



LIT TELCO BOX – INTERIOR WIRING LAYOUT (OPTIONAL)

NO SCALE 4

NOT USED

NO SCALE 5

NOT USED

NO SCALE 6

NOT USED

NO SCALE 7

NOT USED

NO SCALE 8

NOT USED

NO SCALE 9



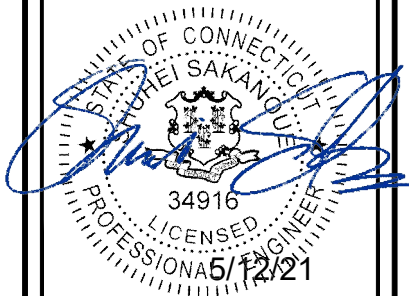
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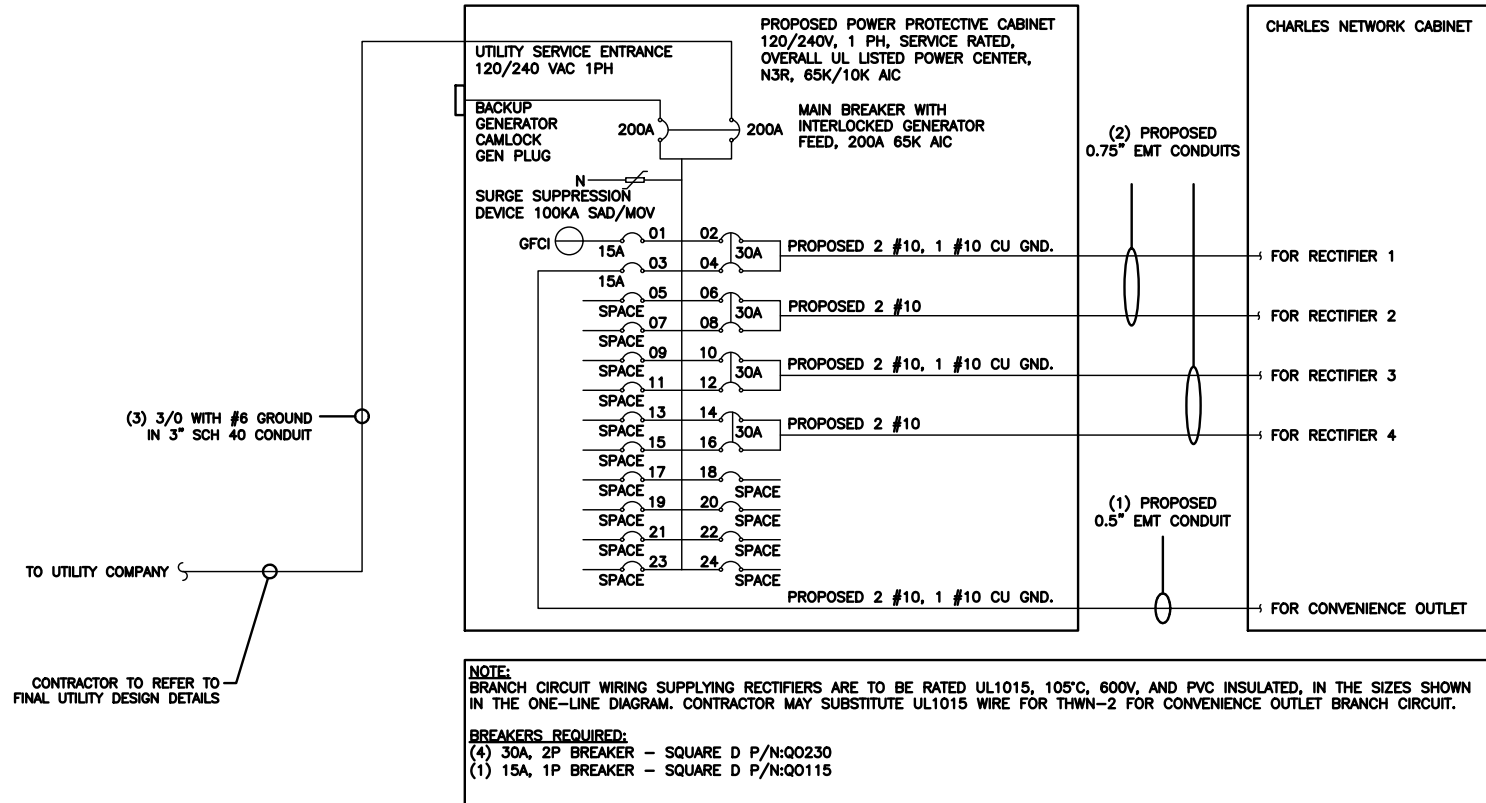
A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
ELECTRICAL
DETAILS

SHEET NUMBER

E-2



NOTES

THE (2) CONDUITS WITH (4) CURRENT CARRYING CONDUCTORS EACH, SHALL APPLY THE ADJUSTMENT FACTOR OF 80% PER 2014/17 NEC TABLE 310.15(B)(3)(a) OR 2020 NEC TABLE 310.15(C)(1) FOR UL1015 WIRE.

#12 FOR 15A-20A/1P BREAKER: 0.8 x 30A = 24.0A
 #10 FOR 25A-30A/2P BREAKER: 0.8 x 40A = 32.0A
 #8 FOR 35A-40A/2P BREAKER: 0.8 x 55A = 44.0A
 #6 FOR 45A-60A/2P BREAKER: 0.8 x 75A = 60.0A

CONDUIT SIZING: AT 40% FILL PER NEC CHAPTER 9, TABLE 4, ARTICLE 358.
 0.5" CONDUIT - 0.122 SQ. IN AREA
 0.75" CONDUIT - 0.213 SQ. IN AREA
 2.0" CONDUIT - 1.316 SQ. IN AREA
 3.0" CONDUIT - 2.907 SQ. IN AREA

CABINET CONVENIENCE OUTLET CONDUCTORS (1 CONDUIT): USING THWN-2, CU.
 #10 - 0.0211 SQ. IN X 2 = 0.0422 SQ. IN
 #10 - 0.0211 SQ. IN X 1 = 0.0211 SQ. IN <GROUND
 TOTAL = 0.0633 SQ. IN

0.5" EMT CONDUIT IS ADEQUATE TO HANDLE THE TOTAL OF (3) WIRES, INCLUDING GROUND WIRE, AS INDICATED ABOVE.

RECTIFIER CONDUCTORS (2 CONDUITS): USING UL1015, CU.
 #10 - 0.0266 SQ. IN X 4 = 0.1064 SQ. IN
 #10 - 0.0082 SQ. IN X 1 = 0.0082 SQ. IN <BARE GROUND
 TOTAL = 0.1146 SQ. IN

0.75" EMT CONDUIT IS ADEQUATE TO HANDLE THE TOTAL OF (5) WIRES, INCLUDING GROUND WIRE, AS INDICATED ABOVE.

PPC FEED CONDUCTORS (1 CONDUIT): USING THWN, CU.
 3/0 - 0.2679 SQ. IN X 3 = 0.8037 SQ. IN
 #6 - 0.0507 SQ. IN X 1 = 0.0507 SQ. IN <GROUND
 TOTAL = 0.8544 SQ. IN

3.0" SCH 40 PVC CONDUIT IS ADEQUATE TO HANDLE THE TOTAL OF (4) WIRES, INCLUDING GROUND WIRE, AS INDICATED ABOVE.

dish wireless.

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05/12/21

PPC ONE-LINE DIAGRAM

NO SCALE 1

PROPOSED CHARLES PANEL SCHEDULE

LOAD SERVED	VOLT AMPS (WATTS)		TRIP	CKT #	PHASE	CKT #	TRIP	VOLT AMPS (WATTS)		LOAD SERVED
	L1	L2						L1	L2	
PPC GFCI OUTLET	180	180	15A	1	A	2	30A	2880	2880	ABB/GE INFINITY RECTIFIER 1
CHARLES GFCI OUTLET			15A	3	B	4	30A	2880	2880	ABB/GE INFINITY RECTIFIER 1
-SPACE-				5	A	6	30A	2880	2880	ABB/GE INFINITY RECTIFIER 2
-SPACE-				7	B	8	30A	2880	2880	ABB/GE INFINITY RECTIFIER 2
-SPACE-				9	A	10	30A	2880	2880	ABB/GE INFINITY RECTIFIER 3
-SPACE-				11	B	12	30A	2880	2880	ABB/GE INFINITY RECTIFIER 3
-SPACE-				13	A	14	30A	2880	2880	ABB/GE INFINITY RECTIFIER 4
-SPACE-				15	B	16	30A	2880	2880	ABB/GE INFINITY RECTIFIER 4
-SPACE-				17	A	18				-SPACE-
-SPACE-				19	B	20				-SPACE-
-SPACE-				21	A	22				-SPACE-
-SPACE-				23	B	24				-SPACE-
VOLTAGE AMPS		180	180					11520	11520	
200A MCB, 1φ, 24 SPACE, 120/240V				L1	L2					
MB RATING: 65,000 AIC				11700	11700					
				98	98					VOLTAGE AMPS
										AMPS
										MAX AMPS
										MAX 125%

PANEL SCHEDULE

NO SCALE 2

NOT USED

NO SCALE 3

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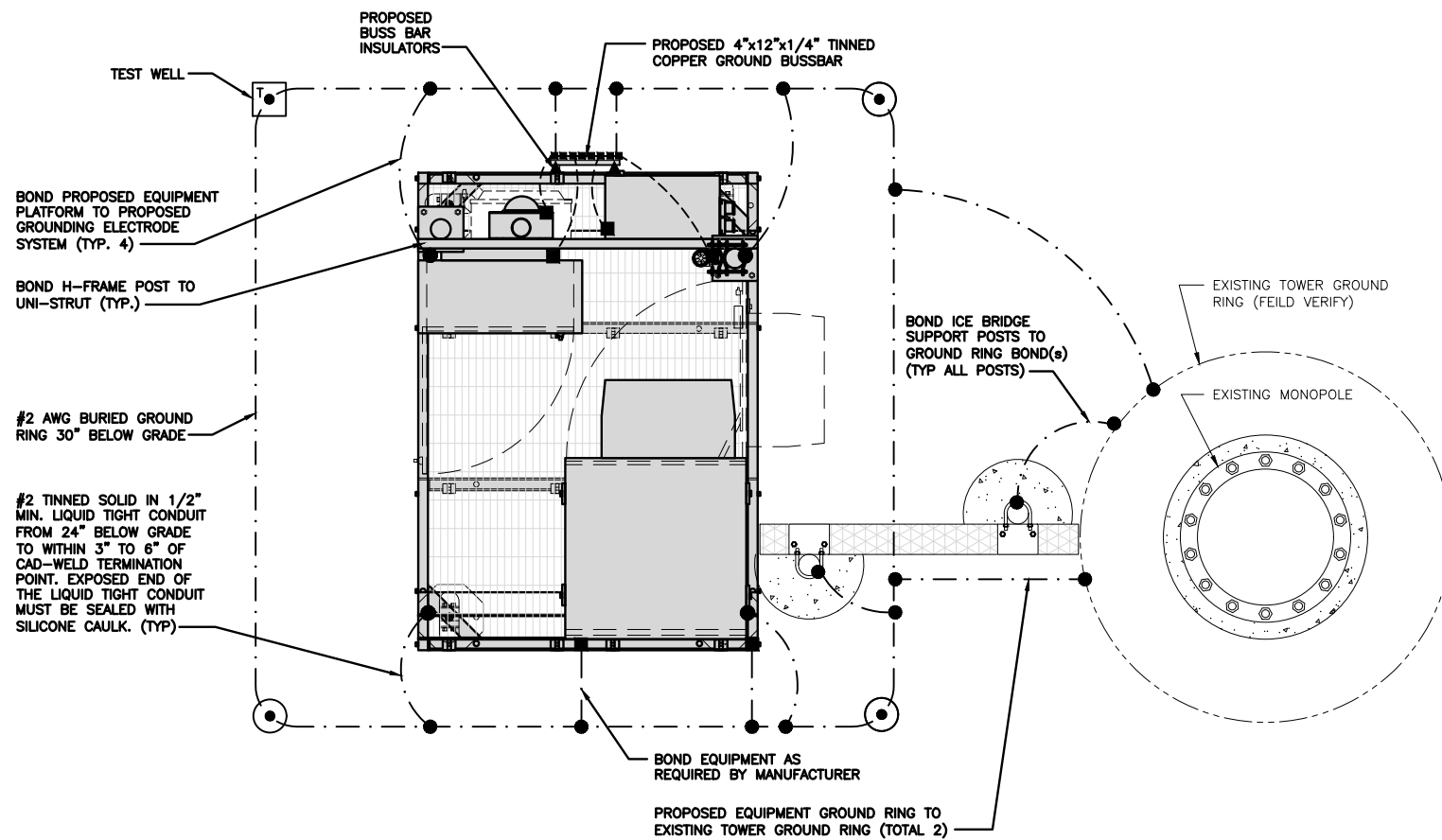
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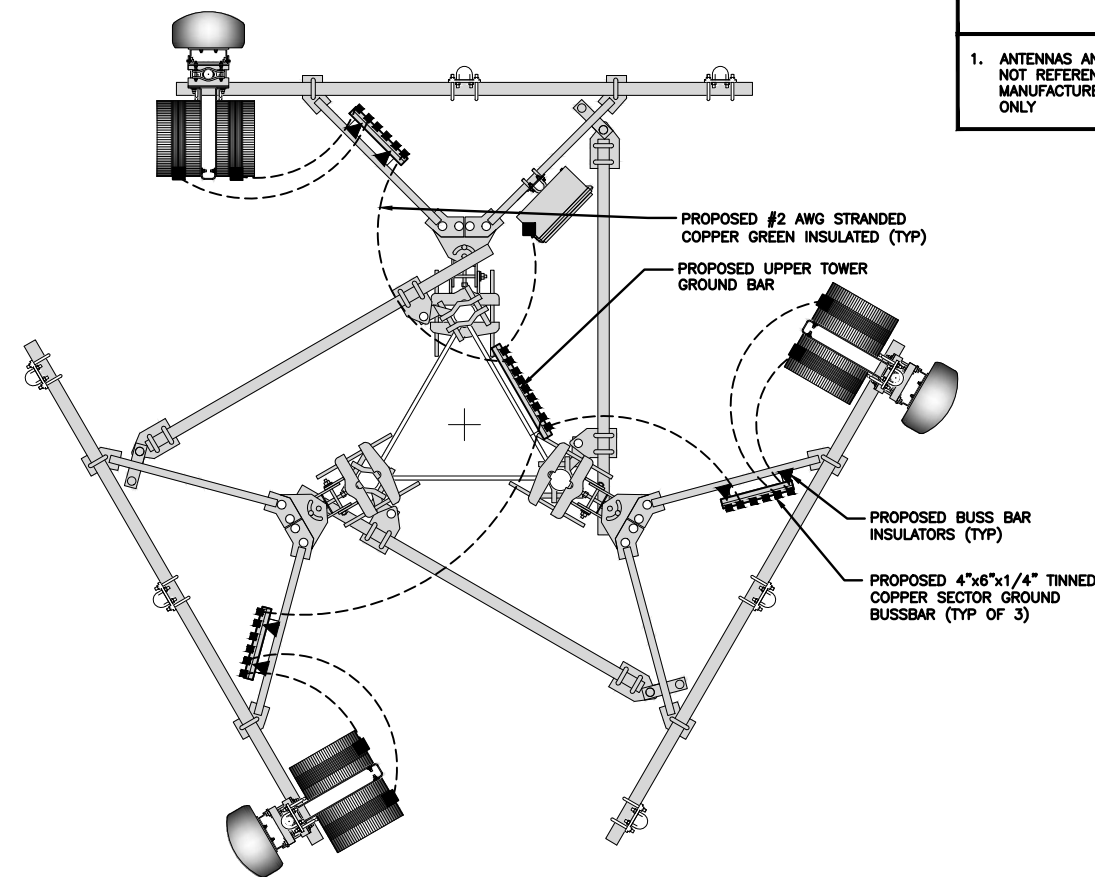
SHEET TITLE
ELECTRICAL ONE-LINE, FAULT
CALCS & PANEL SCHEDULE

SHEET NUMBER
E-3



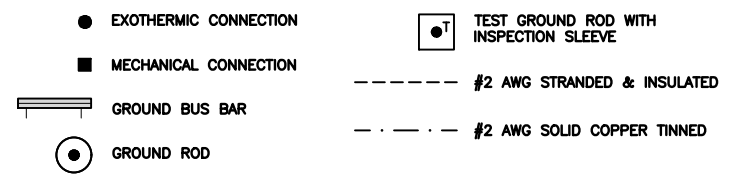
TYPICAL EQUIPMENT GROUNDING PLAN

NO SCALE 1



TYPICAL ANTENNA GROUNDING PLAN

NO SCALE 2



GROUNDING LEGEND

- GROUNDING IS SHOWN DIAGRAMMATICALLY ONLY.
- CONTRACTOR SHALL GROUND ALL EQUIPMENT AS A COMPLETE SYSTEM. GROUNDING SHALL BE IN COMPLIANCE WITH NEC SECTION 250 AND DISH WIRELESS, LLC. GROUNDING AND BONDING REQUIREMENTS AND MANUFACTURER'S SPECIFICATIONS.
- ALL GROUND CONDUCTORS SHALL BE COPPER; NO ALUMINUM CONDUCTORS SHALL BE USED.

GROUNDING KEY NOTES

- (A) EXTERIOR GROUND RING: #2 AWG SOLID COPPER, BURIED AT A DEPTH OF AT LEAST 30 INCHES BELOW GRADE, OR 6 INCHES BELOW THE FROST LINE AND APPROXIMATELY 24 INCHES FROM THE EXTERIOR WALL OR FOOTING.
- (B) TOWER GROUND RING: THE GROUND RING SYSTEM SHALL BE INSTALLED AROUND AN ANTENNA TOWER'S LEGS, AND/OR GUY ANCHORS. WHERE SEPARATE SYSTEMS HAVE BEEN PROVIDED FOR THE TOWER AND THE BUILDING, AT LEAST TWO BONDS SHALL BE MADE BETWEEN THE TOWER RING GROUND SYSTEM AND THE BUILDING RING GROUND SYSTEM USING MINIMUM #2 AWG SOLID COPPER CONDUCTORS.
- (C) INTERIOR GROUND RING: #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTOR EXTENDED AROUND THE PERIMETER OF THE EQUIPMENT AREA. ALL NON-TELECOMMUNICATIONS RELATED METALLIC OBJECTS FOUND WITHIN A SITE SHALL BE GROUNDED TO THE INTERIOR GROUND RING WITH #6 AWG STRANDED GREEN INSULATED CONDUCTOR.
- (D) BOND TO INTERIOR GROUND RING: #2 AWG SOLID TINNED COPPER WIRE PRIMARY BONDS SHALL BE PROVIDED AT LEAST AT FOUR POINTS ON THE INTERIOR GROUND RING, LOCATED AT THE CORNERS OF THE BUILDING.
- (E) GROUND ROD: UL LISTED COPPER CLAD STEEL MINIMUM 1/2" DIAMETER BY EIGHT FEET LONG. GROUND RODS SHALL BE INSTALLED WITH INSPECTION SLEEVES. GROUND RODS SHALL BE DRIVEN TO THE DEPTH OF GROUND RING CONDUCTOR.
- (F) CELL REFERENCE GROUND BAR: POINT OF GROUND REFERENCE FOR ALL COMMUNICATIONS EQUIPMENT FRAMES. ALL BONDS ARE MADE WITH #2 AWG UNLESS NOTED OTHERWISE STRANDED GREEN INSULATED COPPER CONDUCTORS. BOND TO GROUND RING WITH (2) #2 SOLID TINNED COPPER CONDUCTORS.
- (G) HATCH PLATE GROUND BAR: BOND TO THE INTERIOR GROUND RING WITH TWO #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTORS. WHEN A HATCH-PLATE AND A CELL REFERENCE GROUND BAR ARE BOTH PRESENT, THE CRGB MUST BE CONNECTED TO THE HATCH-PLATE AND TO THE INTERIOR GROUND RING USING (2) TWO #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTORS EACH.
- (H) EXTERIOR CABLE ENTRY PORT GROUND BARS: LOCATED AT THE ENTRANCE TO THE CELL SITE BUILDING. BOND TO GROUND RING WITH A #2 AWG SOLID TINNED COPPER CONDUCTORS WITH AN EXOTHERMIC WELD AND INSPECTION SLEEVE.
- (J) TELCO GROUND BAR: BOND TO BOTH CELL REFERENCE GROUND BAR OR EXTERIOR GROUND RING.
- (K) FRAME BONDING: THE BONDING POINT FOR TELECOM EQUIPMENT FRAMES SHALL BE THE GROUND BUS THAT IS NOT ISOLATED FROM THE EQUIPMENTS METAL FRAMEWORK.
- (L) INTERIOR UNIT BONDS: METAL FRAMES, CABINETS AND INDIVIDUAL METALLIC UNITS LOCATED WITH THE AREA OF THE INTERIOR GROUND RING REQUIRE A #6 AWG STRANDED GREEN INSULATED COPPER BOND TO THE INTERIOR GROUND RING.
- (M) FENCE AND GATE GROUNDING: METAL FENCES WITHIN 7 FEET OF THE EXTERIOR GROUND RING OR OBJECTS BONDED TO THE EXTERIOR GROUND RING SHALL BE BONDED TO THE GROUND RING WITH A #2 AWG SOLID TINNED COPPER CONDUCTOR AT AN INTERVAL NOT EXCEEDING 25 FEET. BONDS SHALL BE MADE AT EACH GATE POST AND ACROSS GATE OPENINGS.
- (N) EXTERIOR UNIT BONDS: METALLIC OBJECTS, EXTERNAL TO OR MOUNTED TO THE BUILDING, SHALL BE BONDED TO THE EXTERIOR GROUND RING. USING #2 TINNED SOLID COPPER WIRE
- (P) ICE BRIDGE SUPPORTS: EACH ICE BRIDGE LEG SHALL BE BONDED TO THE GROUND RING WITH #2 AWG BARE TINNED COPPER CONDUCTOR. PROVIDE EXOTHERMIC WELDS AT BOTH THE ICE BRIDGE LEG AND BURIED GROUND RING.
- (Q) DURING ALL DC POWER SYSTEM CHANGES INCLUDING DC SYSTEM CHANGE OUTS, RECTIFIER REPLACEMENTS OR ADDITIONS, BREAKER DISTRIBUTION CHANGES, BATTERY ADDITIONS, BATTERY REPLACEMENTS AND INSTALLATIONS OR CHANGES TO DC CONVERTER SYSTEMS IT SHALL BE REQUIRED THAT SERVICE CONTRACTORS VERIFY ALL DC POWER SYSTEMS ARE EQUIPPED WITH A MASTER DC SYSTEM RETURN GROUND CONDUCTOR FROM THE DC POWER SYSTEM COMMON RETURN BUS DIRECTLY CONNECTED TO THE CELL SITE REFERENCE GROUND BAR
- (R) TOWER TOP COLLECTOR BUSS BAR IS TO BE MECHANICALLY BONDED TO PROPOSED ANTENNA MOUNT COLLAR. REFER TO DISH WIRELESS, LLC. GROUNDING NOTES.

GROUNDING KEY NOTES

NO SCALE 3



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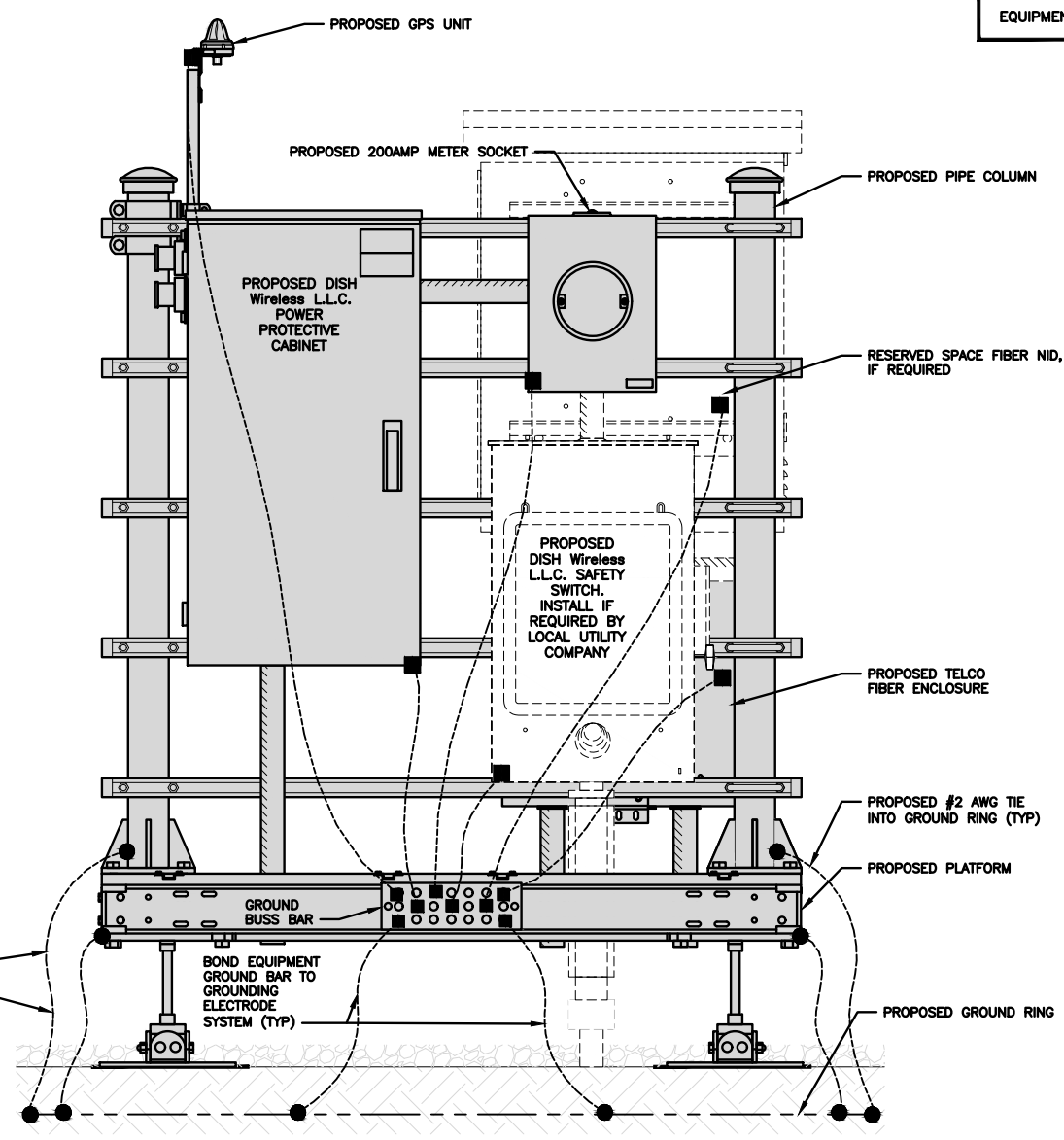
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DISH WIRELESS, LLC.
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SHEET TITLE
GROUNDING PLANS
AND NOTES

SHEET NUMBER
G-1

NOTES
EQUIPMENT CABINET OMITTED FOR CLARITY

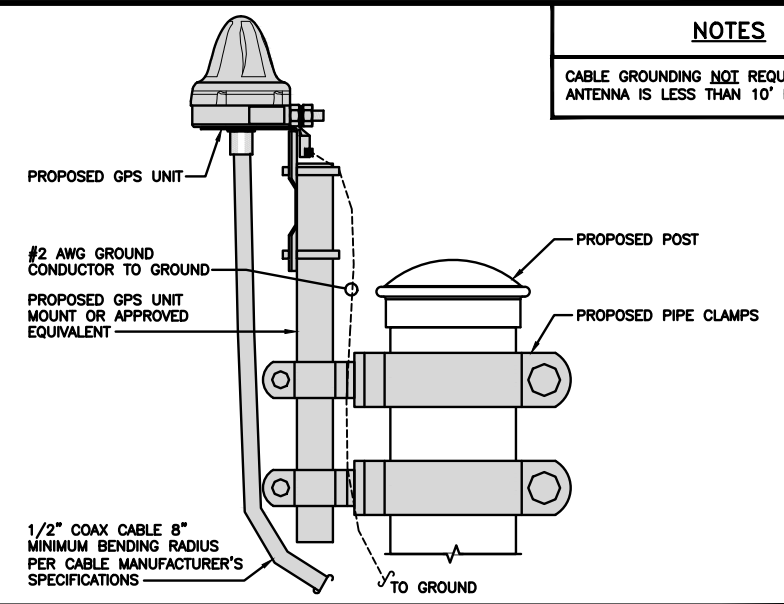


#2 TINNED SOLID IN 1/2" MIN. LIQUID TIGHT CONDUIT FROM 24" BELOW GRADE TO WITHIN 3" TO 6" OF CAD-WELD TERMINATION POINT. EXPOSED END OF THE LIQUID TIGHT CONDUIT MUST BE SEALED WITH SILICONE CAULK. (TYP)

H-FRAME GROUNDING DETAIL

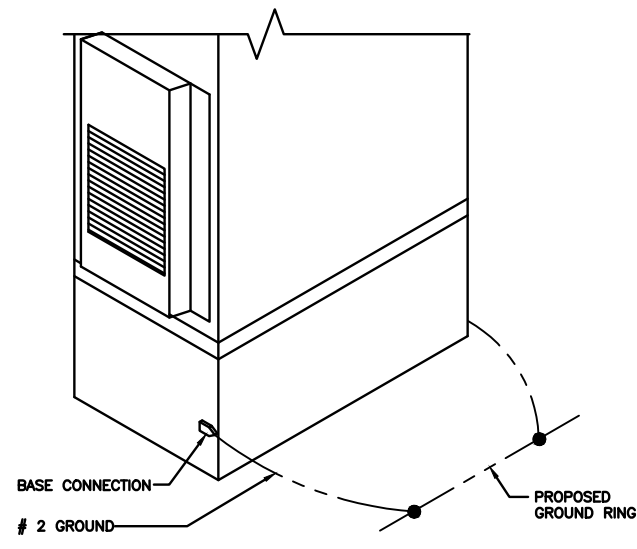
NO SCALE 1

NOTES
CABLE GROUNDING NOT REQUIRED WHEN ANTENNA IS LESS THAN 10' FROM CABINET



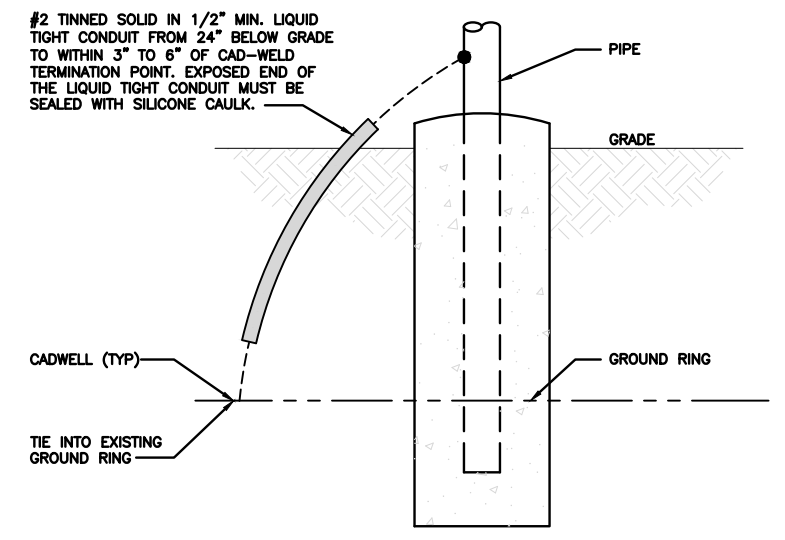
TYPICAL GPS UNIT GROUNDING

NO SCALE 2



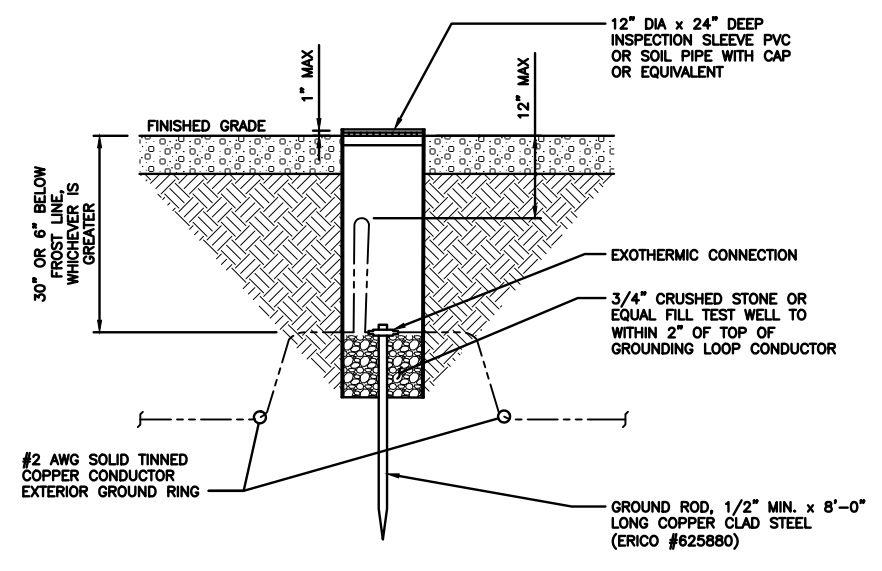
OUTDOOR CABINET GROUNDING

NO SCALE 3



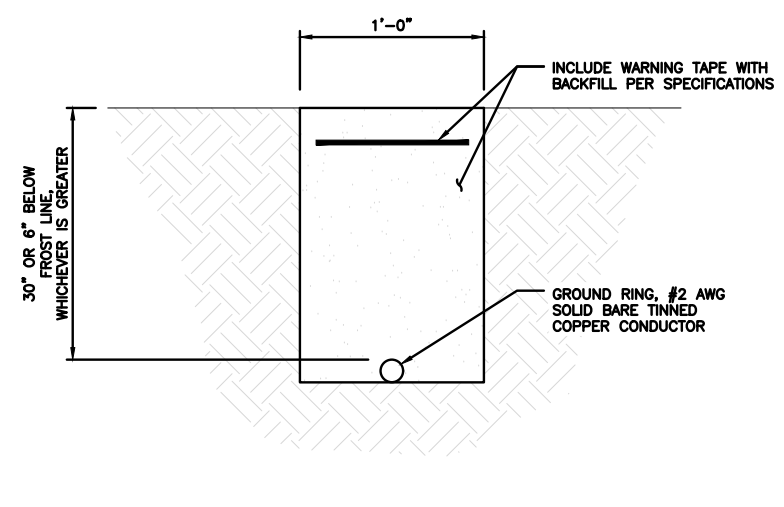
TRANSITIONING GROUND DETAIL

NO SCALE 4



TYPICAL TEST GROUND ROD WITH INSPECTION SLEEVE

NO SCALE 5



TYPICAL GROUND RING TRENCH

NO SCALE 6



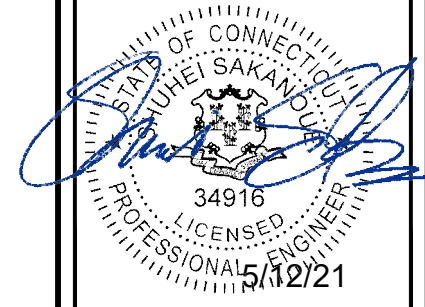
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RCD SS CJW

RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
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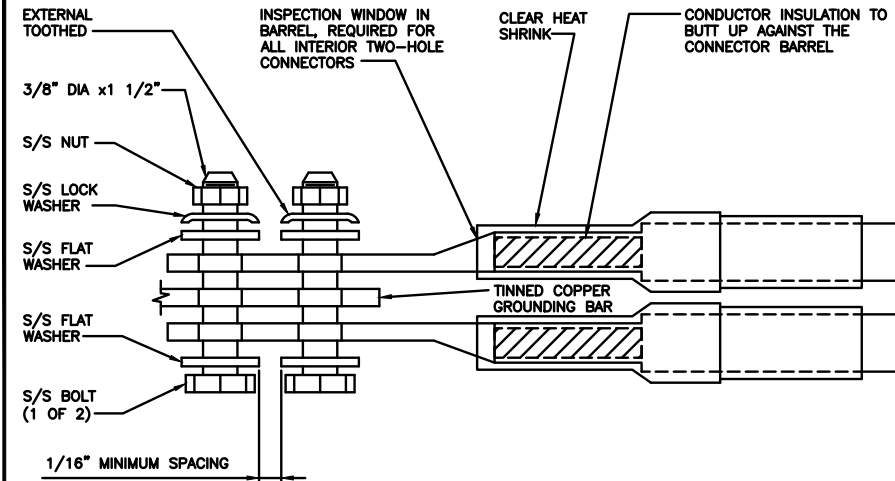
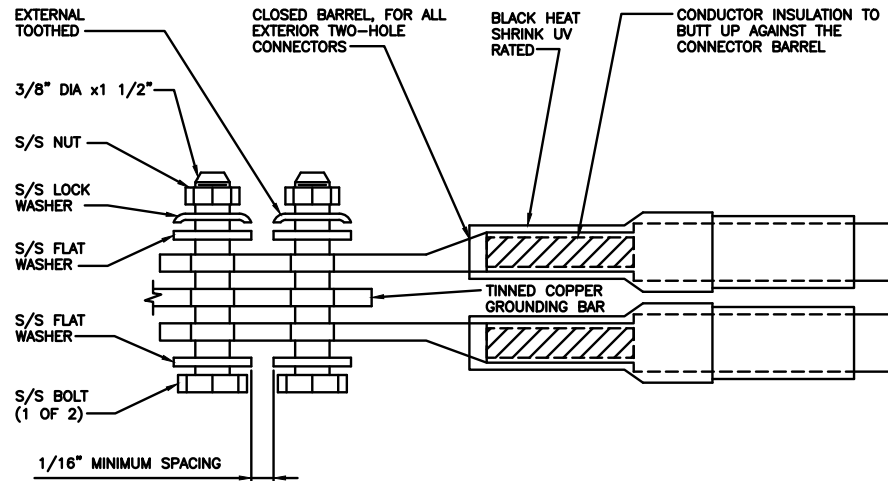
A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL0053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GROUNDING DETAILS

SHEET NUMBER
G-2

1. EXOTHERMIC WELD (2) TWO, #2 AWG BARE TINNED SOLID COPPER CONDUCTORS TO GROUND BAR. ROUTE CONDUCTORS TO BURIED GROUND RING AND PROVIDE PARALLEL EXOTHERMIC WELD.
2. ALL EXTERIOR GROUNDING HARDWARE SHALL BE STAINLESS STEEL 3/8" DIAMETER OR LARGER. ALL HARDWARE 18-8 STAINLESS STEEL INCLUDING LOCK WASHERS, COAT ALL SURFACES WITH AN ANTI-OXIDANT COMPOUND BEFORE MATING.
3. FOR GROUND BOND TO STEEL ONLY: COAT ALL SURFACES WITH AN ANTI-OXIDANT COMPOUND BEFORE MATING.
4. DO NOT INSTALL CABLE GROUNDING KIT AT A BEND AND ALWAYS DIRECT GROUND CONDUCTOR DOWN TO GROUNDING BUS.
5. NUT & WASHER SHALL BE PLACED ON THE FRONT SIDE OF THE GROUND BAR AND BOLTED ON THE BACK SIDE.
6. ALL GROUNDING PARTS AND EQUIPMENT TO BE SUPPLIED AND INSTALLED BY CONTRACTOR.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ADDITIONAL GROUND BAR AS REQUIRED.
8. ENSURE THE WIRE INSULATION TERMINATION IS WITHIN 1/8" OF THE BARREL (NO SHINERS).



TYPICAL GROUNDING NOTES

NO SCALE

1

TYPICAL EXTERIOR TWO HOLE LUG

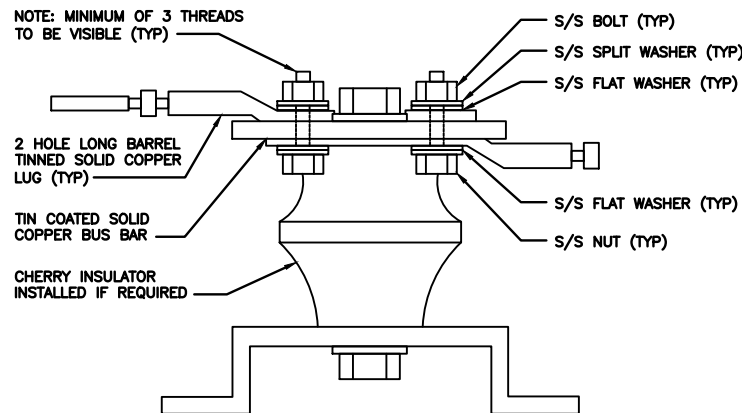
NO SCALE

2

TYPICAL INTERIOR TWO HOLE LUG

NO SCALE

3



LUG DETAIL

NO SCALE

4

NOT USED

NO SCALE

5

NOT USED

NO SCALE

6

NOT USED

NO SCALE

7

NOT USED

NO SCALE

8

NOT USED

NO SCALE

9

dish
wireless.

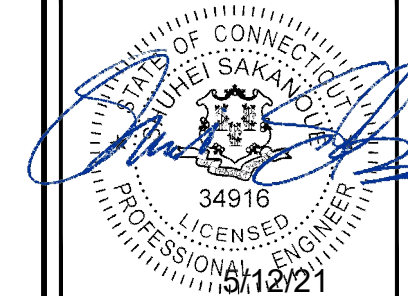
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DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GROUNDING DETAILS

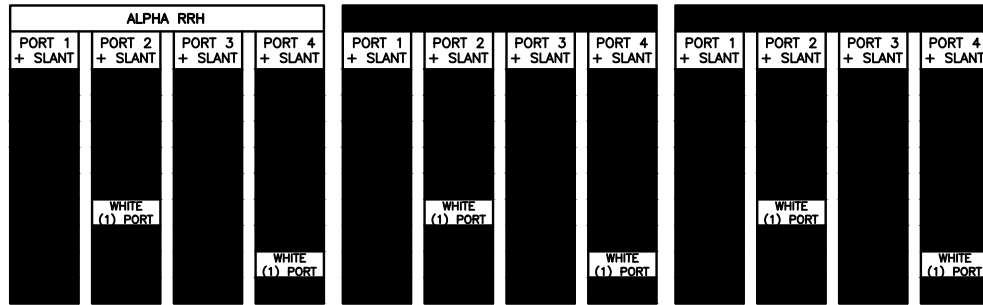
SHEET NUMBER
G-3

RF JUMPER COLOR CODING

3/4" TAPE WIDTHS WITH 3/4" SPACING

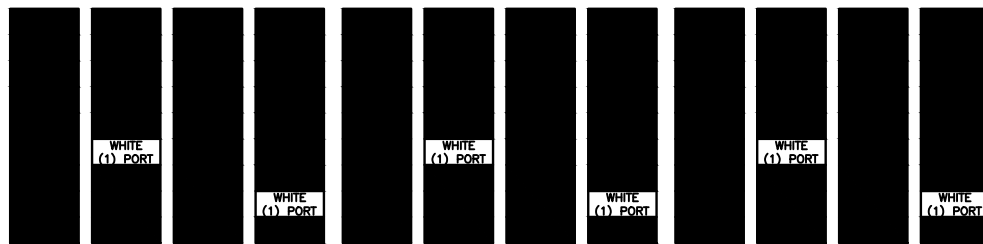
LOW-BAND RRH -
(600MHz N71 BASEBAND) +
(850MHz N26 BAND) +
(700MHz N29 BAND) - OPTIONAL PER MARKET

ADD FREQUENCY COLOR TO SECTOR BAND
(CBRS WILL USE YELLOW BANDS)



MID-BAND RRH -
(AWS BANDS N66+N70)

ADD FREQUENCY COLOR TO SECTOR BAND
(CBRS WILL USE YELLOW BANDS)

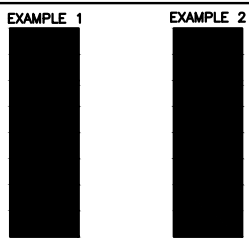


HYBRID/DISCREET CABLES

INCLUDE SECTOR BANDS BEING SUPPORTED AM
LONG WITH FREQUENCY BANDS

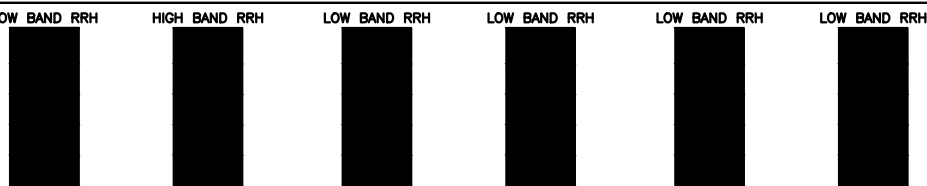
EXAMPLE 1 - HYBRID, OR DISCREET, SUPPORTS
ALL SECTORS, BOTH LOW-BANDS AND MID-BANDS

EXAMPLE 2 - HYBRID, OR DISCREET, SUPPORTS
CBRS ONLY, ALL SECTORS



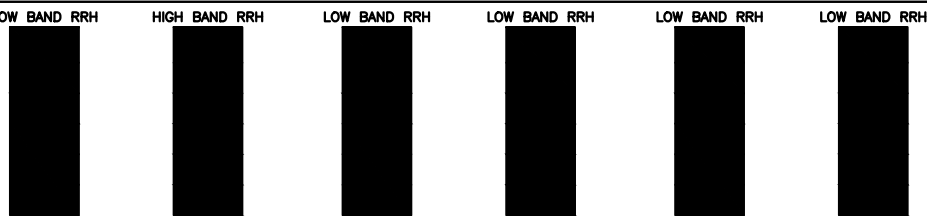
HYBRID/DISCREET CABLES

LOW-BAND RRH FIBER CABLES HAVE SECTOR
STRIPE ONLY

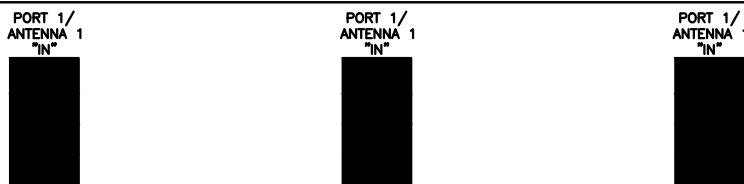


POWER CABLES TO RRHs

LOW-BAND RRH POWER CABLES HAVE SECTOR
STRIPE ONLY



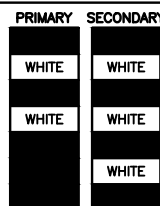
RET MOTORS AT ANTENNAS



MICROWAVE RADIO LINKS

LINKS WILL HAVE A 1.5-2 INCH WHITE WRAP WITH
THE AZIMUTH COLOR OVERLAPPING IN THE MIDDLE.
ADD ADDITIONAL SECTOR COLOR BANDS FOR EACH
ADDITIONAL MW RADIO.

MICROWAVE CABINETS WILL REQUIRE P-TOUCH
LABELS INSIDE THE CABINET TO IDENTIFY THE
LOCAL AND REMOTE SITE ID'S.



RF CABLE COLOR CODES

NO SCALE 1

LOW BANDS (N71-N28)
OPTIONAL - (N29)



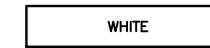
AWS
(N65+N70+H-BLOCK)



CBRS TECH
(3 GHz)



NEGATIVE SLANT PORT
ON ANTRRH



ALPHA SECTOR



BETA SECTOR



GAMMA SECTOR



COLOR IDENTIFIER

NO SCALE 2

NOT USED

NO SCALE 3

NOT USED

NO SCALE 4

dish
wireless.

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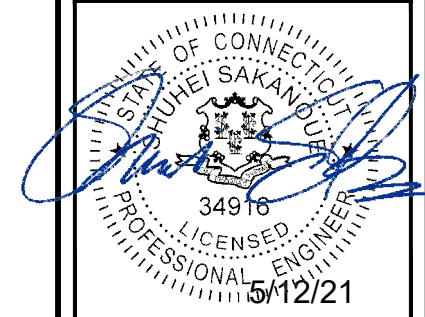
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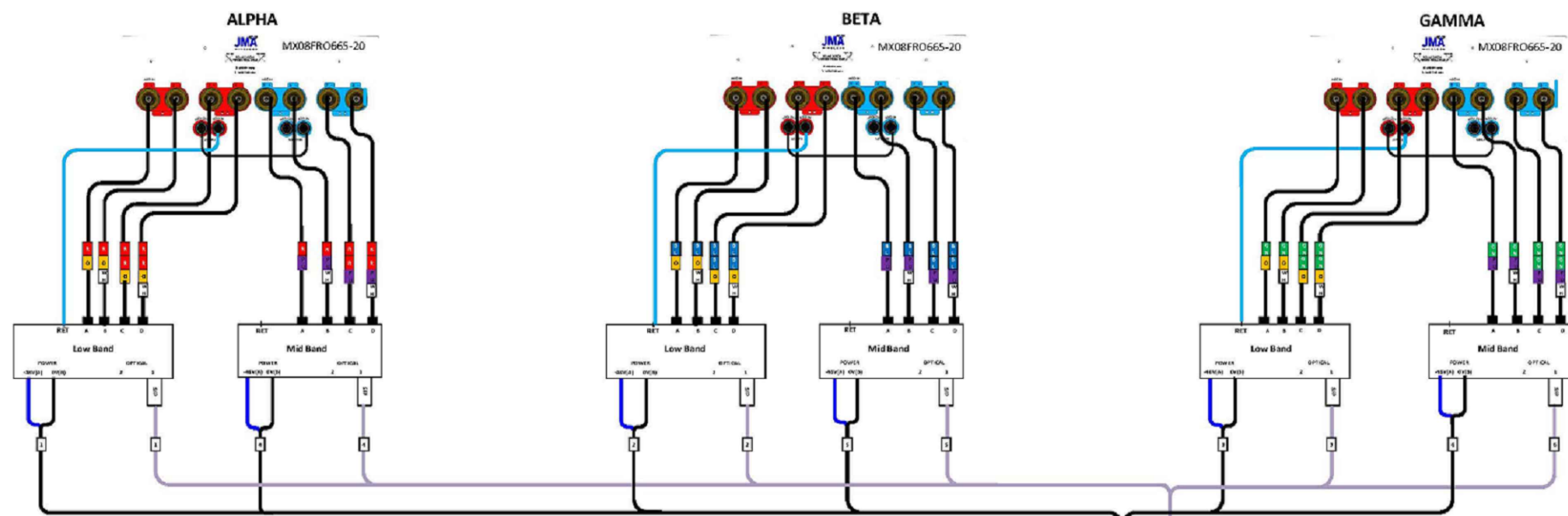
SUBMITTALS		
REV	DATE	DESCRIPTION
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DISH WIRELESS, LLC.
PROJECT INFORMATION
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539 PLAINS RD
HADDAM, CT 06438

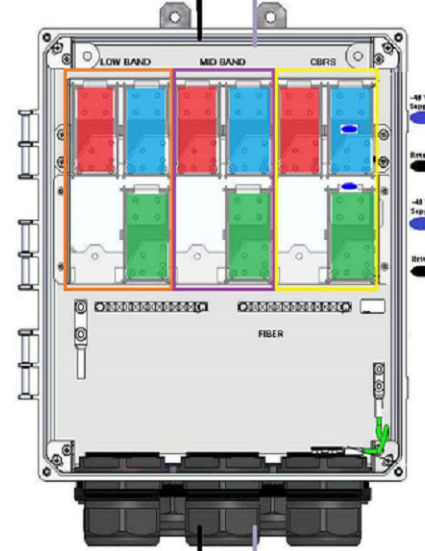
SHEET TITLE
RF
CABLE COLOR CODE

SHEET NUMBER
RF-1



Fiber Patch Panel

Bottom Row	Pair 1	Pair 2	Pair 3	Pair 10	Open	Open
Middle Row	Pair 4	Pair 5	Pair 6	Pair 11	Open	Open
Top Row	Pair 7	Pair 8	Pair 9	Pair 12	Open	Open



CSR NCS540

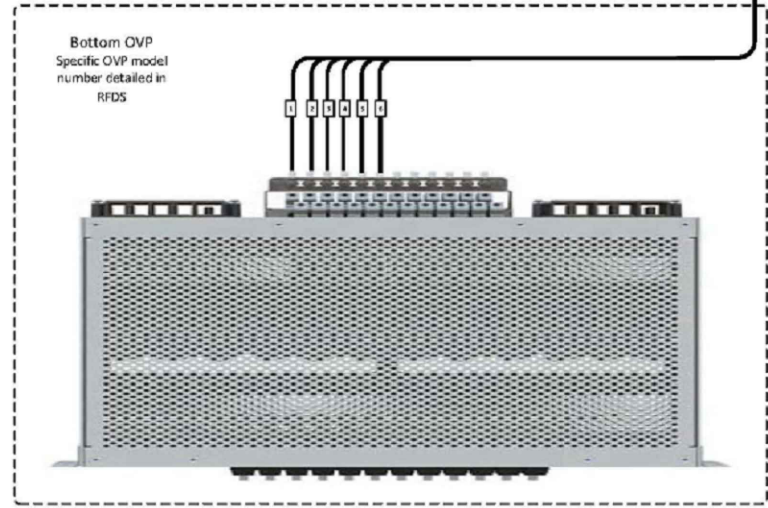
Port	Interface	Description
0	G0/0/0	Spine00
1	G0/0/1	CBRS - Alpha
2	G0/0/2	CBRS - Beta
3	G0/0/3	CBRS - Gamma
4	Te0/0/4	Fujitsu Low-Band RU - Alpha
5	Te0/0/5	Fujitsu Mid-Band RU - Alpha
6	Te0/0/6	Fujitsu Low-Band RU - Beta
7	Te0/0/7	Fujitsu Mid-Band RU - Beta
8	Te0/0/8	Fujitsu Low-Band RU - Gamma
9	Te0/0/9	Fujitsu Mid-Band RU - Gamma
10	Te0/0/10	Fixed Wls
11	Te0/0/11	Fixed Wls
12	Te0/0/12	Fixed Wls
13	Te0/0/13	Fixed Wls
14	Te0/0/14	CBRS1
15	Te0/0/15	CBRS2
16	Te0/0/16	CBRS3
17	G0/0/17	SM1 - BMC
18	G0/0/18	SM2 - BMC
19	Te0/0/19	SM1 - Data 1
20	Te0/0/20	SM1 - Data 2
21	Te0/0/21	SM2 - Data 1
22	Te0/0/22	SM2 - Data 2
23	Te0/0/23	Reserved Uplink (EDC, LDC)
24	Te0/0/24	Blank/Future
25	Te0/0/25	Blank/Future
26	Te0/0/26	Fiber NIU
27	Te0/0/27	Fiber NIU
28	Te0/0/28	Blank/Future
29	Te0/0/29	Blank/Future

top

bottom

Bottom OVP Layout

Circuit 1	Alpha Low Band
Circuit 2	Beta Low Band
Circuit 3	Gamma Low Band
Circuit 4	Alpha Mid Band
Circuit 5	Beta Mid Band
Circuit 6	Gamma Mid Band
Circuit 7	Alpha CBRS
Circuit 8	Beta CBRS
Circuit 9	Gamma CBRS
Circuit 10	Open
Circuit 11	Open
Circuit 12	Open



	5G plumbing diagram JMA MX08FRO665-20			
	2-2-2(LB+MB)			
Drawn By	Rev	Rev No	Orig No	Rev
5-Jan-2021				1



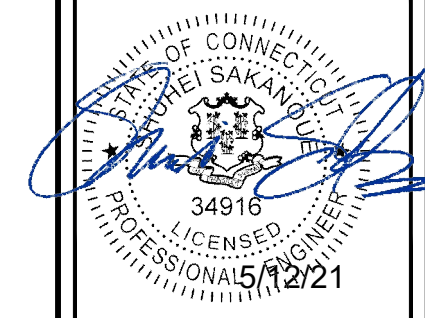
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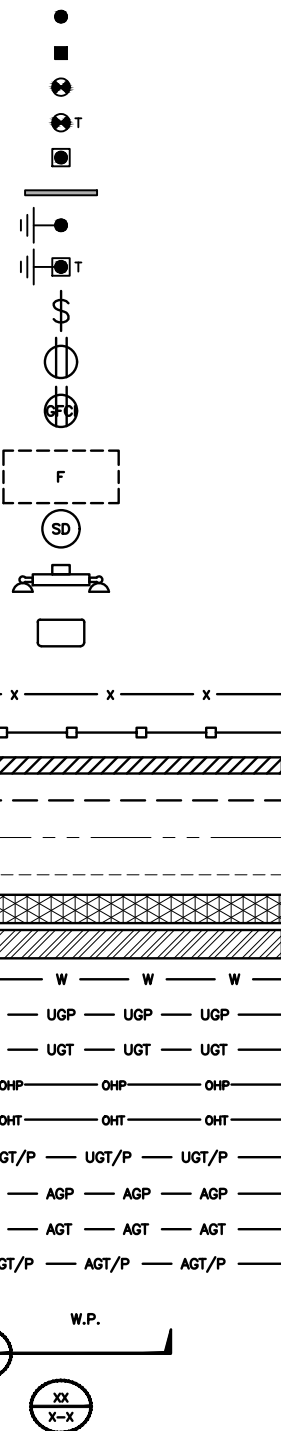
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2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL0053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
RF
PLUMBING DIAGRAM

SHEET NUMBER
RF-2

EXOTHERMIC CONNECTION
 MECHANICAL CONNECTION
 CHEMICAL ELECTROLYTIC GROUNDING SYSTEM
 TEST CHEMICAL ELECTROLYTIC GROUNDING SYSTEM
 EXOTHERMIC WITH INSPECTION SLEEVE
 GROUNDING BAR
 GROUND ROD
 TEST GROUND ROD WITH INSPECTION SLEEVE
 SINGLE POLE SWITCH
 DUPLEX RECEPTACLE
 DUPLEX GFCI RECEPTACLE
 FLUORESCENT LIGHTING FIXTURE
 (2) TWO LAMPS 48-T8
 SMOKE DETECTION (DC)
 EMERGENCY LIGHTING (DC)
 SECURITY LIGHT W/PHOTOCELL LITHONIA ALXW
 LED-1-25A400/51K-SR4-120-PE-DEBTD
 CHAIN LINK FENCE
 WOOD/WROUGHT IRON FENCE
 WALL STRUCTURE
 LEASE AREA
 PROPERTY LINE (PL)
 SETBACKS
 ICE BRIDGE
 CABLE TRAY
 WATER LINE
 UNDERGROUND POWER
 UNDERGROUND TELCO
 OVERHEAD POWER
 OVERHEAD TELCO
 UNDERGROUND TELCO/POWER
 ABOVE GROUND POWER
 ABOVE GROUND TELCO
 ABOVE GROUND TELCO/POWER
 WORKPOINT
 SECTION REFERENCE
 DETAIL REFERENCE



LEGEND

AB ANCHOR BOLT
 ABV ABOVE
 AC ALTERNATING CURRENT
 ADDL ADDITIONAL
 AFF ABOVE FINISHED FLOOR
 AFG ABOVE FINISHED GRADE
 AGL ABOVE GROUND LEVEL
 AIC AMPERAGE INTERRUPTION CAPACITY
 ALUM ALUMINUM
 ALT ALTERNATE
 ANT ANTENNA
 APPROX APPROXIMATE
 ARCH ARCHITECTURAL
 ATS AUTOMATIC TRANSFER SWITCH
 AWG AMERICAN WIRE GAUGE
 BATT BATTERY
 BLDG BUILDING
 BLK BLOCK
 BLKG BLOCKING
 BM BEAM
 BTC BARE TINNED COPPER CONDUCTOR
 BOF BOTTOM OF FOOTING
 CAB CABINET
 CANT CANTILEVERED
 CHG CHARGING
 CLG CEILING
 CLR CLEAR
 COL COLUMN
 COMM COMMON
 CONC CONCRETE
 CONSTR CONSTRUCTION
 DBL DOUBLE
 DC DIRECT CURRENT
 DEPT DEPARTMENT
 DF DOUGLAS FIR
 DIA DIAMETER
 DIAG DIAGONAL
 DIM DIMENSION
 DWG DRAWING
 DWL DOWEL
 EA EACH
 EC ELECTRICAL CONDUCTOR
 EL ELEVATION
 ELEC ELECTRICAL
 EMT ELECTRICAL METALLIC TUBING
 ENG ENGINEER
 EQ EQUAL
 EXP EXPANSION
 EXT EXTERIOR
 EW EACH WAY
 FAB FABRICATION
 FF FINISH FLOOR
 FG FINISH GRADE
 FIF FACILITY INTERFACE FRAME
 FIN FINISH(ED)
 FLR FLOOR
 FDN FOUNDATION
 FOC FACE OF CONCRETE
 FOM FACE OF MASONRY
 FOS FACE OF STUD
 FOW FACE OF WALL
 FS FINISH SURFACE
 FT FOOT
 FTG FOOTING
 GA GAUGE
 GEN GENERATOR
 GFCI GROUND FAULT CIRCUIT INTERRUPTER
 GLB GLUE LAMINATED BEAM
 GLV GALVANIZED
 GPS GLOBAL POSITIONING SYSTEM
 GND GROUND
 GSM GLOBAL SYSTEM FOR MOBILE
 HDG HOT DIPPED GALVANIZED
 HDR HEADER
 HGR HANGER
 HVAC HEAT/VENTILATION/AIR CONDITIONING
 HT HEIGHT
 IGR INTERIOR GROUND RING
 IN INCH
 INT INTERIOR
 LB(S) POUND(S)
 LF LINEAR FEET
 LTE LONG TERM EVOLUTION
 MAS MASONRY
 MAX MAXIMUM
 MB MACHINE BOLT
 MECH MECHANICAL
 MFR MANUFACTURER
 MGB MASTER GROUND BAR
 MIN MINIMUM
 MISC MISCELLANEOUS
 MTL METAL
 MTS MANUAL TRANSFER SWITCH
 MW MICROWAVE
 NEC NATIONAL ELECTRIC CODE
 NM NEWTON METERS
 NO. NUMBER
 # NUMBER
 NTS NOT TO SCALE
 OC ON-CENTER
 OSHA OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
 OPNG OPENING
 P/C PRECAST CONCRETE
 PCS PERSONAL COMMUNICATION SERVICES
 PCU PRIMARY CONTROL UNIT
 PRC PRIMARY RADIO CABINET
 PP POLARIZING PRESERVING
 PSF POUNDS PER SQUARE FOOT
 PSI POUNDS PER SQUARE INCH
 PT PRESSURE TREATED
 PWR POWER CABINET
 QTY QUANTITY
 RAD RADIUS
 RECT RECTIFIER
 REF REFERENCE
 REINF REINFORCEMENT
 REQ'D REQUIRED
 RET REMOTE ELECTRIC TILT
 RF RADIO FREQUENCY
 RMC RIGID METALLIC CONDUIT
 RRH REMOTE RADIO HEAD
 RRU REMOTE RADIO UNIT
 RWY RACEWAY
 SCH SCHEDULE
 SHT SHEET
 SIAD SMART INTEGRATED ACCESS DEVICE
 SIM SIMILAR
 SPEC SPECIFICATION
 SQ SQUARE
 SS STAINLESS STEEL
 STD STANDARD
 STL STEEL
 TEMP TEMPORARY
 THK THICKNESS
 TMA TOWER MOUNTED AMPLIFIER
 TN TOE NAIL
 TOA TOP OF ANTENNA
 TOC TOP OF CURB
 TOF TOP OF FOUNDATION
 TOP TOP OF PLATE (PARAPET)
 TOS TOP OF STEEL
 TOW TOP OF WALL
 TVSS TRANSIENT VOLTAGE SURGE SUPPRESSION
 TYP TYPICAL
 UG UNDERGROUND
 UL UNDERWRITERS LABORATORY
 UNO UNLESS NOTED OTHERWISE
 UMTS UNIVERSAL MOBILE TELECOMMUNICATIONS SYSTEM
 UPS UNINTERRUPTIBLE POWER SYSTEM (DC POWER PLANT)
 VIF VERIFIED IN FIELD
 W WIDE
 W/ WITH
 WD WOOD
 WP WEATHERPROOF
 WT WEIGHT

ABBREVIATIONS

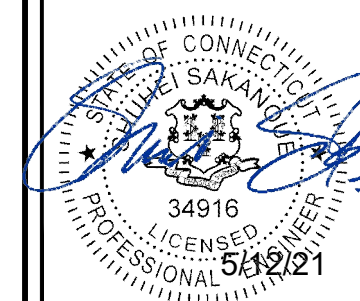


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DRAWN BY: RCD
 CHECKED BY: SS
 APPROVED BY: CJW
 RFDS REV #: N/A

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SUBMITTALS		
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A&E PROJECT NUMBER
 2039-Z5555C

DISH WIRELESS, LLC.
 PROJECT INFORMATION
 BOBDL00053A
 539 PLAINS RD
 HADDAM, CT 06438

SHEET TITLE
 LEGEND AND ABBREVIATIONS

SHEET NUMBER
GN-1

SITE ACTIVITY REQUIREMENTS:

1. NOTICE TO PROCEED – NO WORK SHALL COMMENCE PRIOR TO CONTRACTOR RECEIVING A WRITTEN NOTICE TO PROCEED (NTP) AND THE ISSUANCE OF A PURCHASE ORDER. PRIOR TO ACCESSING/ENTERING THE SITE YOU MUST CONTACT THE DISH WIRELESS, LLC. AND TOWER OWNER NOC & THE DISH WIRELESS, LLC. AND TOWER OWNER CONSTRUCTION MANAGER.
2. "LOOK UP" – DISH WIRELESS, LLC. AND TOWER OWNER SAFETY CLIMB REQUIREMENT:
THE INTEGRITY OF THE SAFETY CLIMB AND ALL COMPONENTS OF THE CLIMBING FACILITY SHALL BE CONSIDERED DURING ALL STAGES OF DESIGN, INSTALLATION, AND INSPECTION. TOWER MODIFICATION, MOUNT REINFORCEMENTS, AND/OR EQUIPMENT INSTALLATIONS SHALL NOT COMPROMISE THE INTEGRITY OR FUNCTIONAL USE OF THE SAFETY CLIMB OR ANY COMPONENTS OF THE CLIMBING FACILITY ON THE STRUCTURE. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO: PINCHING OF THE WIRE ROPE, BENDING OF THE WIRE ROPE FROM ITS SUPPORTS, DIRECT CONTACT OR CLOSE PROXIMITY TO THE WIRE ROPE WHICH MAY CAUSE FRICTIONAL WEAR, IMPACT TO THE ANCHORAGE POINTS IN ANY WAY, OR TO IMPEDE/BLOCK ITS INTENDED USE. ANY COMPROMISED SAFETY CLIMB, INCLUDING EXISTING CONDITIONS MUST BE TAGGED OUT AND REPORTED TO YOUR DISH WIRELESS, LLC. AND DISH WIRELESS, LLC. AND TOWER OWNER POC OR CALL THE NOC TO GENERATE A SAFETY CLIMB MAINTENANCE AND CONTRACTOR NOTICE TICKET.
3. PRIOR TO THE START OF CONSTRUCTION, ALL REQUIRED JURISDICTIONAL PERMITS SHALL BE OBTAINED. THIS INCLUDES, BUT IS NOT LIMITED TO, BUILDING, ELECTRICAL, MECHANICAL, FIRE, FLOOD ZONE, ENVIRONMENTAL, AND ZONING. AFTER ONSITE ACTIVITIES AND CONSTRUCTION ARE COMPLETED, ALL REQUIRED PERMITS SHALL BE SATISFIED AND CLOSED OUT ACCORDING TO LOCAL JURISDICTIONAL REQUIREMENTS.
4. ALL CONSTRUCTION MEANS AND METHODS; INCLUDING BUT NOT LIMITED TO, ERECTION PLANS, RIGGING PLANS, CLIMBING PLANS, AND RESCUE PLANS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR RESPONSIBLE FOR THE EXECUTION OF THE WORK CONTAINED HEREIN, AND SHALL MEET ANSI/ASSE A10.48 (LATEST EDITION); FEDERAL, STATE, AND LOCAL REGULATIONS; AND ANY APPLICABLE INDUSTRY CONSENSUS STANDARDS RELATED TO THE CONSTRUCTION ACTIVITIES BEING PERFORMED. ALL RIGGING PLANS SHALL ADHERE TO ANSI/ASSE A10.48 (LATEST EDITION) AND DISH WIRELESS, LLC. AND TOWER OWNER STANDARDS, INCLUDING THE REQUIRED INVOLVEMENT OF A QUALIFIED ENGINEER FOR CLASS IV CONSTRUCTION, TO CERTIFY THE SUPPORTING STRUCTURE(S) IN ACCORDANCE WITH ANSI/TIA-322 (LATEST EDITION).
5. ALL SITE WORK TO COMPLY WITH DISH WIRELESS, LLC. AND TOWER OWNER INSTALLATION STANDARDS FOR CONSTRUCTION ACTIVITIES ON DISH WIRELESS, LLC. AND TOWER OWNER TOWER SITE AND LATEST VERSION OF ANSI/TIA-1019-A-2012 "STANDARD FOR INSTALLATION, ALTERATION, AND MAINTENANCE OF ANTENNA SUPPORTING STRUCTURES AND ANTENNAS."
6. IF THE SPECIFIED EQUIPMENT CAN NOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION FOR APPROVAL BY DISH WIRELESS, LLC. AND TOWER OWNER PRIOR TO PROCEEDING WITH ANY SUCH CHANGE OF INSTALLATION.
7. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
8. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
9. THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES INCLUDING PRIVATE LOCATES SERVICES PRIOR TO THE START OF CONSTRUCTION.
10. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC AND OTHER UTILITIES WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY CONTRACTOR. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR THE WORKING CREW. THIS WILL INCLUDE BUT NOT BE LIMITED TO A) FALL PROTECTION B) CONFINED SPACE C) ELECTRICAL SAFETY D) TRENCHING AND EXCAVATION E) CONSTRUCTION SAFETY PROCEDURES.
11. ALL SITE WORK SHALL BE AS INDICATED ON THE STAMPED CONSTRUCTION DRAWINGS AND DISH PROJECT SPECIFICATIONS, LATEST APPROVED REVISION.
12. CONTRACTOR SHALL KEEP THE SITE FREE FROM ACCUMULATING WASTE MATERIAL, DEBRIS, AND TRASH AT THE COMPLETION OF THE WORK. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
13. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, SUBJECT TO THE APPROVAL OF DISH WIRELESS, LLC. AND TOWER OWNER, AND/OR LOCAL UTILITIES.
14. THE CONTRACTOR SHALL PROVIDE SITE SIGNAGE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION FOR SITE SIGNAGE REQUIRED BY LOCAL JURISDICTION AND SIGNAGE REQUIRED ON INDIVIDUAL PIECES OF EQUIPMENT, ROOMS, AND SHELTERS.
15. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE CARRIER'S EQUIPMENT AND TOWER AREAS.
16. THE SUB GRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
17. THE AREAS OF THE OWNERS PROPERTY DISTURBED BY THE WORK AND NOT COVERED BY THE TOWER, EQUIPMENT OR DRIVEWAY, SHALL BE GRADED TO A UNIFORM SLOPE, AND STABILIZED TO PREVENT EROSION AS SPECIFIED ON THE CONSTRUCTION DRAWINGS AND/OR PROJECT SPECIFICATIONS.
18. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
19. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.
20. CONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS AND RADIOS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.
21. CONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION. TRASH AND DEBRIS SHOULD BE REMOVED FROM SITE ON A DAILY BASIS.
22. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.

GENERAL NOTES:

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:
CONTRACTOR: GENERAL CONTRACTOR RESPONSIBLE FOR CONSTRUCTION
CARRIER: DISH WIRELESS, LLC.
TOWER OWNER: TOWER OWNER
2. THESE DRAWINGS HAVE BEEN PREPARED USING STANDARDS OF PROFESSIONAL CARE AND COMPLETENESS NORMALLY EXERCISED UNDER SIMILAR CIRCUMSTANCES BY REPUTABLE ENGINEERS IN THIS OR SIMILAR LOCALITIES. IT IS ASSUMED THAT THE WORK DEPICTED WILL BE PERFORMED BY AN EXPERIENCED CONTRACTOR AND/OR WORKPEOPLE WHO HAVE A WORKING KNOWLEDGE OF THE APPLICABLE CODE STANDARDS AND REQUIREMENTS AND OF INDUSTRY ACCEPTED STANDARD GOOD PRACTICE. AS NOT EVERY CONDITION OR ELEMENT IS (OR CAN BE) EXPLICITLY SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL USE INDUSTRY ACCEPTED STANDARD GOOD PRACTICE FOR MISCELLANEOUS WORK NOT EXPLICITLY SHOWN.
3. THESE DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE MEANS OR METHODS OF CONSTRUCTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY FOR PROTECTION OF LIFE AND PROPERTY DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, FORMWORK, SHORING, ETC. SITE VISITS BY THE ENGINEER OR HIS REPRESENTATIVE WILL NOT INCLUDE INSPECTION OF THESE ITEMS AND IS FOR STRUCTURAL OBSERVATION OF THE FINISHED STRUCTURE ONLY.
4. NOTES AND DETAILS IN THE CONSTRUCTION DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT, AND/OR AS PROVIDED FOR IN THE CONTRACT DOCUMENTS. WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL NOTES, AND SPECIFICATIONS, THE GREATER, MORE STRICT REQUIREMENTS, SHALL GOVERN. IF FURTHER CLARIFICATION IS REQUIRED CONTACT THE ENGINEER OF RECORD.
5. SUBSTANTIAL EFFORT HAS BEEN MADE TO PROVIDE ACCURATE DIMENSIONS AND MEASUREMENTS ON THE DRAWINGS TO ASSIST IN THE FABRICATION AND/OR PLACEMENT OF CONSTRUCTION ELEMENTS BUT IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE DIMENSIONS, MEASUREMENTS, AND/OR CLEARANCES SHOWN IN THE CONSTRUCTION DRAWINGS PRIOR TO FABRICATION OR CUTTING OF ANY NEW OR EXISTING CONSTRUCTION ELEMENTS. IF IT IS DETERMINED THAT THERE ARE DISCREPANCIES AND/OR CONFLICTS WITH THE CONSTRUCTION DRAWINGS THE ENGINEER OF RECORD IS TO BE NOTIFIED AS SOON AS POSSIBLE.
6. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING CONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF CARRIER POC AND TOWER OWNER.
7. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
8. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
9. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
10. IF THE SPECIFIED EQUIPMENT CAN NOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION FOR APPROVAL BY THE CARRIER AND TOWER OWNER PRIOR TO PROCEEDING WITH ANY SUCH CHANGE OF INSTALLATION.
11. CONTRACTOR IS TO PERFORM A SITE INVESTIGATION, BEFORE SUBMITTING BIDS, TO DETERMINE THE BEST ROUTING OF ALL CONDUITS FOR POWER, AND TELCO AND FOR GROUNDING CABLES AS SHOWN IN THE POWER, TELCO, AND GROUNDING PLAN DRAWINGS.
12. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF DISH WIRELESS, LLC. AND TOWER OWNER
13. CONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.
14. CONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION. TRASH AND DEBRIS SHOULD BE REMOVED FROM SITE ON A DAILY BASIS.



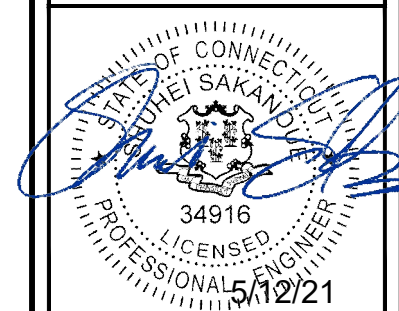
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RCD	SS	CJW
RFDS REV #: N/A		

CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL0053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GENERAL NOTES

SHEET NUMBER
GN-2

CONCRETE, FOUNDATIONS, AND REINFORCING STEEL:

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE ACI 301, ACI 318, ACI 336, ASTM A184, ASTM A185 AND THE DESIGN AND CONSTRUCTION SPECIFICATION FOR CAST-IN-PLACE CONCRETE.
2. UNLESS NOTED OTHERWISE, SOIL BEARING PRESSURE USED FOR DESIGN OF SLABS AND FOUNDATIONS IS ASSUMED TO BE 1000 psf.
3. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH (f'c) OF 3000 psi AT 28 DAYS, UNLESS NOTED OTHERWISE. NO MORE THAN 90 MINUTES SHALL ELAPSE FROM BATCH TIME TO TIME OF PLACEMENT UNLESS APPROVED BY THE ENGINEER OF RECORD. TEMPERATURE OF CONCRETE SHALL NOT EXCEED 90°f AT TIME OF PLACEMENT.
4. CONCRETE EXPOSED TO FREEZE-THAW CYCLES SHALL CONTAIN AIR ENTRAINING ADMIXTURES. AMOUNT OF AIR ENTRAINMENT TO BE BASED ON SIZE OF AGGREGATE AND F3 CLASS EXPOSURE (VERY SEVERE). CEMENT USED TO BE TYPE II PORTLAND CEMENT WITH A MAXIMUM WATER-TO-CEMENT RATIO (W/C) OF 0.45.
5. ALL STEEL REINFORCING SHALL CONFORM TO ASTM A615. ALL WELDED WIRE FABRIC (WWF) SHALL CONFORM TO ASTM A185. ALL SPLICES SHALL BE CLASS "B" TENSION SPLICES, UNLESS NOTED OTHERWISE. ALL HOOKS SHALL BE STANDARD 90 DEGREE HOOKS, UNLESS NOTED OTHERWISE. YIELD STRENGTH (Fy) OF STANDARD DEFORMED BARS ARE AS FOLLOWS:
 #4 BARS AND SMALLER 40 ksi
 #5 BARS AND LARGER 60 ksi
6. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL UNLESS SHOWN OTHERWISE ON DRAWINGS:
 - CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 3"
 - CONCRETE EXPOSED TO EARTH OR WEATHER:
 - #6 BARS AND LARGER 2"
 - #5 BARS AND SMALLER 1-1/2"
 - CONCRETE NOT EXPOSED TO EARTH OR WEATHER:
 - SLAB AND WALLS 3/4"
 - BEAMS AND COLUMNS 1-1/2"
7. A TOOLED EDGE OR A 3/4" CHAMFER SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, UNLESS NOTED OTHERWISE, IN ACCORDANCE WITH ACI 301 SECTION 4.2.4.

ELECTRICAL INSTALLATION NOTES:

1. ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, NEC AND ALL APPLICABLE FEDERAL, STATE, AND LOCAL CODES/ORDINANCES.
2. CONDUIT ROUTINGS ARE SCHEMATIC. CONTRACTOR SHALL INSTALL CONDUITS SO THAT ACCESS TO EQUIPMENT IS NOT BLOCKED AND TRIP HAZARDS ARE ELIMINATED.
3. WIRING, RACEWAY AND SUPPORT METHODS AND MATERIALS SHALL COMPLY WITH THE REQUIREMENTS OF THE NEC.
4. ALL CIRCUITS SHALL BE SEGREGATED AND MAINTAIN MINIMUM CABLE SEPARATION AS REQUIRED BY THE NEC.
- 4.1. ALL EQUIPMENT SHALL BEAR THE UNDERWRITERS LABORATORIES LABEL OF APPROVAL, AND SHALL CONFORM TO REQUIREMENT OF THE NATIONAL ELECTRICAL CODE.
- 4.2. ALL OVERCURRENT DEVICES SHALL HAVE AN INTERRUPTING CURRENT RATING THAT SHALL BE GREATER THAN THE SHORT CIRCUIT CURRENT TO WHICH THEY ARE SUBJECTED, 22,000 AIC MINIMUM. VERIFY AVAILABLE SHORT CIRCUIT CURRENT DOES NOT EXCEED THE RATING OF ELECTRICAL EQUIPMENT IN ACCORDANCE WITH ARTICLE 110.24 NEC OR THE MOST CURRENT ADOPTED CODE PRE THE GOVERNING JURISDICTION.
5. EACH END OF EVERY POWER PHASE CONDUCTOR, GROUNDING CONDUCTOR, AND TELCO CONDUCTOR OR CABLE SHALL BE LABELED WITH COLOR-CODED INSULATION OR ELECTRICAL TAPE (3M BRAND, 1/2" PLASTIC ELECTRICAL TAPE WITH UV PROTECTION, OR EQUAL). THE IDENTIFICATION METHOD SHALL CONFORM WITH NEC AND OSHA.
6. ALL ELECTRICAL COMPONENTS SHALL BE CLEARLY LABELED WITH LAMICOID TAGS SHOWING THEIR RATED VOLTAGE, PHASE CONFIGURATION, WIRE CONFIGURATION, POWER OR AMPACITY RATING AND BRANCH CIRCUIT ID NUMBERS (i.e. PANEL BOARD AND CIRCUIT ID'S).
7. PANEL BOARDS (ID NUMBERS) SHALL BE CLEARLY LABELED WITH PLASTIC LABELS.
8. TIE WRAPS ARE NOT ALLOWED.
9. ALL POWER AND EQUIPMENT GROUND WIRING IN TUBING OR CONDUIT SHALL BE SINGLE COPPER CONDUCTOR (#14 OR LARGER) WITH TYPE THHW, THWN, THWN-2, XHHW, XHHW-2, THW, THW-2, RHW, OR RHW-2 INSULATION UNLESS OTHERWISE SPECIFIED.
10. SUPPLEMENTAL EQUIPMENT GROUND WIRING LOCATED INDOORS SHALL BE SINGLE COPPER CONDUCTOR (#6 OR LARGER) WITH TYPE THHW, THWN, THWN-2, XHHW, XHHW-2, THW, THW-2, RHW, OR RHW-2 INSULATION UNLESS OTHERWISE SPECIFIED.
11. POWER AND CONTROL WIRING IN FLEXIBLE CORD SHALL BE MULTI-CONDUCTOR, TYPE SOOW CORD (#14 OR LARGER) UNLESS OTHERWISE SPECIFIED.
12. POWER AND CONTROL WIRING FOR USE IN CABLE TRAY SHALL BE MULTI-CONDUCTOR, TYPE TC CABLE (#14 OR LARGER), WITH TYPE THHW, THWN, THWN-2, XHHW, XHHW-2, THW, THW-2, RHW, OR RHW-2 INSULATION UNLESS OTHERWISE SPECIFIED.
13. ALL POWER AND GROUNDING CONNECTIONS SHALL BE CRIMP-STYLE, COMPRESSION WIRE LUGS AND WIRE NUTS BY THOMAS AND BETTS (OR EQUAL). LUGS AND WIRE NUTS SHALL BE RATED FOR OPERATION NOT LESS THAN 75° C (90° C IF AVAILABLE).
14. RACEWAY AND CABLE TRAY SHALL BE LISTED OR LABELED FOR ELECTRICAL USE IN ACCORDANCE WITH NEMA, UL, ANSI/IEEE AND NEC.
15. ELECTRICAL METALLIC TUBING (EMT), INTERMEDIATE METAL CONDUIT (IMC), OR RIGID METAL CONDUIT (RMC) SHALL BE USED FOR EXPOSED INDOOR LOCATIONS.

16. ELECTRICAL METALLIC TUBING (EMT) OR METAL-CLAD CABLE (MC) SHALL BE USED FOR CONCEALED INDOOR LOCATIONS.
17. SCHEDULE 40 PVC UNDERGROUND ON STRAIGHTS AND SCHEDULE 80 PVC FOR ALL ELBOWS/90s AND ALL APPROVED ABOVE GRADE PVC CONDUIT.
18. LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT (LIQUID-TITE FLEX) SHALL BE USED INDOORS AND OUTDOORS, WHERE VIBRATION OCCURS OR FLEXIBILITY IS NEEDED.
19. CONDUIT AND TUBING FITTINGS SHALL BE THREADED OR COMPRESSION-TYPE AND APPROVED FOR THE LOCATION USED. SET SCREW FITTINGS ARE NOT ACCEPTABLE.
20. CABINETS, BOXES AND WIRE WAYS SHALL BE LABELED FOR ELECTRICAL USE IN ACCORDANCE WITH NEMA, UL, ANSI/IEEE AND THE NEC.
21. WIREWAYS SHALL BE METAL WITH AN ENAMEL FINISH AND INCLUDE A HINGED COVER, DESIGNED TO SWING OPEN DOWNWARDS (WIREMOLD SPECMATE WIREWAY).
22. SLOTTED WIRING DUCT SHALL BE PVC AND INCLUDE COVER (PANDUIT TYPE E OR EQUAL).
23. CONDUITS SHALL BE FASTENED SECURELY IN PLACE WITH APPROVED NON-PERFORATED STRAPS AND HANGERS. EXPLOSIVE DEVICES (i.e. POWDER-ACTUATED) FOR ATTACHING HANGERS TO STRUCTURE WILL NOT BE PERMITTED. CLOSELY FOLLOW THE LINES OF THE STRUCTURE, MAINTAIN CLOSE PROXIMITY TO THE STRUCTURE AND KEEP CONDUITS IN TIGHT ENVELOPES. CHANGES IN DIRECTION TO ROUTE AROUND OBSTACLES SHALL BE MADE WITH CONDUIT OUTLET BODIES. CONDUIT SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. PARALLEL AND PERPENDICULAR TO STRUCTURE WALL AND CEILING LINES. ALL CONDUIT SHALL BE FISHED TO CLEAR OBSTRUCTIONS. ENDS OF CONDUITS SHALL BE TEMPORARILY CAPPED FLUSH TO FINISH GRADE TO PREVENT CONCRETE, PLASTER OR DIRT FROM ENTERING. CONDUITS SHALL BE RIGIDLY CLAMPED TO BOXES BY GALVANIZED MALLEABLE IRON BUSHING ON INSIDE AND GALVANIZED MALLEABLE IRON LOCKNUT ON OUTSIDE AND INSIDE.
24. EQUIPMENT CABINETS, TERMINAL BOXES, JUNCTION BOXES AND PULL BOXES SHALL BE GALVANIZED OR EPOXY-COATED SHEET STEEL. SHALL MEET OR EXCEED UL 50 AND BE RATED NEMA 1 (OR BETTER) FOR INTERIOR LOCATIONS AND NEMA 3 (OR BETTER) FOR EXTERIOR LOCATIONS.
25. METAL RECEPTACLE, SWITCH AND DEVICE BOXES SHALL BE GALVANIZED, EPOXY-COATED OR NON-CORRODING; SHALL MEET OR EXCEED UL 514A AND NEMA OS 1 AND BE RATED NEMA 1 (OR BETTER) FOR INTERIOR LOCATIONS AND WEATHER PROTECTED (WP OR BETTER) FOR EXTERIOR LOCATIONS.
26. NONMETALLIC RECEPTACLE, SWITCH AND DEVICE BOXES SHALL MEET OR EXCEED NEMA OS 2 (NEWEST REVISION) AND BE RATED NEMA 1 (OR BETTER) FOR INTERIOR LOCATIONS AND WEATHER PROTECTED (WP OR BETTER) FOR EXTERIOR LOCATIONS.
27. THE CONTRACTOR SHALL NOTIFY AND OBTAIN NECESSARY AUTHORIZATION FROM THE CARRIER AND/OR DISH WIRELESS, LLC. AND TOWER OWNER BEFORE COMMENCING WORK ON THE AC POWER DISTRIBUTION PANELS.
28. THE CONTRACTOR SHALL PROVIDE NECESSARY TAGGING ON THE BREAKERS, CABLES AND DISTRIBUTION PANELS IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS TO SAFEGUARD LIFE AND PROPERTY.
29. INSTALL LAMICOID LABEL ON THE METER CENTER TO SHOW "DISH WIRELESS, LLC."
30. ALL EMPTY/SPARE CONDUITS THAT ARE INSTALLED ARE TO HAVE A METERED MULE TAPE PULL CORD INSTALLED.



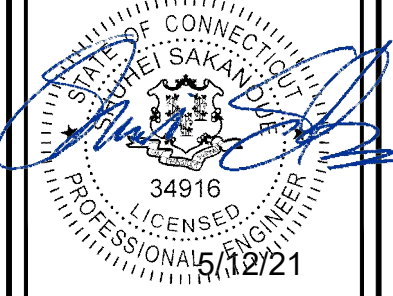
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CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GENERAL NOTES

SHEET NUMBER
GN-3

GROUNDING NOTES:

1. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION AND AC POWER GES'S) SHALL BE BONDED TOGETHER AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.
2. THE CONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR GROUND ELECTRODE SYSTEMS, THE CONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROPERLY SEQUENCING GROUNDING AND UNDERGROUND CONDUIT INSTALLATION AS TO PREVENT ANY LOSS OF CONTINUITY IN THE GROUNDING SYSTEM OR DAMAGE TO THE CONDUIT AND PROVIDE TESTING RESULTS.
4. METAL CONDUIT AND TRAY SHALL BE GROUNDED AND MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH #6 COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.
5. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.
6. EACH CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, #6 STRANDED COPPER OR LARGER FOR INDOOR BTS; #2 BARE SOLID TINNED COPPER FOR OUTDOOR BTS.
7. CONNECTIONS TO THE GROUND BUS SHALL NOT BE DOUBLED UP OR STACKED BACK TO BACK CONNECTIONS ON OPPOSITE SIDE OF THE GROUND BUS ARE PERMITTED.
8. ALL EXTERIOR GROUND CONDUCTORS BETWEEN EQUIPMENT/GROUND BARS AND THE GROUND RING SHALL BE #2 SOLID TINNED COPPER UNLESS OTHERWISE INDICATED.
9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.
10. USE OF 90° BENDS IN THE PROTECTION GROUNDING CONDUCTORS SHALL BE AVOIDED WHEN 45° BENDS CAN BE ADEQUATELY SUPPORTED.
11. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.
12. ALL GROUND CONNECTIONS ABOVE GRADE (INTERIOR AND EXTERIOR) SHALL BE FORMED USING HIGH PRESS CRIMPS.
13. COMPRESSION GROUND CONNECTIONS MAY BE REPLACED BY EXOTHERMIC WELD CONNECTIONS.
14. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO THE BRIDGE AND THE TOWER GROUND BAR.
15. APPROVED ANTIOXIDANT COATINGS (i.e. CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.
16. ALL EXTERIOR GROUND CONNECTIONS SHALL BE COATED WITH A CORROSION RESISTANT MATERIAL.
17. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.
18. BOND ALL METALLIC OBJECTS WITHIN 6 ft OF MAIN GROUND RING WITH (1) #2 BARE SOLID TINNED COPPER GROUND CONDUCTOR.
19. GROUND CONDUCTORS USED FOR THE FACILITY GROUNDING AND LIGHTNING PROTECTION SYSTEMS SHALL NOT BE ROUTED THROUGH METALLIC OBJECTS THAT FORM A RING AROUND THE CONDUCTOR, SUCH AS METALLIC CONDUITS, METAL SUPPORT CLIPS OR SLEEVES THROUGH WALLS OR FLOORS. WHEN IT IS REQUIRED TO BE HOUSED IN CONDUIT TO MEET CODE REQUIREMENTS OR LOCAL CONDITIONS, NON-METALLIC MATERIAL SUCH AS PVC CONDUIT SHALL BE USED. WHERE USE OF METAL CONDUIT IS UNAVOIDABLE (i.e., NONMETALLIC CONDUIT PROHIBITED BY LOCAL CODE) THE GROUND CONDUCTOR SHALL BE BONDED TO EACH END OF THE METAL CONDUIT.
20. ALL GROUNDS THAT TRANSITION FROM BELOW GRADE TO ABOVE GRADE MUST BE #2 BARE SOLID TINNED COPPER IN 3/4" NON-METALLIC, FLEXIBLE CONDUIT FROM 24" BELOW GRADE TO WITHIN 3" TO 6" OF CAD-WELD TERMINATION POINT. THE EXPOSED END OF THE CONDUIT MUST BE SEALED WITH SILICONE CAULK. (ADD TRANSITIONING GROUND STANDARD DETAIL AS WELL).
21. BUILDINGS WHERE THE MAIN GROUNDING CONDUCTORS ARE REQUIRED TO BE ROUTED TO GRADE, THE CONTRACTOR SHALL ROUTE TWO GROUNDING CONDUCTORS FROM THE ROOFTOP, TOWERS, AND WATER TOWERS GROUNDING RING, TO THE EXISTING GROUNDING SYSTEM, THE GROUNDING CONDUCTORS SHALL NOT BE SMALLER THAN 2/0 COPPER. ROOFTOP GROUNDING RING SHALL BE BONDED TO THE EXISTING GROUNDING SYSTEM, THE BUILDING STEEL COLUMNS, LIGHTNING PROTECTION SYSTEM, AND BUILDING MAIN WATER LINE (FERROUS OR NONFERROUS METAL PIPING ONLY). DO NOT ATTACH GROUNDING TO FIRE SPRINKLER SYSTEM PIPES.

dish
wireless.

5701 SOUTH SANTA FE DRIVE
LITTLETON, CO 80120

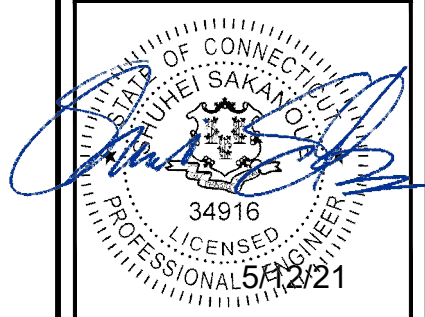
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DRAWN BY:	CHECKED BY:	APPROVED BY:
RCD	SS	CJW

RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GENERAL NOTES

SHEET NUMBER
GN-4

Exhibit D

Structural Analysis Report

Date: **April 22, 2021**



Crown Castle
2000 Corporate Drive
Canonsburg, PA
(724) 416-2000

Subject: **Structural Analysis Report**

Carrier Designation: **DISH Network Co-Locate**
Site Number: BOBDL00053A
Site Name: CT-CCI-T-806478

Crown Castle Designation: **BU Number:** 806478
Site Name: HRT 080 953381
JDE Job Number: 645651
Work Order Number: 1945873
Order Number: 553396 Rev. 0

Engineering Firm Designation: **Crown Castle Project Number:** 1945873

Site Data: **539 PLAINS RD, HADDAM, MIDDLESEX County, CT**
Latitude 41° 26' 35", Longitude -72° 30' 22.4"
180 Foot - Self Support Tower

Crown Castle is pleased to submit this “**Structural Analysis Report**” to determine the structural integrity of the above-mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC7: Proposed Equipment Configuration

Sufficient Capacity

This analysis utilizes an ultimate 3-second gust wind speed of 130 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - "Analysis Criteria".

Structural analysis prepared by: Mishka Stueber

Respectfully submitted by:

Maham Barimani, P.E.
Senior Project Engineer

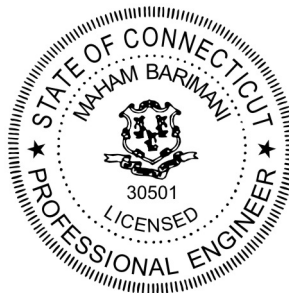


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1) INTRODUCTION

This tower is a 180 ft Self Support tower designed by ROHN. The tower has been modified multiple times to accommodate additional loading.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	130 mph
Exposure Category:	B
Topographic Factor:	1
Ice Thickness:	1.5 in
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
140.0	140.0	3	fujitsu	TA08025-B604	1	1-1/2
		3	fujitsu	TA08025-B605		
		3	jma wireless	MX08FRO665-20 w/ Mount Pipe		
		1	raycap	RDIDC-9181-PF-48		
		1	tower mounts	Commscope MTC3975083 (3)		

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	
182.0	186.0	3	ems wireless	RR90-17-02DP w/ Mount Pipe	6	1-5/8	
	179.0	3	ericsson	KRY 112 489/1			
178.0	179.0	6	antel	LPA-80080/6CF	8	1-5/8	
		3	commscope	CBC78T-DS-43-2X			
		6	commscope	JAHH-65B-R3B w/ Mount Pipe			
		3	samsung telecommunications	RFV01U-D1A			
		3	samsung telecommunications	RFV01U-D2A			
	3	vzw	Sub6 Antenna - VZS01 w/ Mount Pipe				
	178.0	178.0	1	rfs/celwave			DB-B1-6C-8AB-0Z
			1	rfs/celwave			DB-T1-6Z-8AB-0Z
1			tower mounts	Sector Mount [SM 510-3]			
165.0	167.0	3	cci antennas	DMP65R-BU8D w/ Mount Pipe	1	Conduit 3/8 7/16 3/4 1-1/4	
		3	cci antennas	OPA65R-BU6D w/ Mount Pipe	2		
		3	ericsson	RRUS 32 B2	2		
		3	ericsson	RRUS 32 B30	4		
		3	ericsson	RRUS 4449 B5/B12	12		

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
		3	ericsson	RRUS 4478 B14		
		3	powerwave technologies	7770.00 w/ Mount Pipe		
		6	powerwave technologies	LGP21401		
		3	quintel technology	QS66512-2 w/ Mount Pipe		
		3	raycap	DC6-48-60-18-8F		
	165.0	1	tower mounts	Sector Mount [SM 510-3]		
150.0	150.0	3	alcatel lucent	PCS 1900MHZ 4X45W-65MHZ	4	1-1/4
		6	alcatel lucent	RRH2X50-800		
		3	alcatel lucent	TD-RRH8X20-25		
		3	commscope	NNVV-65B-R4 w/ Mount Pipe		
		3	rfs celwave	APXVTM14-ALU-I20 w/ Mount Pipe		
		1	tower mounts	Sector Mount [SM 502-3]		
50.0	50.0	1	gps	GPS_A	1	1/2
		1	tower mounts	Side Arm Mount [SO 305-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
4-GEOTECHNICAL REPORTS	1240448	CCISITES
4-POST-MODIFICATION INSPECTION	6011748	CCISITES
4-POST-MODIFICATION INSPECTION	2393878	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	300985	CCISITES
4-TOWER MANUFACTURER DRAWINGS	1067089	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	5864073	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	1274944	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	1004663	CCISITES

3.1) Analysis Method

tnxTower (version 8.0.9.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A. When applicable, Crown Castle has calculated and provided the effective area for panel antennas using approved methods following the intent of the TIA-222 standard.

tnxTower was used to determine the loads on the modified structure. Additional calculations were performed to determine the stresses in the reinforcing elements. These calculations are included in Appendix C.

3.2) Assumptions

- 1) Tower and structures were maintained in accordance with the TIA-222 Standard.
- 2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.

This analysis may be affected if any assumptions are not valid or have been made in error. Crown Castle should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	180 - 160	Leg	ROHN 2 STD	2	-26.206	38.684	67.7	Pass
T2	160 - 155	Leg	ROHN 2.5 EH	38	-35.350	78.151	45.2	Pass
T3	155 - 150	Leg	ROHN 2.5 EH	47	-43.741	78.148	56.0	Pass
T4	150 - 145	Leg	ROHN 2.5 EH	56	-53.793	78.149	68.8	Pass
T5	145 - 140	Leg	ROHN 2.5 EH	65	-63.708	98.081	65.0	Pass
T6	140 - 133.333	Leg	ROHN 3 EH	77	-75.455	99.059	76.2	Pass
T7	133.333 - 126.667	Leg	ROHN 3 EH	86	-89.011	129.274	68.9	Pass
T8	126.667 - 120	Leg	ROHN 3 EH	98	-100.685	141.695	71.1	Pass
T9	120 - 113.333	Leg	ROHN 3.5 EH	140	-114.070	161.556	70.6	Pass
T10	113.333 - 106.667	Leg	ROHN 3.5 EH	152	-125.783	161.594	77.8	Pass
T11	106.667 - 100	Leg	BT100140- Rohn 3.5EH w/ 2" SR	164	-138.334	244.582	47.0 ¹	Pass ¹
T12	100 - 80	Leg	BT100140- Rohn 4EH w/ 2" SR	173	-172.302	286.747	59.9 ¹	Pass ¹
T13	80 - 60	Leg	BT100140- Rohn 5EH w/ 2" SR (60-80)	194	-202.914	319.408	63.4 ¹	Pass ¹
T14	60 - 40	Leg	BT100140- Rohn 5EH w/ 2" SR (40-60)	209	-233.537	400.743	58.0 ¹	Pass ¹
T15	40 - 30	Leg	BT100140- Rohn 6EHS w/ 2" SR (30-40)	230	-250.927	373.300	57.3 ¹	Pass ¹
T16	30 - 20	Leg	BT100140- Rohn 6EHS w/ 2" SR (20-30)	239	-265.219	439.396	51.5 ¹	Pass ¹
T17	20 - 0	Leg	BT100140- Rohn 6EH w/ 2" SR	251	-297.529	437.361	67.9 ¹	Pass ¹
T1	180 - 160	Diagonal	L2x2x1/4	10	-5.294	21.921	24.2	Pass
T2	160 - 155	Diagonal	L1 3/4x1 3/4x3/16	43	-4.592	8.960	51.2	Pass
T3	155 - 150	Diagonal	L1 3/4x1 3/4x3/16	52	-4.502	8.115	55.5	Pass
T4	150 - 145	Diagonal	L2x2x1/4	61	-5.640	14.435	39.1	Pass
T5	145 - 140	Diagonal	2L1 3/4x1 3/4x3/16x3/16	70	-5.539	10.763	51.5	Pass
T6	140 - 133.333	Diagonal	2L2x2x3/16x1/2	82	-6.930	34.333	20.2	Pass
T7	133.333 - 126.667	Diagonal	2L2x2x3/16x1/2	91	-7.063	31.258	22.6	Pass
T8	126.667 - 120	Diagonal	2L2x2x3/16x1/2	108	-7.697	40.133	19.2	Pass
T9	120 - 113.333	Diagonal	2L2 1/2x2 1/2x3/16x1/2	145	-7.370	43.852	16.8	Pass
T10	113.333 - 106.667	Diagonal	2L2 1/2x2 1/2x3/16x1/2	157	-7.624	41.968	18.2	Pass
T11	106.667 - 100	Diagonal	2L2 1/2x2 1/2x3/16x1/2	169	-7.043	41.098	17.1	Pass
T12	100 - 80	Diagonal	2L3x3x3/16x1/2	178	-7.813	48.925	16.0	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T13	80 - 60	Diagonal	2L3x3x3/16x1/4	199	-9.370	36.097	26.0	Pass
T14	60 - 40	Diagonal	2L3x3x1/4x1/4	213	-10.539	41.581	25.3	Pass
T15	40 - 30	Diagonal	2L3 1/2x3 1/2x1/4x1/4	234	-10.168	60.389	16.8	Pass
T16	30 - 20	Diagonal	2L3 1/2x3 1/2x1/4x1/4	243	-11.889	54.955	21.6	Pass
T17	20 - 0	Diagonal	L4x4x1/4	255	-11.317	20.932	54.1	Pass
T8	126.667 - 120	Horizontal	L2 1/2x2 1/2x1/4	100	-1.746	14.671	11.9	Pass
T5	145 - 140	Secondary Horizontal	L2x2x1/4	73	-1.105	11.066	10.0	Pass
T7	133.333 - 126.667	Secondary Horizontal	L2x2x1/4	94	-1.544	8.365	18.5	Pass
T9	120 - 113.333	Secondary Horizontal	L2 1/2x2 1/2x1/4	148	-1.978	12.994	15.2	Pass
T10	113.333 - 106.667	Secondary Horizontal	L2 1/2x2 1/2x1/4	160	-2.181	11.476	19.0	Pass
T14	60 - 40	Secondary Horizontal	L3x3x1/4	217	-4.050	8.153	49.7	Pass
T16	30 - 20	Secondary Horizontal	L3 1/2x3 1/2x1/4	247	-4.600	10.692	43.0	Pass
T1	180 - 160	Top Girt	L2x2x1/8	6	-0.100	4.273	2.3	Pass
T8	126.667 - 120	Redund Horz 1 Bracing	L2x2x1/4	105	1.746	25.709	6.8	Pass
T8	126.667 - 120	Redund Diag 1 Bracing	L2x2x1/4	129	-1.158	26.237	4.4	Pass
							Summary	
						Leg (T10)	77.8	Pass
						Diagonal (T3)	55.5	Pass
						Horizontal (T8)	11.9	Pass
						Secondary Horizontal (T14)	49.7	Pass
						Top Girt (T1)	2.3	Pass
						Redund Horz 1 Bracing (T8)	6.8	Pass
						Redund Diag 1 Bracing (T8)	4.4	Pass
						Bolt Checks	74.8	Pass
						Rating =	77.8	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	59.0	Pass
1	Base Foundation (Structure)	0	30.0	Pass
1	Base Foundation (Soil Interaction)	0	96.2	Pass

Structure Rating (max from all components) =	96.2%
---	--------------

Notes:

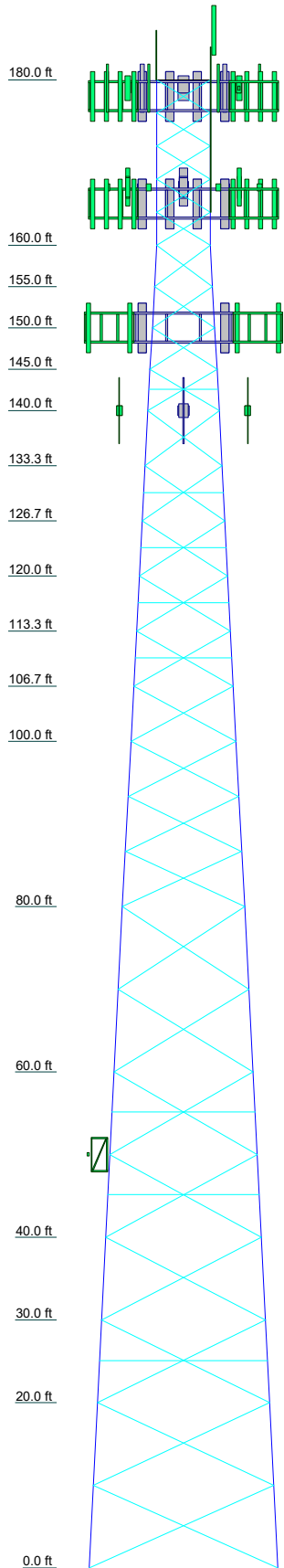
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

APPENDIX A
TNXTOWER OUTPUT

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	
Legs	ROHN 2.5 EH			ROHN 3 EH			ROHN 3.5 EH			ROHN 3.5 EH			ROHN 3.5 EH			ROHN 2.5 STD		
Leg Grade	A572-50																	
Diagonals	L2x2x1/4			2L2x2x3/16x1/2			2L2x2x3/16x1/2			2L2x2x3/16x1/2			2L3x3x3/16x1/4			2L3x3x1/4x1/4		
Diagonal Grade	A36																	
Top Girts	N.A.																	
Sec. Horizontals	N.A.			L2x2x1/2x1/4			I			I			I			N.A.		
Face Width (ft)	6.52083			8.60418			9.96833			10.6354			11.3151			12.6771		
# Panels @ (ft)	5 @ 4			4 @ 5			9 @ 6.66667			8 @ 10			8 @ 10			8 @ 10		
Weight (K)	1.0			0.2			0.2			0.2			0.2			0.2		



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	BT100140- Rohn 3.5EH w/ 2" SR	G	BT100140- Rohn 6EH w/ 2" SR
B	BT100140- Rohn 4EH w/ 2" SR	H	L1 3/4x1 3/4x3/16
C	BT100140- Rohn 5EH w/ 2" SR (60-80)	I	L2x2x1/4
D	BT100140- Rohn 5EH w/ 2" SR (40-60)	J	2L1 3/4x1 3/4x3/16x3/16
E	BT100140- Rohn 6EHS w/ 2" SR (30-40)	K	A572-50
F	BT100140- Rohn 6EHS w/ 2" SR (20-30)	L	L3 1/2x3 1/2x1/4

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

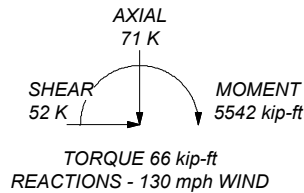
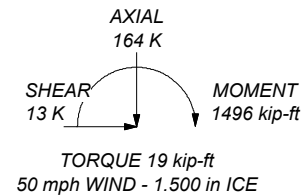
1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 77.6%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:

DOWN: 303 K
SHEAR: 32 K

UPLIFT: -251 K
SHEAR: 27 K



<p align="center">Crown Castle 2000 Corporate Drive Canonsburg, PA The Pathway to Possible Phone: (724) 416-2000 FAX:</p>		Job: 806478	
		Project:	Client: Crown Castle
Code: TIA-222-H		Date: 04/21/21	Scale: NTS
Path:		Dwg No. E-1	

Tower Input Data

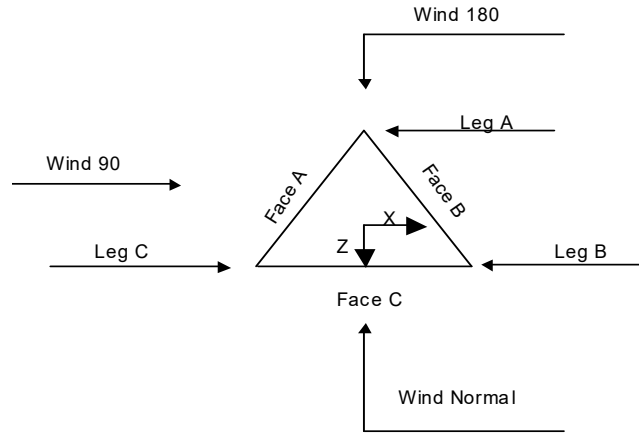
The main tower is a 3x free standing tower with an overall height of 180.000 ft above the ground line.
 The base of the tower is set at an elevation of 0.000 ft above the ground line.
 The face width of the tower is 6.521 ft at the top and 22.865 ft at the base.
 This tower is designed using the TIA-222-H standard.

The following design criteria apply:

- Tower is located in Middlesex County, Connecticut.
- Tower base elevation above sea level: 504.000 ft.
- Basic wind speed of 130 mph.
- Risk Category II.
- Exposure Category B.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.000 ft.
- Nominal ice thickness of 1.500 in.
- Ice thickness is considered to increase with height.
- Ice density of 56.000 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50.000 °F.
- Deflections calculated using a wind speed of 60 mph.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.
- Tower analysis based on target reliabilities in accordance with Annex S.
- Load Modification Factors used: $K_{es}(F_w) = 0.95$, $K_{es}(t_i) = 0.85$.
- Maximum demand-capacity ratio is: 1.05.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section ✓ Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area ✓ Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination ✓ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder Ignore KL/ry For 60 Deg. Angle Legs	Use ASCE 10 X-Brace Ly Rules ✓ Calculate Redundant Bracing Forces Ignore Redundant Members in FEA ✓ SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feed Line Torque ✓ Include Angle Block Shear Check Use TIA-222-H Bracing Resist. Exemption Use TIA-222-H Tension Splice Exemption <div style="text-align: center; background-color: #e0e0e0; padding: 2px;">Poles</div> Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets Pole Without Linear Attachments Pole With Shroud Or No Appurtenances Outside and Inside Corner Radii Are Known
--	---	---



Triangular Tower

Tower Section Geometry

<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Assembly Database</i>	<i>Description</i>	<i>Section Width</i>	<i>Number of Sections</i>	<i>Section Length</i>
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	180.000-160.000			6.521	1	20.000
T2	160.000-155.000			6.563	1	5.000
T3	155.000-150.000			7.068	1	5.000
T4	150.000-145.000			7.581	1	5.000
T5	145.000-140.000			8.091	1	5.000
T6	140.000-133.333			8.604	1	6.667
T7	133.333-126.667			9.281	1	6.667
T8	126.667-120.000			9.958	1	6.667
T9	120.000-113.333			10.635	1	6.667
T10	113.333-106.667			11.315	1	6.667
T11	106.667-100.000			11.997	1	6.667
T12	100.000-80.000			12.677	1	20.000
T13	80.000-60.000			14.771	1	20.000
T14	60.000-40.000			16.771	1	20.000
T15	40.000-30.000			18.854	1	10.000
T16	30.000-20.000			19.859	1	10.000
T17	20.000-0.000			20.865	1	20.000

Tower Section Geometry (cont'd)

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	180.000-160.000	4.000	X Brace	No	No	0.000	0.000
T2	160.000-155.000	5.000	X Brace	No	No	0.000	0.000
T3	155.000-150.000	5.000	X Brace	No	No	0.000	0.000
T4	150.000-145.000	5.000	X Brace	No	No	0.000	0.000
T5	145.000-140.000	5.000	X Brace	No	Yes	0.000	0.000
T6	140.000-133.333	6.667	X Brace	No	No	0.000	0.000
T7	133.333-126.667	6.667	X Brace	No	Yes	0.000	0.000
T8	126.667-120.000	3.333	Double K1	No	Yes	0.000	0.000
T9	120.000-113.333	6.667	X Brace	No	Yes	0.000	0.000
T10	113.333-106.667	6.667	X Brace	No	Yes	0.000	0.000
T11	106.667-100.000	6.667	X Brace	No	No	0.000	0.000
T12	100.000-80.000	6.667	X Brace	No	No	0.000	0.000
T13	80.000-60.000	10.000	X Brace	No	No	0.000	0.000
T14	60.000-40.000	10.000	X Brace	No	Yes	0.000	0.000
T15	40.000-30.000	10.000	X Brace	No	No	0.000	0.000
T16	30.000-20.000	10.000	X Brace	No	Yes	0.000	0.000
T17	20.000-0.000	10.000	X Brace	No	No	0.000	0.000

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.000-160.000	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A572-50 (50 ksi)
T2 160.000-155.000	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T3 155.000-150.000	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T4 150.000-145.000	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A572-50 (50 ksi)
T5 145.000-140.000	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Double Equal Angle	2L1 3/4x1 3/4x3/16x3/16	A36 (36 ksi)
T6 140.000-133.333	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Double Equal Angle	2L2x2x3/16x1/2	A36 (36 ksi)
T7 133.333-126.667	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Double Equal Angle	2L2x2x3/16x1/2	A36 (36 ksi)
T8 126.667-120.000	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Double Equal Angle	2L2x2x3/16x1/2	A36 (36 ksi)
T9 120.000-113.333	Pipe	ROHN 3.5 EH	A572-50 (50 ksi)	Double Equal Angle	2L2 1/2x2 1/2x3/16x1/2	A36 (36 ksi)
T10 113.333-106.667	Pipe	ROHN 3.5 EH	A572-50 (50 ksi)	Double Equal Angle	2L2 1/2x2 1/2x3/16x1/2	A36 (36 ksi)
T11 106.667-100.000	Arbitrary Shape	BT100140- Rohn 3.5EH w/ 2" SR	A572-50 (50 ksi)	Double Equal Angle	2L2 1/2x2 1/2x3/16x1/2	A36 (36 ksi)
T12 100.000-80.000	Arbitrary Shape	BT100140- Rohn 4EH w/ 2" SR	A572-50 (50 ksi)	Double Equal Angle	2L3x3x3/16x1/2	A36 (36 ksi)
T13 80.000-60.000	Arbitrary Shape	BT100140- Rohn 5EH w/ 2" SR (60-80)	A572-50 (50 ksi)	Double Equal Angle	2L3x3x3/16x1/4	A36 (36 ksi)
T14 60.000-40.000	Arbitrary Shape	BT100140- Rohn 5EH w/ 2" SR (40-60)	A572-50 (50 ksi)	Double Equal Angle	2L3x3x1/4x1/4	A572-50 (50 ksi)
T15 40.000-30.000	Arbitrary Shape	BT100140- Rohn 6EHS w/ 2" SR (30-40)	A572-50 (50 ksi)	Double Equal Angle	2L3 1/2x3 1/2x1/4x1/4	A572-50 (50 ksi)

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T16 30.000-20.000	Arbitrary Shape	BT100140- Rohn 6EHS w/ 2" SR (20-30)	A572-50 (50 ksi)	Double Equal Angle	2L3 1/2x3 1/2x1/4x1/4	A572-50 (50 ksi)
T17 20.000-0.000	Arbitrary Shape	BT100140- Rohn 6EH w/ 2" SR	A572-50 (50 ksi)	Equal Angle	L4x4x1/4	A572-50 (50 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.000-160.000	Single Angle	L2x2x1/8	A36 (36 ksi)	Flat Bar		A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T8 126.667-120.000	None	Solid Round		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T5 145.000-140.000	Equal Angle	L2x2x1/4	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T7 133.333-126.667	Equal Angle	L2x2x1/4	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T9 120.000-113.333	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T10 113.333-106.667	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T14 60.000-40.000	Equal Angle	L3x3x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T16 30.000-20.000	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Redundant Bracing Grade	Redundant Type	Redundant Size	K Factor
T8 126.667-120.000	A36 (36 ksi)	Horizontal (1) Diagonal (1)	Equal Angle Equal Angle	1 1

Tower Section Geometry (cont'd)

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_r	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontal	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
T1 180.000-160.000	0.000	0.188	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T2 160.000-155.000	0.000	0.188	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T3 155.000-150.000	0.000	0.188	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T4 150.000-145.000	0.000	0.188	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T5 145.000-140.000	0.000	0.188	A36 (36 ksi)	1.03	1	1.05	58.500	Mid-Pt	Mid-Pt
T6 140.000-133.333	0.000	0.500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T7 133.333-126.667	0.000	0.500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T8 126.667-120.000	0.000	0.500	A36 (36 ksi)	1.1	1	1.1	Mid-Pt	Mid-Pt	Mid-Pt
T9 120.000-113.333	0.000	0.500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T10 113.333-106.667	0.000	0.500	A36 (36 ksi)	1.03	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T11 106.667-100.000	0.000	0.500	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T12 100.000-80.000	0.000	0.500	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T13 80.000-60.000	0.000	0.250	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T14 60.000-40.000	0.000	0.250	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T15 40.000-30.000	0.000	0.250	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T16 30.000-20.000	0.000	0.250	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt
T17 20.000-0.000	0.000	0.500	A36 (36 ksi)	1.1	1	1.05	Mid-Pt	Mid-Pt	Mid-Pt

Tower Section Geometry (cont'd)

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors ¹						
				X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
				X Y	X Y	X Y	X Y	X Y	X Y	X Y
T1 180.000-160.000	Yes	No	1	1	1	1	1	1	1	1
T2 160.000-155.000	Yes	No	1	1	1	1	1	1	1	1
T3 155.000-150.000	Yes	No	1	1	1	1	1	1	1	1
T4 150.000-145.000	Yes	No	1	1	1	1	1	1	1	1
T5 145.000-140.000	No	No	1	1	1	1	1	1	1	1
T6 140.000-133.333	Yes	No	1	1	1	1	1	1	1	1
T7 133.333-126.667	No	No	1	1	1	1	1	1	1	1
T8 126.667-120.000	No	No	0.5	1	1	1	1	1	1	1

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors ¹							
				X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y	
T9 120.000-113.333	No	No	1	1	1	1	1	1	1	1	1
T10 113.333-106.667	No	No	1	1	1	1	1	1	1	1	1
T11 106.667-100.000	Yes	No	0.78	1	1	1	1	1	1	1	1
T12 100.000-80.000	Yes	No	0.8	1	1	1	1	1	1	1	1
T13 80.000-60.000	Yes	No	0.83	1	1	1	1	1	1	1	1
T14 60.000-40.000	No	No	0.85	1	1	1	1	1	1	1	1
T15 40.000-30.000	Yes	No	0.85	1	1	1	1	1	1	1	1
T16 30.000-20.000	No	No	0.85	1	1	1	1	1	1	1	1
T17 20.000-0.000	Yes	No	0.865	1	1	1	1	1	1	1	1

¹Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.000-160.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T2 160.000-155.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T3 155.000-150.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T4 150.000-145.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T5 145.000-140.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T6 140.000-133.333	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T7 133.333-126.667	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T8 126.667-120.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T9 120.000-113.333	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T10 113.333-106.667	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T11 106.667-100.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T12 100.000-80.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T13 80.000-60.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T14 60.000-40.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T15 40.000-30.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T16 30.000-20.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T17 20.000-0.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.000-160.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T2 160.000-155.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T3 155.000-150.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T4 150.000-145.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T5 145.000-140.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T6 140.000-133.333	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T7 133.333-126.667	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T8 126.667-120.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T9 120.000-113.333	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T10 113.333-106.667	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T11 106.667-100.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T12 100.000-80.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T13 80.000-60.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T14 60.000-40.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T15 40.000-30.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T16 30.000-20.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T17 20.000-0.000	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.000-160.000	Flange	0.625 A325N	4	0.500 A325X	1	0.500 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T2 160.000-155.000	Flange	0.750 A325N	0	0.500 A325N	1	0.500 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T3 155.000-150.000	Flange	0.750 A325N	0	0.500 A325N	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T4 150.000-145.000	Flange	0.750 A325N	0	0.500 A325X	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T5 145.000-140.000	Flange	0.750 A325N	4	0.500 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	0*
T6 140.000-133.333	Flange	0.875 A325N	0	0.500 A325N	2	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T7 133.333-126.667	Flange	0.875 A325N	0	0.500 A325N	2	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	0*
T8 126.667-120.000	Flange	0.875 A325N	4	0.500 A325N	2	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0*
T9 120.000-113.333	Flange	0.875 A325N	0	0.500 A325N	2	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0*
T10 113.333-106.667	Flange	0.875 A325N	0	0.500 A325N	2	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0*
T11 106.667-100.000	Flange	0.875 A325N	4	0.500 A325N	2	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T12 100.000-80.000	Flange	1.000 A325N	4	0.500 A325N	2	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T13 80.000-60.000	Flange	1.000 A325N	4	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T14 60.000-40.000	Flange	1.000 A325N	6	0.625 A325N	1	0.625 A325X	0	0.625 A325X	0	0.625 A325X	0	0.625 A325X	0	0.625 A325N	0*
T15 40.000-30.000	Flange	1.000 A325N	0	0.625 A325N	1	0.625 A325N	0	0.000 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T16 30.000-20.000	Flange	1.000 A325N	6	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0*
T17 20.000-0.000	Flange	1.000 A449	0	0.625 A325N	2	0.625 A325X	0	0.625 A325X	0	0.625 A325X	0	0.625 A325X	0	0.625 A325N	0

* Out-of-plane partial restraint assumed

Tower Section Geometry (cont'd)

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.000-160.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T2 160.000-155.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T3 155.000-150.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T4 150.000-145.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T5 145.000-140.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T6 140.000-133.333	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T7 133.333-126.667	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T8 126.667-120.000	0.625 A325N	1	0.625 A325N	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T9 120.000-113.333	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T10 113.333-106.667	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T11 106.667-100.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T12 100.000-80.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T13 80.000-60.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T14 60.000-40.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T15 40.000-30.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T16 30.000-20.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0
T17 20.000-0.000	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
FLC 158-50J(1-5/8")	A	No	No	Ar (CaAa)	178.000 - 0.000	0.000	0.39	8	8	1.500 0.750	2.015		0.001
Feedline Ladder (Af)	A	No	No	Af (CaAa)	180.000 - 0.000	0.000	0.385	1	1	3.000	3.000		0.008
LDF6-50A(1-1/4")	B	No	No	Ar (CaAa)	165.000 - 0.000	0.000	-0.4	12	6	0.500	1.550		0.001
2-1/2" Rigid Conduit	B	No	No	Ar (CaAa)	165.000 - 0.000	0.000	-0.36	1	1	0.850 0.750	2.500		0.003
WR- VG122ST-BRDA(7/16)	B	No	No	Ar (CaAa)	165.000 - 0.000	0.000	-0.37	3	2	0.500	0.000		0.000
FB-L98B-002-75000(3/8)	B	No	No	Ar (CaAa)	165.000 - 0.000	4.500	-0.39	1	1	0.394	0.394		0.000
WR- VG86ST-BRD(3/4)	B	No	No	Ar (CaAa)	165.000 - 0.000	4.500	-0.41	4	4	0.850 0.750	0.795		0.001
Feedline Ladder (Af)	B	No	No	Af (CaAa)	180.000 - 0.000	0.000	-0.39	1	1	3.000	3.000		0.008
HB114-1-0813U4-M5J(1-1/4)	C	No	No	Ar (CaAa)	150.000 - 0.000	0.000	-0.37	4	4	0.850 0.750	1.540		0.001
LDF4-50A(1/2")	C	No	No	Ar (CaAa)	50.000 - 0.000	0.000	-0.35	1	1	0.630	0.630		0.000
Feedline Ladder (Af)	C	No	No	Af (CaAa)	150.000 - 0.000	-0.750	-0.42	2	1	3.000	3.000		0.008
HCS 6X12 4AWG(1-5/8)	C	No	No	Ar (CaAa)	180.000 - 0.000	-1.500	-0.37	7	7	0.500	1.660		0.002
Feedline Ladder (Af)	C	No	No	Af (CaAa)	180.000 - 150.000	-0.750	-0.41	1	1	3.000	3.000		0.008
Safety Line 3/8	A	No	No	Ar (CaAa)	180.000 - 0.000	0.000	0.02	1	1	0.375	0.375		0.000
Thin Flat Bar Climbing Ladder	A	No	No	Af (CaAa)	180.000 - 0.000	0.000	0	1	1	2.000	2.000		0.004
2" SR	A	No	No	Ar (CaAa)	110.000 - 0.000	0.000	0.5	1	1	2.000	2.000		0.000

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
2" SR	B	No	No	Ar (CaAa)	110.000 - 0.000	0.000	0.5	1	1	2.000	2.000		0.000
2" SR	C	No	No	Ar (CaAa)	110.000 - 0.000	0.000	0.5	1	1	2.000	2.000		0.000
* CU12PSM9P 6XXX(1-1/2)	A	No	No	Ar (CaAa)	140.000 - 0.000	-2.000	0.5	1	1	1.600	1.600		0.002
***** ***													

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	CAAA ft ² /ft	Weight klf
***** ***								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	CAAA In Face ft ²	CAAA Out Face ft ²	Weight K
T1	180.000-160.000	A	0.000	0.000	46.433	0.000	0.385
		B	0.000	0.000	22.337	0.000	0.237
		C	0.000	0.000	33.240	0.000	0.504
T2	160.000-155.000	A	0.000	0.000	12.414	0.000	0.100
		B	0.000	0.000	14.837	0.000	0.111
		C	0.000	0.000	8.310	0.000	0.126
T3	155.000-150.000	A	0.000	0.000	12.414	0.000	0.100
		B	0.000	0.000	14.837	0.000	0.111
		C	0.000	0.000	8.310	0.000	0.126
T4	150.000-145.000	A	0.000	0.000	12.414	0.000	0.100
		B	0.000	0.000	14.837	0.000	0.111
		C	0.000	0.000	13.890	0.000	0.192
T5	145.000-140.000	A	0.000	0.000	12.414	0.000	0.100
		B	0.000	0.000	14.837	0.000	0.111
		C	0.000	0.000	13.890	0.000	0.192
T6	140.000-133.333	A	0.000	0.000	17.619	0.000	0.149
		B	0.000	0.000	19.782	0.000	0.148
		C	0.000	0.000	18.520	0.000	0.256
T7	133.333-126.667	A	0.000	0.000	17.619	0.000	0.149
		B	0.000	0.000	19.782	0.000	0.148
		C	0.000	0.000	18.520	0.000	0.256
T8	126.667-120.000	A	0.000	0.000	17.619	0.000	0.149
		B	0.000	0.000	19.782	0.000	0.148
		C	0.000	0.000	18.520	0.000	0.256
T9	120.000-113.333	A	0.000	0.000	17.619	0.000	0.149
		B	0.000	0.000	19.782	0.000	0.148
		C	0.000	0.000	18.520	0.000	0.256
T10	113.333-106.667	A	0.000	0.000	18.286	0.000	0.149
		B	0.000	0.000	20.449	0.000	0.148
		C	0.000	0.000	19.187	0.000	0.256
T11	106.667-100.000	A	0.000	0.000	18.952	0.000	0.149
		B	0.000	0.000	21.116	0.000	0.148
		C	0.000	0.000	19.853	0.000	0.256
T12	100.000-80.000	A	0.000	0.000	56.857	0.000	0.447

Tower Section	Tower Elevation	Face	A _R	A _F	C _{AA} In Face	C _{AA} Out Face	Weight
n	ft		ft ²	ft ²	ft ²	ft ²	K
		B	0.000	0.000	63.347	0.000	0.443
		C	0.000	0.000	59.560	0.000	0.768
T13	80.000-60.000	A	0.000	0.000	56.857	0.000	0.447
		B	0.000	0.000	63.347	0.000	0.443
		C	0.000	0.000	59.560	0.000	0.768
T14	60.000-40.000	A	0.000	0.000	56.857	0.000	0.447
		B	0.000	0.000	63.347	0.000	0.443
		C	0.000	0.000	60.190	0.000	0.769
T15	40.000-30.000	A	0.000	0.000	28.428	0.000	0.223
		B	0.000	0.000	31.674	0.000	0.221
		C	0.000	0.000	30.410	0.000	0.386
T16	30.000-20.000	A	0.000	0.000	28.428	0.000	0.223
		B	0.000	0.000	31.674	0.000	0.221
		C	0.000	0.000	30.410	0.000	0.386
T17	20.000-0.000	A	0.000	0.000	56.857	0.000	0.447
		B	0.000	0.000	63.347	0.000	0.443
		C	0.000	0.000	60.820	0.000	0.771

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation	Face or Leg	Ice Thickness	A _R	A _F	C _{AA} In Face	C _{AA} Out Face	Weight
n	ft		in	ft ²	ft ²	ft ²	ft ²	K
T1	180.000-160.000	A	1.502	0.000	0.000	103.047	0.000	1.645
		B		0.000	0.000	39.641	0.000	0.708
		C		0.000	0.000	61.586	0.000	1.196
T2	160.000-155.000	A	1.491	0.000	0.000	27.589	0.000	0.435
		B		0.000	0.000	27.543	0.000	0.425
		C		0.000	0.000	15.368	0.000	0.298
T3	155.000-150.000	A	1.486	0.000	0.000	27.567	0.000	0.434
		B		0.000	0.000	27.504	0.000	0.424
		C		0.000	0.000	15.355	0.000	0.297
T4	150.000-145.000	A	1.481	0.000	0.000	27.546	0.000	0.433
		B		0.000	0.000	27.464	0.000	0.422
		C		0.000	0.000	27.143	0.000	0.492
T5	145.000-140.000	A	1.476	0.000	0.000	27.523	0.000	0.432
		B		0.000	0.000	27.423	0.000	0.421
		C		0.000	0.000	27.116	0.000	0.491
T6	140.000-133.333	A	1.470	0.000	0.000	39.687	0.000	0.626
		B		0.000	0.000	36.498	0.000	0.560
		C		0.000	0.000	36.113	0.000	0.653
T7	133.333-126.667	A	1.462	0.000	0.000	39.634	0.000	0.624
		B		0.000	0.000	36.419	0.000	0.557
		C		0.000	0.000	36.063	0.000	0.651
T8	126.667-120.000	A	1.455	0.000	0.000	39.578	0.000	0.621
		B		0.000	0.000	36.337	0.000	0.555
		C		0.000	0.000	36.010	0.000	0.649
T9	120.000-113.333	A	1.447	0.000	0.000	39.520	0.000	0.618
		B		0.000	0.000	36.250	0.000	0.552
		C		0.000	0.000	35.955	0.000	0.646
T10	113.333-106.667	A	1.438	0.000	0.000	41.084	0.000	0.636
		B		0.000	0.000	37.785	0.000	0.570
		C		0.000	0.000	37.522	0.000	0.664
T11	106.667-100.000	A	1.429	0.000	0.000	42.632	0.000	0.652
		B		0.000	0.000	39.302	0.000	0.587
		C		0.000	0.000	39.074	0.000	0.681
T12	100.000-80.000	A	1.410	0.000	0.000	127.391	0.000	1.935
		B		0.000	0.000	117.195	0.000	1.740
		C		0.000	0.000	116.742	0.000	2.023
T13	80.000-60.000	A	1.375	0.000	0.000	126.491	0.000	1.896
		B		0.000	0.000	115.929	0.000	1.703
		C		0.000	0.000	115.884	0.000	1.988
T14	60.000-40.000	A	1.329	0.000	0.000	125.321	0.000	1.845
		B		0.000	0.000	114.283	0.000	1.657
		C		0.000	0.000	118.058	0.000	1.977
T15	40.000-30.000	A	1.283	0.000	0.000	62.061	0.000	0.897

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
T16	30.000-20.000	B	1.240	0.000	0.000	56.299	0.000	0.805
		C		0.000	0.000	60.010	0.000	0.981
		A		0.000	0.000	61.516	0.000	0.874
T17	20.000-0.000	B	1.132	0.000	0.000	55.533	0.000	0.784
		C		0.000	0.000	59.407	0.000	0.959
		A		0.000	0.000	120.242	0.000	1.634
		B		0.000	0.000	107.146	0.000	1.462
		C		0.000	0.000	115.730	0.000	1.807

Feed Line Center of Pressure

Section	Elevation ft	CP _x in	CP _z in	CP _x Ice in	CP _z Ice in
T1	180.000-160.000	4.649	-13.012	4.763	-13.252
T2	160.000-155.000	5.241	-19.348	5.348	-19.624
T3	155.000-150.000	5.522	-20.436	5.641	-20.750
T4	150.000-145.000	7.493	-16.591	8.235	-17.876
T5	145.000-140.000	7.260	-16.299	8.075	-17.640
T6	140.000-133.333	8.387	-19.396	9.185	-21.276
T7	133.333-126.667	8.064	-18.968	9.057	-21.156
T8	126.667-120.000	6.840	-16.584	7.943	-18.861
T9	120.000-113.333	8.079	-19.304	9.530	-22.466
T10	113.333-106.667	8.169	-19.569	9.588	-22.641
T11	106.667-100.000	9.115	-21.598	10.413	-24.467
T12	100.000-80.000	9.105	-21.845	10.834	-25.631
T13	80.000-60.000	10.917	-25.966	12.721	-29.914
T14	60.000-40.000	10.425	-24.837	13.031	-29.359
T15	40.000-30.000	11.892	-27.608	15.034	-32.111
T16	30.000-20.000	10.485	-24.820	13.928	-30.067
T17	20.000-0.000	12.058	-28.333	15.878	-33.981

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T1	1	FLC 158-50J(1-5/8")	160.00 - 178.00	0.6000	0.6000
T1	2	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T1	4	LDF6-50A(1-1/4")	160.00 - 165.00	0.6000	0.6000
T1	5	2-1/2" Rigid Conduit	160.00 - 165.00	0.6000	0.6000
T1	6	WR-VG122ST-BRDA(7/16)	160.00 - 165.00	0.6000	0.6000
T1	7	FB-L98B-002-75000(3/8)	160.00 - 165.00	0.6000	0.6000
T1	8	WR-VG86ST-BRD(3/4)	160.00 - 165.00	0.6000	0.6000
T1	9	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T1	15	HCS 6X12 4AWG(1-5/8)	160.00 - 180.00	0.6000	0.6000
T1	16	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T1	18	Safety Line 3/8	160.00 - 180.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T1	19	Thin Flat Bar Climbing Ladder	160.00 - 180.00	0.6000	0.6000
T2	1	FLC 158-50J(1-5/8")	155.00 - 160.00	0.6000	0.6000
T2	2	Feedline Ladder (Af)	155.00 - 160.00	0.6000	0.6000
T2	4	LDF6-50A(1-1/4")	155.00 - 160.00	0.6000	0.6000
T2	5	2-1/2" Rigid Conduit	155.00 - 160.00	0.6000	0.6000
T2	6	WR-VG122ST-BRDA(7/16)	155.00 - 160.00	0.6000	0.6000
T2	7	FB-L98B-002-75000(3/8)	155.00 - 160.00	0.6000	0.6000
T2	8	WR-VG86ST-BRD(3/4)	155.00 - 160.00	0.6000	0.6000
T2	9	Feedline Ladder (Af)	155.00 - 160.00	0.6000	0.6000
T2	15	HCS 6X12 4AWG(1-5/8)	155.00 - 160.00	0.6000	0.6000
T2	16	Feedline Ladder (Af)	155.00 - 160.00	0.6000	0.6000
T2	18	Safety Line 3/8	155.00 - 160.00	0.6000	0.6000
T2	19	Thin Flat Bar Climbing Ladder	155.00 - 160.00	0.6000	0.6000
T3	1	FLC 158-50J(1-5/8")	150.00 - 155.00	0.6000	0.6000
T3	2	Feedline Ladder (Af)	150.00 - 155.00	0.6000	0.6000
T3	4	LDF6-50A(1-1/4")	150.00 - 155.00	0.6000	0.6000
T3	5	2-1/2" Rigid Conduit	150.00 - 155.00	0.6000	0.6000
T3	6	WR-VG122ST-BRDA(7/16)	150.00 - 155.00	0.6000	0.6000
T3	7	FB-L98B-002-75000(3/8)	150.00 - 155.00	0.6000	0.6000
T3	8	WR-VG86ST-BRD(3/4)	150.00 - 155.00	0.6000	0.6000
T3	9	Feedline Ladder (Af)	150.00 - 155.00	0.6000	0.6000
T3	15	HCS 6X12 4AWG(1-5/8)	150.00 - 155.00	0.6000	0.6000
T3	16	Feedline Ladder (Af)	150.00 - 155.00	0.6000	0.6000
T3	18	Safety Line 3/8	150.00 - 155.00	0.6000	0.6000
T3	19	Thin Flat Bar Climbing Ladder	150.00 - 155.00	0.6000	0.6000
T4	1	FLC 158-50J(1-5/8")	145.00 - 150.00	0.6000	0.6000
T4	2	Feedline Ladder (Af)	145.00 - 150.00	0.6000	0.6000
T4	4	LDF6-50A(1-1/4")	145.00 - 150.00	0.6000	0.6000
T4	5	2-1/2" Rigid Conduit	145.00 - 150.00	0.6000	0.6000
T4	6	WR-VG122ST-BRDA(7/16)	145.00 - 150.00	0.6000	0.6000
T4	7	FB-L98B-002-75000(3/8)	145.00 - 150.00	0.6000	0.6000
T4	8	WR-VG86ST-BRD(3/4)	145.00 - 150.00	0.6000	0.6000
T4	9	Feedline Ladder (Af)	145.00 - 150.00	0.6000	0.6000
T4	11	HB114-1-0813U4-M5J(1-1/4)	145.00 - 150.00	0.6000	0.6000
T4	13	Feedline Ladder (Af)	145.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
			150.00		
T4	15	HCS 6X12 4AWG(1-5/8)	145.00 - 150.00	0.6000	0.6000
T4	18	Safety Line 3/8	145.00 - 150.00	0.6000	0.6000
T4	19	Thin Flat Bar Climbing Ladder	145.00 - 150.00	0.6000	0.6000
T5	1	FLC 158-50J(1-5/8")	140.00 - 145.00	0.6000	0.6000
T5	2	Feedline Ladder (Af)	140.00 - 145.00	0.6000	0.6000
T5	4	LDF6-50A(1-1/4")	140.00 - 145.00	0.6000	0.6000
T5	5	2-1/2" Rigid Conduit	140.00 - 145.00	0.6000	0.6000
T5	6	WR-VG122ST-BRDA(7/16)	140.00 - 145.00	0.6000	0.6000
T5	7	FB-L98B-002-75000(3/8)	140.00 - 145.00	0.6000	0.6000
T5	8	WR-VG86ST-BRD(3/4)	140.00 - 145.00	0.6000	0.6000
T5	9	Feedline Ladder (Af)	140.00 - 145.00	0.6000	0.6000
T5	11	HB114-1-0813U4-M5J(1-1/4)	140.00 - 145.00	0.6000	0.6000
T5	13	Feedline Ladder (Af)	140.00 - 145.00	0.6000	0.6000
T5	15	HCS 6X12 4AWG(1-5/8)	140.00 - 145.00	0.6000	0.6000
T5	18	Safety Line 3/8	140.00 - 145.00	0.6000	0.6000
T5	19	Thin Flat Bar Climbing Ladder	140.00 - 145.00	0.6000	0.6000
T6	1	FLC 158-50J(1-5/8")	133.33 - 140.00	0.6000	0.6000
T6	2	Feedline Ladder (Af)	133.33 - 140.00	0.6000	0.6000
T6	4	LDF6-50A(1-1/4")	133.33 - 140.00	0.6000	0.6000
T6	5	2-1/2" Rigid Conduit	133.33 - 140.00	0.6000	0.6000
T6	6	WR-VG122ST-BRDA(7/16)	133.33 - 140.00	0.6000	0.6000
T6	7	FB-L98B-002-75000(3/8)	133.33 - 140.00	0.6000	0.6000
T6	8	WR-VG86ST-BRD(3/4)	133.33 - 140.00	0.6000	0.6000
T6	9	Feedline Ladder (Af)	133.33 - 140.00	0.6000	0.6000
T6	11	HB114-1-0813U4-M5J(1-1/4)	133.33 - 140.00	0.6000	0.6000
T6	13	Feedline Ladder (Af)	133.33 - 140.00	0.6000	0.6000
T6	15	HCS 6X12 4AWG(1-5/8)	133.33 - 140.00	0.6000	0.6000
T6	18	Safety Line 3/8	133.33 - 140.00	0.6000	0.6000
T6	19	Thin Flat Bar Climbing Ladder	133.33 - 140.00	0.6000	0.6000
T6	25	CU12PSM9P6XXX(1-1/2)	133.33 - 140.00	0.6000	0.6000
T7	1	FLC 158-50J(1-5/8")	126.67 - 133.33	0.6000	0.6000
T7	2	Feedline Ladder (Af)	126.67 - 133.33	0.6000	0.6000
T7	4	LDF6-50A(1-1/4")	126.67 - 133.33	0.6000	0.6000
T7	5	2-1/2" Rigid Conduit	126.67 - 133.33	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T7	6	WR-VG122ST-BRDA(7/16)	126.67 - 133.33	0.6000	0.6000
T7	7	FB-L98B-002-75000(3/8)	126.67 - 133.33	0.6000	0.6000
T7	8	WR-VG86ST-BRD(3/4)	126.67 - 133.33	0.6000	0.6000
T7	9	Feedline Ladder (Af)	126.67 - 133.33	0.6000	0.6000
T7	11	HB114-1-0813U4-M5J(1-1/4)	126.67 - 133.33	0.6000	0.6000
T7	13	Feedline Ladder (Af)	126.67 - 133.33	0.6000	0.6000
T7	15	HCS 6X12 4AWG(1-5/8)	126.67 - 133.33	0.6000	0.6000
T7	18	Safety Line 3/8	126.67 - 133.33	0.6000	0.6000
T7	19	Thin Flat Bar Climbing Ladder	126.67 - 133.33	0.6000	0.6000
T7	25	CU12PSM9P6XXX(1-1/2)	126.67 - 133.33	0.6000	0.6000
T8	1	FLC 158-50J(1-5/8")	120.00 - 126.67	0.6000	0.5698
T8	2	Feedline Ladder (Af)	120.00 - 126.67	0.6000	0.5698
T8	4	LDF6-50A(1-1/4")	120.00 - 126.67	0.6000	0.5698
T8	5	2-1/2" Rigid Conduit	120.00 - 126.67	0.6000	0.5698
T8	6	WR-VG122ST-BRDA(7/16)	120.00 - 126.67	0.6000	0.5698
T8	7	FB-L98B-002-75000(3/8)	120.00 - 126.67	0.6000	0.5698
T8	8	WR-VG86ST-BRD(3/4)	120.00 - 126.67	0.6000	0.5698
T8	9	Feedline Ladder (Af)	120.00 - 126.67	0.6000	0.5698
T8	11	HB114-1-0813U4-M5J(1-1/4)	120.00 - 126.67	0.6000	0.5698
T8	13	Feedline Ladder (Af)	120.00 - 126.67	0.6000	0.5698
T8	15	HCS 6X12 4AWG(1-5/8)	120.00 - 126.67	0.6000	0.5698
T8	18	Safety Line 3/8	120.00 - 126.67	0.6000	0.5698
T8	19	Thin Flat Bar Climbing Ladder	120.00 - 126.67	0.6000	0.5698
T8	25	CU12PSM9P6XXX(1-1/2)	120.00 - 126.67	0.6000	0.5698
T9	1	FLC 158-50J(1-5/8")	113.33 - 120.00	0.6000	0.6000
T9	2	Feedline Ladder (Af)	113.33 - 120.00	0.6000	0.6000
T9	4	LDF6-50A(1-1/4")	113.33 - 120.00	0.6000	0.6000
T9	5	2-1/2" Rigid Conduit	113.33 - 120.00	0.6000	0.6000
T9	6	WR-VG122ST-BRDA(7/16)	113.33 - 120.00	0.6000	0.6000
T9	7	FB-L98B-002-75000(3/8)	113.33 - 120.00	0.6000	0.6000
T9	8	WR-VG86ST-BRD(3/4)	113.33 - 120.00	0.6000	0.6000
T9	9	Feedline Ladder (Af)	113.33 - 120.00	0.6000	0.6000
T9	11	HB114-1-0813U4-M5J(1-1/4)	113.33 - 120.00	0.6000	0.6000
T9	13	Feedline Ladder (Af)	113.33 - 120.00	0.6000	0.6000
T9	15	HCS 6X12 4AWG(1-5/8)	113.33 - 120.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T9	18	Safety Line 3/8	120.00 113.33 -	0.6000	0.6000
T9	19	Thin Flat Bar Climbing Ladder	120.00 113.33 -	0.6000	0.6000
T9	25	CU12PSM9P6XXX(1-1/2)	120.00 113.33 -	0.6000	0.6000
T10	1	FLC 158-50J(1-5/8")	120.00 106.67 -	0.6000	0.6000
T10	2	Feedline Ladder (Af)	113.33 106.67 -	0.6000	0.6000
T10	4	LDF6-50A(1-1/4")	113.33 106.67 -	0.6000	0.6000
T10	5	2-1/2" Rigid Conduit	113.33 106.67 -	0.6000	0.6000
T10	6	WR-VG122ST-BRDA(7/16)	113.33 106.67 -	0.6000	0.6000
T10	7	FB-L98B-002-75000(3/8)	113.33 106.67 -	0.6000	0.6000
T10	8	WR-VG86ST-BRD(3/4)	113.33 106.67 -	0.6000	0.6000
T10	9	Feedline Ladder (Af)	113.33 106.67 -	0.6000	0.6000
T10	11	HB114-1-0813U4-M5J(1-1/4)	113.33 106.67 -	0.6000	0.6000
T10	13	Feedline Ladder (Af)	113.33 106.67 -	0.6000	0.6000
T10	15	HCS 6X12 4AWG(1-5/8)	113.33 106.67 -	0.6000	0.6000
T10	18	Safety Line 3/8	113.33 106.67 -	0.6000	0.6000
T10	19	Thin Flat Bar Climbing Ladder	113.33 106.67 -	0.6000	0.6000
T10	21	2" SR	110.00 106.67 -	0.6000	0.6000
T10	22	2" SR	110.00 106.67 -	0.6000	0.6000
T10	23	2" SR	110.00 106.67 -	0.6000	0.6000
T10	25	CU12PSM9P6XXX(1-1/2)	110.00 106.67 -	0.6000	0.6000
T11	1	FLC 158-50J(1-5/8")	113.33 100.00 -	0.6000	0.6000
T11	2	Feedline Ladder (Af)	106.67 100.00 -	0.6000	0.6000
T11	4	LDF6-50A(1-1/4")	106.67 100.00 -	0.6000	0.6000
T11	5	2-1/2" Rigid Conduit	106.67 100.00 -	0.6000	0.6000
T11	6	WR-VG122ST-BRDA(7/16)	106.67 100.00 -	0.6000	0.6000
T11	7	FB-L98B-002-75000(3/8)	106.67 100.00 -	0.6000	0.6000
T11	8	WR-VG86ST-BRD(3/4)	106.67 100.00 -	0.6000	0.6000
T11	9	Feedline Ladder (Af)	106.67 100.00 -	0.6000	0.6000
T11	11	HB114-1-0813U4-M5J(1-1/4)	106.67 100.00 -	0.6000	0.6000
T11	13	Feedline Ladder (Af)	106.67 100.00 -	0.6000	0.6000
T11	15	HCS 6X12 4AWG(1-5/8)	106.67 100.00 -	0.6000	0.6000
T11	18	Safety Line 3/8	106.67 100.00 -	0.6000	0.6000
T11	19	Thin Flat Bar Climbing Ladder	106.67 100.00 -	0.6000	0.6000
T11	21	2" SR	106.67 100.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T11	22	2" SR	100.00 - 106.67	0.6000	0.6000
T11	23	2" SR	100.00 - 106.67	0.6000	0.6000
T11	25	CU12PSM9P6XXX(1-1/2)	100.00 - 106.67	0.6000	0.6000
T12	1	FLC 158-50J(1-5/8")	80.00 - 100.00	0.6000	0.6000
T12	2	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T12	4	LDF6-50A(1-1/4")	80.00 - 100.00	0.6000	0.6000
T12	5	2-1/2" Rigid Conduit	80.00 - 100.00	0.6000	0.6000
T12	6	WR-VG122ST-BRDA(7/16)	80.00 - 100.00	0.6000	0.6000
T12	7	FB-L98B-002-75000(3/8)	80.00 - 100.00	0.6000	0.6000
T12	8	WR-VG86ST-BRD(3/4)	80.00 - 100.00	0.6000	0.6000
T12	9	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T12	11	HB114-1-0813U4-M5J(1-1/4)	80.00 - 100.00	0.6000	0.6000
T12	13	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T12	15	HCS 6X12 4AWG(1-5/8)	80.00 - 100.00	0.6000	0.6000
T12	18	Safety Line 3/8	80.00 - 100.00	0.6000	0.6000
T12	19	Thin Flat Bar Climbing Ladder	80.00 - 100.00	0.6000	0.6000
T12	21	2" SR	80.00 - 100.00	0.6000	0.6000
T12	22	2" SR	80.00 - 100.00	0.6000	0.6000
T12	23	2" SR	80.00 - 100.00	0.6000	0.6000
T12	25	CU12PSM9P6XXX(1-1/2)	80.00 - 100.00	0.6000	0.6000
T13	1	FLC 158-50J(1-5/8")	60.00 - 80.00	0.6000	0.6000
T13	2	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T13	4	LDF6-50A(1-1/4")	60.00 - 80.00	0.6000	0.6000
T13	5	2-1/2" Rigid Conduit	60.00 - 80.00	0.6000	0.6000
T13	6	WR-VG122ST-BRDA(7/16)	60.00 - 80.00	0.6000	0.6000
T13	7	FB-L98B-002-75000(3/8)	60.00 - 80.00	0.6000	0.6000
T13	8	WR-VG86ST-BRD(3/4)	60.00 - 80.00	0.6000	0.6000
T13	9	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T13	11	HB114-1-0813U4-M5J(1-1/4)	60.00 - 80.00	0.6000	0.6000
T13	13	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T13	15	HCS 6X12 4AWG(1-5/8)	60.00 - 80.00	0.6000	0.6000
T13	18	Safety Line 3/8	60.00 - 80.00	0.6000	0.6000
T13	19	Thin Flat Bar Climbing Ladder	60.00 - 80.00	0.6000	0.6000
T13	21	2" SR	60.00 - 80.00	0.6000	0.6000
T13	22	2" SR	60.00 - 80.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T13	23	2" SR	80.00 60.00 -	0.6000	0.6000
T13	25	CU12PSM9P6XXX(1-1/2)	80.00 60.00 -	0.6000	0.6000
T14	1	FLC 158-50J(1-5/8")	80.00 40.00 -	0.6000	0.6000
T14	2	Feedline Ladder (Af)	60.00 40.00 -	0.6000	0.6000
T14	4	LDF6-50A(1-1/4")	60.00 40.00 -	0.6000	0.6000
T14	5	2-1/2" Rigid Conduit	60.00 40.00 -	0.6000	0.6000
T14	6	WR-VG122ST-BRDA(7/16)	60.00 40.00 -	0.6000	0.6000
T14	7	FB-L98B-002-75000(3/8)	60.00 40.00 -	0.6000	0.6000
T14	8	WR-VG86ST-BRD(3/4)	60.00 40.00 -	0.6000	0.6000
T14	9	Feedline Ladder (Af)	60.00 40.00 -	0.6000	0.6000
T14	11	HB114-1-0813U4-M5J(1-1/4)	60.00 40.00 -	0.6000	0.6000
T14	12	LDF4-50A(1/2")	60.00 40.00 -	0.6000	0.6000
T14	13	Feedline Ladder (Af)	50.00 40.00 -	0.6000	0.6000
T14	15	HCS 6X12 4AWG(1-5/8)	60.00 40.00 -	0.6000	0.6000
T14	18	Safety Line 3/8	60.00 40.00 -	0.6000	0.6000
T14	19	Thin Flat Bar Climbing Ladder	60.00 40.00 -	0.6000	0.6000
T14	21	2" SR	60.00 40.00 -	0.6000	0.6000
T14	22	2" SR	60.00 40.00 -	0.6000	0.6000
T14	23	2" SR	60.00 40.00 -	0.6000	0.6000
T14	25	CU12PSM9P6XXX(1-1/2)	60.00 40.00 -	0.6000	0.6000
T15	1	FLC 158-50J(1-5/8")	60.00 30.00 -	0.6000	0.6000
T15	2	Feedline Ladder (Af)	40.00 30.00 -	0.6000	0.6000
T15	4	LDF6-50A(1-1/4")	40.00 30.00 -	0.6000	0.6000
T15	5	2-1/2" Rigid Conduit	40.00 30.00 -	0.6000	0.6000
T15	6	WR-VG122ST-BRDA(7/16)	40.00 30.00 -	0.6000	0.6000
T15	7	FB-L98B-002-75000(3/8)	40.00 30.00 -	0.6000	0.6000
T15	8	WR-VG86ST-BRD(3/4)	40.00 30.00 -	0.6000	0.6000
T15	9	Feedline Ladder (Af)	40.00 30.00 -	0.6000	0.6000
T15	11	HB114-1-0813U4-M5J(1-1/4)	40.00 30.00 -	0.6000	0.6000
T15	12	LDF4-50A(1/2")	40.00 30.00 -	0.6000	0.6000
T15	13	Feedline Ladder (Af)	40.00 30.00 -	0.6000	0.6000
T15	15	HCS 6X12 4AWG(1-5/8)	40.00 30.00 -	0.6000	0.6000
T15	18	Safety Line 3/8	40.00 30.00 -	0.6000	0.6000
T15	19	Thin Flat Bar Climbing Ladder	40.00 30.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T15	21	2" SR	30.00 - 40.00	0.6000	0.6000
T15	22	2" SR	30.00 - 40.00	0.6000	0.6000
T15	23	2" SR	30.00 - 40.00	0.6000	0.6000
T15	25	CU12PSM9P6XXX(1-1/2)	30.00 - 40.00	0.6000	0.6000
T16	1	FLC 158-50J(1-5/8")	20.00 - 30.00	0.6000	0.6000
T16	2	Feedline Ladder (Af)	20.00 - 30.00	0.6000	0.6000
T16	4	LDF6-50A(1-1/4")	20.00 - 30.00	0.6000	0.6000
T16	5	2-1/2" Rigid Conduit	20.00 - 30.00	0.6000	0.6000
T16	6	WR-VG122ST-BRDA(7/16)	20.00 - 30.00	0.6000	0.6000
T16	7	FB-L98B-002-75000(3/8)	20.00 - 30.00	0.6000	0.6000
T16	8	WR-VG86ST-BRD(3/4)	20.00 - 30.00	0.6000	0.6000
T16	9	Feedline Ladder (Af)	20.00 - 30.00	0.6000	0.6000
T16	11	HB114-1-0813U4-M5J(1-1/4)	20.00 - 30.00	0.6000	0.6000
T16	12	LDF4-50A(1/2")	20.00 - 30.00	0.6000	0.6000
T16	13	Feedline Ladder (Af)	20.00 - 30.00	0.6000	0.6000
T16	15	HCS 6X12 4AWG(1-5/8)	20.00 - 30.00	0.6000	0.6000
T16	18	Safety Line 3/8	20.00 - 30.00	0.6000	0.6000
T16	19	Thin Flat Bar Climbing Ladder	20.00 - 30.00	0.6000	0.6000
T16	21	2" SR	20.00 - 30.00	0.6000	0.6000
T16	22	2" SR	20.00 - 30.00	0.6000	0.6000
T16	23	2" SR	20.00 - 30.00	0.6000	0.6000
T16	25	CU12PSM9P6XXX(1-1/2)	20.00 - 30.00	0.6000	0.6000
T17	1	FLC 158-50J(1-5/8")	0.00 - 20.00	0.6000	0.6000
T17	2	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T17	4	LDF6-50A(1-1/4")	0.00 - 20.00	0.6000	0.6000
T17	5	2-1/2" Rigid Conduit	0.00 - 20.00	0.6000	0.6000
T17	6	WR-VG122ST-BRDA(7/16)	0.00 - 20.00	0.6000	0.6000
T17	7	FB-L98B-002-75000(3/8)	0.00 - 20.00	0.6000	0.6000
T17	8	WR-VG86ST-BRD(3/4)	0.00 - 20.00	0.6000	0.6000
T17	9	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T17	11	HB114-1-0813U4-M5J(1-1/4)	0.00 - 20.00	0.6000	0.6000
T17	12	LDF4-50A(1/2")	0.00 - 20.00	0.6000	0.6000
T17	13	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T17	15	HCS 6X12 4AWG(1-5/8)	0.00 - 20.00	0.6000	0.6000
T17	18	Safety Line 3/8	0.00 - 20.00	0.6000	0.6000
T17	19	Thin Flat Bar Climbing Ladder	0.00 - 20.00	0.6000	0.6000
T17	21	2" SR	0.00 - 20.00	0.6000	0.6000
T17	22	2" SR	0.00 - 20.00	0.6000	0.6000
T17	23	2" SR	0.00 - 20.00	0.6000	0.6000
T17	25	CU12PSM9P6XXX(1-1/2)	0.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
Lightning Rod 5/8" x 6'	C	From Leg	0.000	0.000	180.000	No Ice	0.375	0.375	0.006
			0.000			1/2"	0.989	0.989	0.010
			3.000			Ice	1.619	1.619	0.019
						1" Ice	2.464	2.464	0.047
						2" Ice			
* 19" Accelerator	B	From Leg	0.000	0.000	182.000	No Ice	7.600	7.600	0.250
			0.000			1/2"	8.110	8.110	0.331
			4.000			Ice	8.620	8.620	0.412
						1" Ice	9.640	9.640	0.574
						2" Ice			
(3) RR90-17-02DP w/ Mount Pipe	B	From Leg	0.500	0.000	182.000	No Ice	4.470	2.920	0.034
			0.000			1/2"	5.080	3.500	0.067
			4.000			Ice	5.700	4.100	0.108
						1" Ice	7.010	5.350	0.216
						2" Ice			
(3) KRY 112 489/1	B	From Leg	0.500	0.000	182.000	No Ice	0.560	0.366	0.015
			0.000			1/2"	0.659	0.449	0.021
			-3.000			Ice	0.765	0.543	0.027
						1" Ice	1.000	0.754	0.046
						2" Ice			
15' x 4" Mount Pipe	B	From Leg	0.000	0.000	182.000	No Ice	5.032	5.032	0.180
			0.000			1/2"	8.296	8.296	0.227
			-8.000			Ice	9.858	9.858	0.283
						1" Ice	12.224	12.224	0.426
						2" Ice			
*** 178 P *** (2) LPA-80080/6CF	A	From Leg	4.000	0.000	178.000	No Ice	4.326	8.619	0.021
			0.000			1/2"	4.764	9.075	0.069
			1.000			Ice	5.210	9.539	0.123
						1" Ice	6.123	10.486	0.251
						2" Ice			
(2) LPA-80080/6CF	B	From Leg	4.000	0.000	178.000	No Ice	4.326	8.619	0.021
			0.000			1/2"	4.764	9.075	0.069
			1.000			Ice	5.210	9.539	0.123
						1" Ice	6.123	10.486	0.251
						2" Ice			
(2) LPA-80080/6CF	C	From Leg	4.000	0.000	178.000	No Ice	4.326	8.619	0.021
			0.000			1/2"	4.764	9.075	0.069
			1.000			Ice	5.210	9.539	0.123
						1" Ice	6.123	10.486	0.251
						2" Ice			
(2) JAHH-65B-R3B w/ Mount Pipe	A	From Leg	4.000	0.000	178.000	No Ice	5.500	4.380	0.096
			0.000			1/2"	5.970	4.840	0.169
			1.000			Ice	6.450	5.300	0.254
						1" Ice	7.440	6.260	0.457
						2" Ice			
(2) JAHH-65B-R3B w/ Mount Pipe	B	From Leg	4.000	0.000	178.000	No Ice	5.500	4.380	0.096
			0.000			1/2"	5.970	4.840	0.169
			1.000			Ice	6.450	5.300	0.254
						1" Ice	7.440	6.260	0.457
						2" Ice			
(2) JAHH-65B-R3B w/ Mount Pipe	C	From Leg	4.000	0.000	178.000	No Ice	5.500	4.380	0.096
			0.000			1/2"	5.970	4.840	0.169
			1.000			Ice	6.450	5.300	0.254
						1" Ice	7.440	6.260	0.457
						2" Ice			
Sub6 Antenna - VZS01 w/ Mount Pipe	A	From Leg	4.000	0.000	178.000	No Ice	4.915	2.687	0.101
			0.000			1/2"	5.264	3.151	0.141
			1.000			Ice	5.623	3.631	0.186
						1" Ice	6.371	4.639	0.294

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAAA Front ft ²	CAAA Side ft ²	Weight K	
Sub6 Antenna - VZS01 w/ Mount Pipe	B	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	4.915	2.687	0.101
						1/2"	5.264	3.151	0.141
						Ice	5.623	3.631	0.186
Sub6 Antenna - VZS01 w/ Mount Pipe	C	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	4.915	2.687	0.101
						1/2"	5.264	3.151	0.141
						Ice	5.623	3.631	0.186
RFV01U-D1A	A	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	1.875	1.250	0.084
						1/2"	2.045	1.393	0.103
						Ice	2.223	1.543	0.124
RFV01U-D1A	B	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	1.875	1.250	0.084
						1/2"	2.045	1.393	0.103
						Ice	2.223	1.543	0.124
RFV01U-D1A	C	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	1.875	1.250	0.084
						1/2"	2.045	1.393	0.103
						Ice	2.223	1.543	0.124
RFV01U-D2A	A	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	1.875	1.013	0.070
						1/2"	2.045	1.145	0.087
						Ice	2.223	1.284	0.106
RFV01U-D2A	B	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	1.875	1.013	0.070
						1/2"	2.045	1.145	0.087
						Ice	2.223	1.284	0.106
RFV01U-D2A	C	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	1.875	1.013	0.070
						1/2"	2.045	1.145	0.087
						Ice	2.223	1.284	0.106
DB-B1-6C-8AB-0Z	A	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120
CBC78T-DS-43-2X	A	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	0.368	0.512	0.021
						1/2"	0.446	0.605	0.027
						Ice	0.531	0.705	0.035
CBC78T-DS-43-2X	B	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	0.368	0.512	0.021
						1/2"	0.446	0.605	0.027
						Ice	0.531	0.705	0.035
CBC78T-DS-43-2X	C	From Leg	4.000 0.000 1.000	0.000	178.000	2" Ice			
						No Ice	0.368	0.512	0.021
						1/2"	0.446	0.605	0.027
						Ice	0.531	0.705	0.035
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	2" Ice			
						No Ice	5.600	2.333	0.044
						1/2"	5.915	2.558	0.080
						Ice	6.240	2.791	0.120

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
Sector Mount [SM 510-3]	C	None		0.000	178.000	2" Ice No Ice 1/2" Ice 1" Ice 2" Ice	39.970 39.970 56.450 72.590 104.060 104.060	2.396 3.077 3.960 6.296	
*** 165 *** 7770.00 w/ Mount Pipe	A	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	5.746 6.179 6.607 7.488 7.155	4.254 5.014 5.711 7.155 7.155	0.055 0.103 0.157 0.287
7770.00 w/ Mount Pipe	B	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	5.746 6.179 6.607 7.488 7.155	4.254 5.014 5.711 7.155 7.155	0.055 0.103 0.157 0.287
7770.00 w/ Mount Pipe	C	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	5.746 6.179 6.607 7.488 7.155	4.254 5.014 5.711 7.155 7.155	0.055 0.103 0.157 0.287
DMP65R-BU8D w/ Mount Pipe	A	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	15.890 16.810 17.760 19.700 11.370	7.890 8.740 9.600 11.370	0.139 0.252 0.380 0.679
DMP65R-BU8D w/ Mount Pipe	B	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	15.890 16.810 17.760 19.700 11.370	7.890 8.740 9.600 11.370	0.139 0.252 0.380 0.679
DMP65R-BU8D w/ Mount Pipe	C	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	15.890 16.810 17.760 19.700 11.370	7.890 8.740 9.600 11.370	0.139 0.252 0.380 0.679
OPA65R-BU6D w/ Mount Pipe	A	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	12.250 13.000 13.760 15.340 8.790	6.050 6.710 7.390 8.790	0.089 0.176 0.275 0.508
OPA65R-BU6D w/ Mount Pipe	B	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	12.250 13.000 13.760 15.340 8.790	6.050 6.710 7.390 8.790	0.089 0.176 0.275 0.508
OPA65R-BU6D w/ Mount Pipe	C	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	12.250 13.000 13.760 15.340 8.790	6.050 6.710 7.390 8.790	0.089 0.176 0.275 0.508
QS66512-2 w/ Mount Pipe	A	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.040 4.420 4.820 5.630 5.790	4.180 4.570 4.970 5.790	0.137 0.206 0.287 0.482
QS66512-2 w/ Mount Pipe	B	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.040 4.420 4.820 5.630 5.790	4.180 4.570 4.970 5.790	0.137 0.206 0.287 0.482
QS66512-2 w/ Mount Pipe	C	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice	4.040 4.420 4.820	4.180 4.570 4.970	0.137 0.206 0.287

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz Lateral	Vert						ft
(2) LGP21401	A	From Leg	4.000	0.000	0.000	165.000	1" Ice	5.630	5.790	0.482
							2" Ice			
							No Ice	1.104	0.207	0.014
							1/2" Ice	1.239	0.274	0.021
(2) LGP21401	B	From Leg	4.000	0.000	0.000	165.000	1" Ice	1.381	0.348	0.030
							2" Ice	1.688	0.521	0.055
							No Ice	1.104	0.207	0.014
							1/2" Ice	1.239	0.274	0.021
(2) LGP21401	C	From Leg	4.000	0.000	0.000	165.000	1" Ice	1.381	0.348	0.030
							2" Ice	1.688	0.521	0.055
							No Ice	1.104	0.207	0.014
							1/2" Ice	1.239	0.274	0.021
RRUS 4449 B5/B12	A	From Leg	4.000	0.000	0.000	165.000	1" Ice	1.381	0.348	0.030
							2" Ice	1.688	0.521	0.055
							No Ice	1.968	1.408	0.071
							1/2" Ice	2.144	1.564	0.090
RRUS 4449 B5/B12	B	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.328	1.727	0.111
							2" Ice	2.718	2.075	0.163
							No Ice	1.968	1.408	0.071
							1/2" Ice	2.144	1.564	0.090
RRUS 4449 B5/B12	C	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.328	1.727	0.111
							2" Ice	2.718	2.075	0.163
							No Ice	1.968	1.408	0.071
							1/2" Ice	2.144	1.564	0.090
RRUS 4478 B14	A	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.566	1.656	0.140
							2" Ice	2.566	1.656	0.140
							No Ice	1.843	1.059	0.060
							1/2" Ice	2.012	1.197	0.076
RRUS 4478 B14	B	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.190	1.342	0.094
							2" Ice	2.566	1.656	0.140
							No Ice	1.843	1.059	0.060
							1/2" Ice	2.012	1.197	0.076
RRUS 4478 B14	C	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.190	1.342	0.094
							2" Ice	2.566	1.656	0.140
							No Ice	1.843	1.059	0.060
							1/2" Ice	2.012	1.197	0.076
DC6-48-60-18-8F	A	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.570	2.570	0.126
							2" Ice	2.570	2.570	0.126
							No Ice	1.212	1.212	0.020
							1/2" Ice	1.892	1.892	0.042
DC6-48-60-18-8F	B	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.105	2.105	0.067
							2" Ice	2.570	2.570	0.126
							No Ice	1.212	1.212	0.020
							1/2" Ice	1.892	1.892	0.042
DC6-48-60-18-8F	C	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.105	2.105	0.067
							2" Ice	2.570	2.570	0.126
							No Ice	1.212	1.212	0.020
							1/2" Ice	1.892	1.892	0.042
RRUS 32 B30	A	From Leg	4.000	0.000	0.000	165.000	1" Ice	2.692	1.573	0.060
							2" Ice	2.912	1.756	0.080
							No Ice	3.138	1.945	0.104

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz Lateral	Vert						ft
RRUS 32 B30	B	From Leg	4.000	0.000	0.000	165.000	1" Ice	3.614	2.346	0.161
							2" Ice			
							No Ice	2.692	1.573	0.060
							1/2" Ice	2.912	1.756	0.080
							Ice	3.138	1.945	0.104
RRUS 32 B30	C	From Leg	4.000	0.000	0.000	165.000	1" Ice	3.614	2.346	0.161
							2" Ice			
							No Ice	2.692	1.573	0.060
							1/2" Ice	2.912	1.756	0.080
							Ice	3.138	1.945	0.104
RRUS 32 B2	A	From Leg	4.000	0.000	0.000	165.000	1" Ice	3.614	2.346	0.161
							2" Ice			
							No Ice	2.731	1.668	0.053
							1/2" Ice	2.953	1.855	0.074
							Ice	3.182	2.049	0.098
RRUS 32 B2	B	From Leg	4.000	0.000	0.000	165.000	1" Ice	3.663	2.458	0.157
							2" Ice			
							No Ice	2.731	1.668	0.053
							1/2" Ice	2.953	1.855	0.074
							Ice	3.182	2.049	0.098
RRUS 32 B2	C	From Leg	4.000	0.000	0.000	165.000	1" Ice	3.663	2.458	0.157
							2" Ice			
							No Ice	2.731	1.668	0.053
							1/2" Ice	2.953	1.855	0.074
							Ice	3.182	2.049	0.098
Sector Mount [SM 510-3]	C	None			0.000	165.000	1" Ice	3.663	2.458	0.157
							2" Ice			
							No Ice	39.970	39.970	2.396
							1/2" Ice	56.450	56.450	3.077
							Ice	72.590	72.590	3.960
* APXVTM14-ALU-I20 w/ Mount Pipe	A	From Leg	4.000	0.000	0.000	150.000	1" Ice	104.060	104.060	6.296
							2" Ice			
							No Ice	4.090	2.860	0.077
							1/2" Ice	4.480	3.230	0.127
							Ice	4.880	3.610	0.185
APXVTM14-ALU-I20 w/ Mount Pipe	B	From Leg	4.000	0.000	0.000	150.000	1" Ice	5.710	4.400	0.331
							2" Ice			
							No Ice	4.090	2.860	0.077
							1/2" Ice	4.480	3.230	0.127
							Ice	4.880	3.610	0.185
APXVTM14-ALU-I20 w/ Mount Pipe	C	From Leg	4.000	0.000	0.000	150.000	1" Ice	5.710	4.400	0.331
							2" Ice			
							No Ice	4.090	2.860	0.077
							1/2" Ice	4.480	3.230	0.127
							Ice	4.880	3.610	0.185
NNVV-65B-R4 w/ Mount Pipe	A	From Leg	4.000	0.000	0.000	150.000	1" Ice	5.710	4.400	0.331
							2" Ice			
							No Ice	7.550	4.230	0.110
							1/2" Ice	8.040	4.670	0.197
							Ice	8.530	5.120	0.296
NNVV-65B-R4 w/ Mount Pipe	B	From Leg	4.000	0.000	0.000	150.000	1" Ice	9.560	6.050	0.529
							2" Ice			
							No Ice	7.550	4.230	0.110
							1/2" Ice	8.040	4.670	0.197
							Ice	8.530	5.120	0.296
NNVV-65B-R4 w/ Mount Pipe	C	From Leg	4.000	0.000	0.000	150.000	1" Ice	9.560	6.050	0.529
							2" Ice			
							No Ice	7.550	4.230	0.110
							1/2" Ice	8.040	4.670	0.197
							Ice	8.530	5.120	0.296
TD-RRH8X20-25	A	From Leg	4.000	0.000	0.000	150.000	1" Ice	9.560	6.050	0.529
							2" Ice			
							No Ice	4.045	1.535	0.070
							1/2"	4.298	1.714	0.097

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAAA Front ft ²	CAAA Side ft ²	Weight K
			0.000			Ice 4.557	1.901	0.128
						1" Ice 5.098	2.295	0.201
						2" Ice		
TD-RRH8X20-25	B	From Leg	4.000	0.000	150.000	No Ice 4.045	1.535	0.070
			0.000			1/2" 4.298	1.714	0.097
			0.000			Ice 4.557	1.901	0.128
						1" Ice 5.098	2.295	0.201
						2" Ice		
TD-RRH8X20-25	C	From Leg	4.000	0.000	150.000	No Ice 4.045	1.535	0.070
			0.000			1/2" 4.298	1.714	0.097
			0.000			Ice 4.557	1.901	0.128
						1" Ice 5.098	2.295	0.201
						2" Ice		
(2) RRH2X50-800	A	From Leg	4.000	0.000	150.000	No Ice 1.701	1.282	0.053
			0.000			1/2" 1.864	1.428	0.070
			0.000			Ice 2.035	1.580	0.090
						1" Ice 2.398	1.908	0.138
						2" Ice		
(2) RRH2X50-800	B	From Leg	4.000	0.000	150.000	No Ice 1.701	1.282	0.053
			0.000			1/2" 1.864	1.428	0.070
			0.000			Ice 2.035	1.580	0.090
						1" Ice 2.398	1.908	0.138
						2" Ice		
(2) RRH2X50-800	C	From Leg	4.000	0.000	150.000	No Ice 1.701	1.282	0.053
			0.000			1/2" 1.864	1.428	0.070
			0.000			Ice 2.035	1.580	0.090
						1" Ice 2.398	1.908	0.138
						2" Ice		
PCS 1900MHZ 4X45W-65MHZ	A	From Leg	4.000	0.000	150.000	No Ice 2.322	2.238	0.060
			0.000			1/2" 2.527	2.441	0.083
			0.000			Ice 2.739	2.651	0.110
						1" Ice 3.185	3.093	0.173
						2" Ice		
PCS 1900MHZ 4X45W-65MHZ	B	From Leg	4.000	0.000	150.000	No Ice 2.322	2.238	0.060
			0.000			1/2" 2.527	2.441	0.083
			0.000			Ice 2.739	2.651	0.110
						1" Ice 3.185	3.093	0.173
						2" Ice		
PCS 1900MHZ 4X45W-65MHZ	C	From Leg	4.000	0.000	150.000	No Ice 2.322	2.238	0.060
			0.000			1/2" 2.527	2.441	0.083
			0.000			Ice 2.739	2.651	0.110
						1" Ice 3.185	3.093	0.173
						2" Ice		
12.5' x 2.375" Horizontal Mount Pipe	A	From Leg	4.000	0.000	150.000	No Ice 2.980	0.010	0.046
			0.000			1/2" 4.250	0.050	0.068
			0.000			Ice 5.550	0.100	0.981
						1" Ice 8.060	0.240	0.183
						2" Ice		
12.5' x 2.375" Horizontal Mount Pipe	B	From Leg	4.000	0.000	150.000	No Ice 2.980	0.010	0.046
			0.000			1/2" 4.250	0.050	0.068
			0.000			Ice 5.550	0.100	0.981
						1" Ice 8.060	0.240	0.183
						2" Ice		
12.5' x 2.375" Horizontal Mount Pipe	C	From Leg	4.000	0.000	150.000	No Ice 2.980	0.010	0.046
			0.000			1/2" 4.250	0.050	0.068
			0.000			Ice 5.550	0.100	0.981
						1" Ice 8.060	0.240	0.183
						2" Ice		
6' x 2" Mount Pipe	A	From Leg	4.000	0.000	150.000	No Ice 1.425	1.425	0.022
			0.000			1/2" 1.925	1.925	0.033
			0.000			Ice 2.294	2.294	0.048
						1" Ice 3.060	3.060	0.090
						2" Ice		
6' x 2" Mount Pipe	B	From Leg	4.000	0.000	150.000	No Ice 1.425	1.425	0.022
			0.000			1/2" 1.925	1.925	0.033

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	CAAA Front ft²	CAAA Side ft²	Weight K
			0.000			Ice 2.294	2.294	0.048
						1" Ice 3.060	3.060	0.090
						2" Ice		
6' x 2" Mount Pipe	C	From Leg	4.000	0.000	150.000	No Ice 1.425	1.425	0.022
			0.000			1/2" 1.925	1.925	0.033
			0.000			Ice 2.294	2.294	0.048
						1" Ice 3.060	3.060	0.090
						2" Ice		
Sector Mount [SM 502-3]	C	None		0.000	150.000	No Ice 29.820	29.820	1.673
						1/2" 42.210	42.210	2.266
						Ice 54.430	54.430	3.052
						1" Ice 78.490	78.490	5.180
						2" Ice		
*** 140 P ***								
MX08FRO665-20 w/ Mount Pipe	A	From Leg	4.000	0.000	140.000	No Ice 8.010	4.230	0.098
			0.000			1/2" 8.520	4.690	0.184
			0.000			Ice 9.040	5.160	0.281
						1" Ice 10.110	6.120	0.512
						2" Ice		
MX08FRO665-20 w/ Mount Pipe	B	From Leg	4.000	0.000	140.000	No Ice 8.010	4.230	0.098
			0.000			1/2" 8.520	4.690	0.184
			0.000			Ice 9.040	5.160	0.281
						1" Ice 10.110	6.120	0.512
						2" Ice		
MX08FRO665-20 w/ Mount Pipe	C	From Leg	4.000	0.000	140.000	No Ice 8.010	4.230	0.098
			0.000			1/2" 8.520	4.690	0.184
			0.000			Ice 9.040	5.160	0.281
						1" Ice 10.110	6.120	0.512
						2" Ice		
TA08025-B604	A	From Leg	4.000	0.000	140.000	No Ice 1.964	0.981	0.064
			0.000			1/2" 2.138	1.112	0.081
			0.000			Ice 2.320	1.250	0.100
						1" Ice 2.705	1.548	0.148
						2" Ice		
TA08025-B604	B	From Leg	4.000	0.000	140.000	No Ice 1.964	0.981	0.064
			0.000			1/2" 2.138	1.112	0.081
			0.000			Ice 2.320	1.250	0.100
						1" Ice 2.705	1.548	0.148
						2" Ice		
TA08025-B604	C	From Leg	4.000	0.000	140.000	No Ice 1.964	0.981	0.064
			0.000			1/2" 2.138	1.112	0.081
			0.000			Ice 2.320	1.250	0.100
						1" Ice 2.705	1.548	0.148
						2" Ice		
TA08025-B605	A	From Leg	4.000	0.000	140.000	No Ice 1.964	1.129	0.075
			0.000			1/2" 2.138	1.267	0.093
			0.000			Ice 2.320	1.411	0.114
						1" Ice 2.705	1.723	0.164
						2" Ice		
TA08025-B605	B	From Leg	4.000	0.000	140.000	No Ice 1.964	1.129	0.075
			0.000			1/2" 2.138	1.267	0.093
			0.000			Ice 2.320	1.411	0.114
						1" Ice 2.705	1.723	0.164
						2" Ice		
TA08025-B605	C	From Leg	4.000	0.000	140.000	No Ice 1.964	1.129	0.075
			0.000			1/2" 2.138	1.267	0.093
			0.000			Ice 2.320	1.411	0.114
						1" Ice 2.705	1.723	0.164
						2" Ice		
RDIDC-9181-PF-48	A	From Leg	4.000	0.000	140.000	No Ice 2.312	1.293	0.022
			0.000			1/2" 2.502	1.448	0.041
			0.000			Ice 2.700	1.610	0.063
						1" Ice 3.118	1.957	0.117
						2" Ice		
(2) 8' x 2" Mount Pipe	A	From Leg	4.000	0.000	140.000	No Ice 1.900	1.900	0.029

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
			0.000 0.000			1/2" Ice	2.728 3.401	2.728 3.401	0.044 0.063
(2) 8' x 2" Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	140.000	1" Ice 2" Ice No Ice	4.396 4.396 1.900	4.396 4.396 1.900	0.119 0.119 0.029
(2) 8' x 2" Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	140.000	1/2" Ice 1" Ice 2" Ice No Ice	2.728 3.401 4.396 1.900	2.728 3.401 4.396 1.900	0.044 0.063 0.119 0.029
Commscope MTC3975083 (3)	C	None		0.000	140.000	1/2" Ice 1" Ice 2" Ice No Ice	34.120 44.390 64.930 23.850	34.120 44.390 64.930 23.850	1.803 2.345 3.431 1.260
***** * GPS_A	C	From Leg	3.000 0.000 0.000	0.000	50.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.255 0.320 0.393 0.561	0.255 0.320 0.393 0.561	0.001 0.005 0.010 0.025
Side Arm Mount [SO 305-1]	C	From Leg	1.500 0.000 0.000	0.000	50.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.530 0.780 1.060 1.730	1.520 2.070 2.660 3.910	0.030 0.044 0.064 0.125
* (4) L2x2x1/4 (RD)	A	From Leg	0.500 0.000 0.000	0.000	126.667 - 120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.944 1.273 1.610 2.305	0.005 0.021 0.044 0.113	0.016 0.022 0.032 0.065
(4) L2x2x1/4 (RD)	B	From Leg	0.500 0.000 0.000	0.000	126.667 - 120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.944 1.273 1.610 2.305	0.005 0.021 0.044 0.113	0.016 0.022 0.032 0.065
(4) L2x2x1/4 (RD)	C	From Leg	0.500 0.000 0.000	0.000	126.667 - 120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.944 1.273 1.610 2.305	0.005 0.021 0.044 0.113	0.016 0.022 0.032 0.065
(4) L2x2x1/4 (RH)	A	From Leg	0.500 0.000 0.000	0.000	126.667 - 120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.825 1.115 1.412 2.029	0.005 0.021 0.044 0.113	0.014 0.019 0.028 0.057
(4) L2x2x1/4 (RH)	B	From Leg	0.500 0.000 0.000	0.000	126.667 - 120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.825 1.115 1.412 2.029	0.005 0.021 0.044 0.113	0.014 0.019 0.028 0.057
(4) L2x2x1/4 (RH)	C	From Leg	0.500 0.000 0.000	0.000	126.667 - 120.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.825 1.115 1.412 2.029	0.005 0.021 0.044 0.113	0.014 0.019 0.028 0.057
***** ***									

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	7	17.692	0.127	0.017
			Max. Compression	10	-26.206	-0.103	0.025
			Max. Mx	22	-1.389	1.081	-0.039

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft	
T2	160 - 155	Diagonal	Max. My	20	-1.718	0.006	1.119	
			Max. Vy	6	1.199	-0.495	0.006	
			Max. Vx	8	-1.235	-0.012	0.519	
			Max Tension	25	5.105	0.000	0.000	
			Max. Compression	24	-5.294	0.000	0.000	
			Max. Mx	31	0.839	0.043	0.000	
			Max. My	24	-2.522	-0.001	-0.005	
			Max. Vy	31	-0.031	0.043	0.000	
			Max. Vx	24	0.001	0.000	0.000	
			Max Tension	14	0.167	0.000	0.000	
			Max. Compression	11	-0.100	0.000	0.000	
			Max. Mx	26	0.100	-0.053	0.000	
		Max. My	26	0.092	0.000	0.000		
		Max. Vy	26	0.033	0.000	0.000		
		Max. Vx	26	-0.000	0.000	0.000		
		Leg	Max Tension	15	26.217	0.126	0.011	
			Max. Compression	10	-35.350	0.089	0.034	
			Max. Mx	22	24.525	0.131	-0.026	
			Max. My	8	-4.503	-0.014	0.198	
			Max. Vy	14	0.077	-0.109	0.013	
			Max. Vx	8	-0.141	-0.014	0.198	
			Diagonal	Max Tension	25	4.451	0.000	0.000
				Max. Compression	24	-4.592	0.000	0.000
				Max. Mx	31	0.568	0.021	0.003
Max. My	37			-1.164	0.017	-0.003		
Max. Vy	29			0.021	0.018	0.002		
Max. Vx	37			0.001	0.000	0.000		
Leg	Max Tension	15		33.727	-0.106	0.012		
	Max. Compression	10		-43.741	0.126	0.037		
	Max. Mx	10		-43.741	0.126	0.037		
	Max. My	8		-4.787	-0.014	0.198		
	Max. Vy	18		-0.038	0.126	-0.025		
	Max. Vx	8		0.110	-0.014	0.198		
	Diagonal	Max Tension	24	4.585	0.000	0.000		
		Max. Compression	25	-4.502	0.000	0.000		
		Max. Mx	31	0.806	0.025	0.003		
		Max. My	31	0.740	0.021	0.003		
		Max. Vy	29	0.023	0.021	0.003		
		Max. Vx	31	-0.001	0.000	0.000		
Leg		Max Tension	15	41.112	-0.107	0.019		
		Max. Compression	10	-53.793	-0.038	0.027		
		Max. Mx	10	-53.684	0.126	0.037		
		Max. My	8	-6.308	-0.024	0.237		
		Max. Vy	18	0.063	0.126	-0.025		
		Max. Vx	8	-0.110	-0.024	0.237		
	Diagonal	Max Tension	25	5.445	0.000	0.000		
		Max. Compression	24	-5.640	0.000	0.000		
		Max. Mx	27	0.894	0.037	0.003		
		Max. My	24	-5.594	-0.006	-0.005		
		Max. Vy	27	-0.031	0.037	0.003		
		Max. Vx	31	-0.002	0.000	0.000		
Leg		Max Tension	7	49.954	-0.088	0.024		
		Max. Compression	10	-63.708	0.070	0.042		
		Max. Mx	10	-63.653	0.304	-0.007		
		Max. My	8	-6.687	-0.024	0.237		
		Max. Vy	10	-0.154	0.304	-0.007		
		Max. Vx	8	0.162	-0.024	0.237		
	Diagonal	Max Tension	24	5.570	0.000	0.000		
		Max. Compression	24	-5.539	0.000	0.000		
		Max. Mx	27	1.104	-0.048	0.008		
		Max. My	10	3.848	-0.040	-0.010		
		Max. Vy	27	0.040	-0.048	0.008		
		Max. Vx	31	0.003	0.000	0.000		
Secondary Horizontal		Max Tension	6	0.219	0.011	-0.003		
		Max. Compression	11	-0.178	0.004	0.004		
		Max. Mx	36	0.101	0.026	0.001		
		Max. My	6	-0.096	0.010	0.007		
		Max. Vy	36	0.031	0.026	0.001		
		Max. Vx	36	0.031	0.026	0.001		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft				
T6	140 - 133.333	Leg	Max. Vx	6	-0.002	0.000	0.000				
			Max Tension	7	59.490	0.015	0.031				
		Diagonal	Max. Compression	10	-75.455	-0.074	0.051				
			Max. Mx	27	-38.177	-0.114	-0.002				
			Max. My	8	-8.014	-0.040	0.384				
			Max. Vy	18	0.069	0.075	-0.025				
			Max. Vx	8	-0.140	-0.040	0.384				
			Max Tension	25	6.740	0.000	0.000				
			Max. Compression	24	-6.930	0.000	0.000				
			Max. Mx	27	0.913	-0.066	0.006				
			Max. My	24	-6.909	0.012	0.017				
			Max. Vy	29	-0.049	-0.056	-0.006				
			Max. Vx	24	-0.004	0.000	0.000				
			Max Tension	7	71.706	-0.664	0.002				
T7	133.333 - 126.667	Leg	Max. Compression	10	-89.011	-1.085	-0.002				
			Max. Mx	10	-89.011	-1.085	-0.002				
			Max. My	8	-8.660	-0.143	0.404				
			Max. Vy	10	0.584	0.858	0.004				
		Diagonal	Max. Vx	8	0.219	-0.040	0.384				
			Max Tension	25	7.007	-0.043	0.006				
			Max. Compression	24	-7.063	0.000	0.000				
			Max. Mx	27	1.582	-0.076	-0.011				
			Max. My	10	4.611	-0.062	-0.016				
			Max. Vy	27	0.052	-0.076	-0.011				
			Max. Vx	31	0.004	0.000	0.000				
			Max Tension	8	0.627	0.012	-0.008				
		Secondary Horizontal	Max. Compression	9	-0.516	0.009	0.008				
			Max. Mx	31	0.160	0.036	0.001				
			Max. My	11	0.541	0.007	-0.009				
			Max. Vy	31	-0.035	0.036	0.001				
			Max. Vx	10	-0.002	0.010	-0.009				
			T8	126.667 - 120	Leg	Max Tension	7	82.277	0.419	0.001	
						Diagonal	Max. Compression	10	-100.685	1.142	-0.054
							Max. Mx	10	-100.230	1.555	0.041
Max. My	8	-9.202					-0.181	0.762			
Max. Vy	10	-1.601	1.555	0.041							
Max. Vx	8	-0.637	-0.181	0.762							
Max Tension	25	7.044	-0.039	-0.001							
Max. Compression	10	-7.697	0.000	0.000							
Max. Mx	10	4.728	-0.096	0.001							
Max. My	27	-0.336	-0.009	0.004							
Max. Vy	10	-0.040	-0.096	0.001							
Max. Vx	27	0.002	0.000	0.000							
Horizontal	Max Tension	8	0.436	0.019	0.010						
	Max. Compression	9	-0.373	0.012	0.007						
	Max. Mx	29	0.171	0.048	0.026						
	Max. My	29	0.171	0.048	0.026						
	Max. Vy	29	0.046	0.048	0.026						
	Max. Vx	29	0.006	0.000	0.000						
	Redund Horz 1 Bracing	Max Tension	10	1.733	0.000	0.000					
		Max. Compression	23	-1.411	0.000	0.000					
Max. Mx		26	0.468	-0.010	0.000						
Max. My		26	0.339	0.000	0.000						
Redund Diag 1 Bracing	Max. Vy	26	-0.015	0.000	0.000						
	Max. Vx	26	-0.000	0.000	0.000						
	Max Tension	23	0.894	0.000	0.000						
	Max. Compression	10	-1.158	0.000	0.000						
	Max. Mx	26	-0.338	-0.012	0.000						
	Max. My	26	-0.295	0.000	0.000						
	Max. Vy	26	0.016	0.000	0.000						
	Max. Vx	26	-0.001	0.000	0.000						
T9	120 - 113.333	Leg	Max Tension	7	93.893	-0.991	-0.002				

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft	
T10	113.333 - 106.667	Diagonal	Max. Compression	10	-114.070	-0.822	0.020	
			Max. Mx	10	-114.035	1.276	-0.004	
			Max. My	8	-9.820	-0.181	0.762	
			Max. Vy	10	-0.758	1.276	-0.004	
			Max. Vx	8	0.372	-0.181	0.762	
			Max Tension	25	7.210	-0.071	0.015	
			Max. Compression	24	-7.370	0.000	0.000	
			Max. Mx	27	1.554	-0.113	-0.014	
			Max. My	10	-6.863	0.029	-0.027	
			Max. Vy	27	0.071	-0.113	-0.014	
			Max. Vx	31	-0.005	0.000	0.000	
			Max Tension	8	0.991	0.015	-0.011	
			Secondary Horizontal	Max. Compression	9	-0.811	0.018	0.012
				Max. Mx	32	0.197	0.053	0.003
				Max. My	6	-0.594	0.023	0.012
		Max. Vy		32	-0.048	0.053	0.003	
		Max. Vx		6	-0.003	0.000	0.000	
		Max Tension		7	104.374	-0.900	-0.001	
		Diagonal	Max. Compression	10	-125.783	-0.534	0.038	
			Max. Mx	10	-125.734	1.146	-0.002	
			Max. My	8	-10.344	-0.140	0.721	
			Max. Vy	10	-0.629	1.146	-0.002	
			Max. Vx	8	0.315	-0.140	0.721	
			Max Tension	25	7.248	-0.076	0.003	
			Max. Compression	24	-7.624	0.000	0.000	
Max. Mx	27		1.234	-0.125	-0.017			
Max. My	10		4.093	-0.107	-0.025			
Max. Vy	27		0.076	-0.125	-0.017			
Max. Vx	31		0.005	0.000	0.000			
Max Tension	8		0.774	0.024	-0.010			
Secondary Horizontal	Max. Compression		9	-0.625	0.015	0.012		
	Max. Mx		30	0.304	0.062	0.001		
	Max. My		8	-0.605	0.020	0.012		
	Max. Vy	30	-0.051	0.062	0.001			
	Max. Vx	8	-0.002	0.000	0.000			
	Max Tension	7	115.076	0.319	0.023			
Diagonal	Max. Compression	10	-138.334	4.126	0.063			
	Max. Mx	10	-138.334	4.126	0.063			
	Max. My	8	-11.121	-0.119	0.364			
	Max. Vy	10	-0.740	4.126	0.063			
	Max. Vx	8	0.131	-0.119	0.364			
	Max Tension	24	7.111	0.000	0.000			
	Max. Compression	24	-7.043	0.000	0.000			
	Max. Mx	27	1.746	-0.120	-0.014			
	Max. My	30	1.140	-0.115	-0.018			
	Max. Vy	29	-0.079	-0.116	0.014			
	Max. Vx	30	0.005	0.000	0.000			
	Max Tension	7	144.095	-3.007	0.026			
	Diagonal	Max. Compression	10	-172.302	3.034	0.078		
		Max. Mx	10	-149.250	4.126	0.063		
		Max. My	8	-13.664	-0.032	0.438		
Max. Vy		18	0.343	4.057	-0.036			
Max. Vx		8	-0.146	-0.032	0.438			
Max Tension		24	7.901	0.000	0.000			
Max. Compression		24	-7.813	0.000	0.000			
Max. Mx		27	1.579	-0.176	0.021			
Max. My		37	-1.964	-0.152	0.028			
Max. Vy		29	-0.106	-0.173	-0.022			
Max. Vx		37	-0.006	0.000	0.000			
Max Tension		7	170.020	-3.339	0.067			
Secondary Horizontal		Max. Compression	10	-202.914	1.432	0.103		
		Max. Mx	11	-182.151	3.381	0.112		
		Max. My	8	-15.844	-0.250	0.748		
	Max. Vy	18	0.271	3.323	-0.067			
	Max. Vx	8	-0.176	-0.054	0.611			
	Max Tension	7	170.020	-3.339	0.067			
Leg	Max. Compression	10	-172.302	3.034	0.078			
	Max. Mx	10	-149.250	4.126	0.063			
	Max. My	8	-13.664	-0.032	0.438			
	Max. Vy	18	0.343	4.057	-0.036			
	Max. Vx	8	-0.146	-0.032	0.438			
	Max Tension	7	144.095	-3.007	0.026			
Leg	Max. Compression	10	-172.302	3.034	0.078			
	Max. Mx	10	-149.250	4.126	0.063			
	Max. My	8	-13.664	-0.032	0.438			
	Max. Vy	18	0.343	4.057	-0.036			
	Max. Vx	8	-0.146	-0.032	0.438			
	Max Tension	7	144.095	-3.007	0.026			
Leg	Max. Compression	10	-172.302	3.034	0.078			
	Max. Mx	10	-149.250	4.126	0.063			
	Max. My	8	-13.664	-0.032	0.438			
	Max. Vy	18	0.343	4.057	-0.036			
	Max. Vx	8	-0.146	-0.032	0.438			
	Max Tension	7	144.095	-3.007	0.026			

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T14	60 - 40	Diagonal	Max Tension	24	9.375	0.000	0.000
			Max. Compression	24	-9.370	0.000	0.000
			Max. Mx	29	1.724	-0.232	0.028
			Max. My	30	1.451	-0.231	-0.033
			Max. Vy	29	-0.116	-0.232	0.028
			Max. Vx	30	0.007	0.000	0.000
		Leg	Max Tension	7	195.407	2.581	0.027
			Max. Compression	10	-233.537	1.569	0.083
			Max. Mx	10	-233.503	9.992	-0.009
			Max. My	8	-17.825	-0.740	0.945
			Max. Vy	10	-2.899	9.992	-0.009
			Max. Vx	8	0.313	-0.740	0.945
		Diagonal	Max Tension	13	10.102	-0.153	0.003
			Max. Compression	10	-10.986	0.000	0.000
			Max. Mx	29	1.101	-0.310	-0.045
			Max. My	31	-3.433	-0.279	-0.050
			Max. Vy	29	-0.145	-0.310	-0.045
			Max. Vx	31	-0.009	0.000	0.000
Secondary Horizontal	Max Tension	10	2.674	0.060	-0.001		
	Max. Compression	7	-2.082	0.046	0.011		
	Max. Mx	32	0.464	0.157	0.012		
	Max. My	30	0.263	0.157	0.014		
	Max. Vy	32	-0.087	0.157	0.012		
	Max. Vx	30	-0.004	0.000	0.000		
	Leg	Max Tension	7	209.149	-2.244	0.049	
		Max. Compression	10	-250.927	1.171	0.066	
		Max. Mx	37	12.264	-2.591	-0.045	
		Max. My	8	-19.922	-0.183	1.034	
		Max. Vy	33	-0.388	-2.570	0.023	
		Max. Vx	8	-0.166	-0.183	1.034	
Diagonal	Max Tension	12	10.074	0.000	0.000		
	Max. Compression	12	-10.168	0.000	0.000		
	Max. Mx	29	0.622	-0.402	-0.049		
	Max. My	37	-3.203	-0.364	0.053		
	Max. Vy	29	-0.174	-0.402	-0.049		
	Max. Vx	37	-0.009	0.000	0.000		
Leg	Max Tension	7	220.628	-1.425	0.041		
	Max. Compression	10	-265.219	-0.607	-0.036		
	Max. Mx	10	-265.135	10.887	-0.003		
	Max. My	8	-20.754	-0.183	1.034		
	Max. Vy	27	2.474	-7.096	0.015		
	Max. Vx	8	0.283	-0.183	1.034		
	Diagonal	Max Tension	13	10.939	-0.229	0.015	
		Max. Compression	10	-11.889	0.000	0.000	
		Max. Mx	27	2.387	-0.403	-0.058	
		Max. My	30	2.118	-0.396	-0.064	
		Max. Vy	29	-0.177	-0.402	0.055	
		Max. Vx	30	0.010	0.000	0.000	
Secondary Horizontal	Max Tension	10	2.529	0.092	-0.001		
	Max. Compression	7	-1.997	0.070	0.014		
	Max. Mx	30	1.363	0.208	0.014		
	Max. My	30	0.747	0.205	0.017		
	Max. Vy	30	-0.105	0.208	0.014		
	Max. Vx	30	-0.004	0.000	0.000		
	Leg	Max Tension	7	246.501	-3.959	0.068	
		Max. Compression	10	-297.529	0.000	-0.000	
		Max. Mx	27	-120.483	9.548	0.000	
		Max. My	8	-23.498	-0.214	1.477	
		Max. Vy	27	-1.682	-7.096	0.015	
		Max. Vx	8	-0.287	-0.214	1.477	
Diagonal	Max Tension	13	10.925	0.000	0.000		
	Max. Compression	12	-11.317	0.000	0.000		
	Max. Mx	29	-1.066	0.329	0.035		
	Max. My	30	5.045	0.241	0.043		
	Max. Vy	29	0.124	0.329	0.035		
	Max. Vx	30	-0.007	0.000	0.000		

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	302.108	27.747	-16.941
	Max. H _x	18	302.108	27.747	-16.941
	Max. H _z	7	-252.611	-23.442	14.453
	Min. Vert	7	-252.611	-23.442	14.453
	Min. H _x	7	-252.611	-23.442	14.453
	Min. H _z	18	302.108	27.747	-16.941
Leg B	Max. Vert	10	305.116	-27.297	-17.433
	Max. H _x	23	-248.879	22.928	14.835
	Max. H _z	23	-248.879	22.928	14.835
	Min. Vert	23	-248.879	22.928	14.835
	Min. H _x	10	305.116	-27.297	-17.433
	Min. H _z	10	305.116	-27.297	-17.433
Leg A	Max. Vert	2	301.326	0.792	31.824
	Max. H _x	20	25.442	5.634	1.948
	Max. H _z	2	301.326	0.792	31.824
	Min. Vert	15	-244.909	-0.729	-26.739
	Min. H _x	9	18.323	-5.571	1.400
	Min. H _z	15	-244.909	-0.729	-26.739

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	59.140	0.000	-0.000	-22.315	-36.697	0.000
1.2 Dead+1.0 Wind 0 deg - No Ice	70.969	-0.055	-50.989	-5498.226	-35.455	29.851
0.9 Dead+1.0 Wind 0 deg - No Ice	53.226	-0.055	-50.989	-5491.531	-24.446	29.851
1.2 Dead+1.0 Wind 30 deg - No Ice	70.969	24.124	-41.903	-4559.927	-2650.953	15.485
0.9 Dead+1.0 Wind 30 deg - No Ice	53.226	24.124	-41.903	-4553.232	-2639.945	15.485
1.2 Dead+1.0 Wind 60 deg - No Ice	70.969	42.651	-24.630	-2684.425	-4646.543	-31.525
0.9 Dead+1.0 Wind 60 deg - No Ice	53.226	42.651	-24.630	-2677.731	-4635.534	-31.525
1.2 Dead+1.0 Wind 90 deg - No Ice	70.969	49.517	0.055	-18.197	-5383.932	-65.543
0.9 Dead+1.0 Wind 90 deg - No Ice	53.226	49.517	0.055	-11.502	-5372.924	-65.543
1.2 Dead+1.0 Wind 120 deg - No Ice	70.969	44.945	26.018	2755.211	-4844.746	-55.813
0.9 Dead+1.0 Wind 120 deg - No Ice	53.226	44.945	26.018	2761.905	-4833.737	-55.813
1.2 Dead+1.0 Wind 150 deg - No Ice	70.969	24.891	43.120	4644.530	-2740.628	-45.089
0.9 Dead+1.0 Wind 150 deg - No Ice	53.226	24.891	43.120	4651.224	-2729.619	-45.089
1.2 Dead+1.0 Wind 180 deg - No Ice	70.969	0.055	47.919	5194.140	-52.617	-29.851
0.9 Dead+1.0 Wind 180 deg - No Ice	53.226	0.055	47.919	5200.834	-41.608	-29.851
1.2 Dead+1.0 Wind 210 deg - No Ice	70.969	-24.124	41.903	4506.371	2562.882	-15.485
0.9 Dead+1.0 Wind 210 deg - No Ice	53.226	-24.124	41.903	4513.066	2573.891	-15.485
1.2 Dead+1.0 Wind 240 deg - No Ice	70.969	-45.310	26.165	2756.135	4775.437	31.525
0.9 Dead+1.0 Wind 240 deg	53.226	-45.310	26.165	2762.830	4786.446	31.525

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
- No Ice						
1.2 Dead+1.0 Wind 270 deg	70.969	-49.517	-0.055	-35.359	5295.861	65.543
- No Ice						
0.9 Dead+1.0 Wind 270 deg	53.226	-49.517	-0.055	-28.664	5306.870	65.543
- No Ice						
1.2 Dead+1.0 Wind 300 deg	70.969	-42.287	-24.483	-2683.501	4539.709	55.813
- No Ice						
0.9 Dead+1.0 Wind 300 deg	53.226	-42.287	-24.483	-2676.807	4550.718	55.813
- No Ice						
1.2 Dead+1.0 Wind 330 deg	70.969	-24.891	-43.120	-4698.085	2652.556	45.089
- No Ice						
0.9 Dead+1.0 Wind 330 deg	53.226	-24.891	-43.120	-4691.391	2663.565	45.089
- No Ice						
1.2 Dead+1.0 Ice+1.0 Temp	164.818	0.000	-0.000	-124.201	-92.873	-0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	164.818	-0.010	-12.643	-1498.052	-91.421	8.687
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	164.818	6.060	-10.517	-1274.400	-755.222	1.815
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	164.818	10.518	-6.073	-788.488	-1243.380	-10.090
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	164.818	12.560	0.010	-122.749	-1461.441	-19.165
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	164.818	11.309	6.542	584.659	-1317.678	-18.559
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	164.818	6.331	10.968	1073.432	-784.285	-13.106
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	164.818	0.010	12.249	1218.629	-94.326	-8.687
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	164.818	-6.060	10.517	1025.998	569.476	-1.815
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	164.818	-10.858	6.270	555.596	1084.498	10.090
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	164.818	-12.560	-0.010	-125.654	1275.694	19.165
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	164.818	-10.968	-6.345	-817.551	1105.067	18.559
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	164.818	-6.331	-10.968	-1321.834	598.539	13.106
Dead+Wind 0 deg - Service	59.140	-0.012	-11.550	-1256.590	-34.772	6.736
Dead+Wind 30 deg - Service	59.140	5.468	-9.497	-1045.203	-624.952	3.521
Dead+Wind 60 deg - Service	59.140	9.664	-5.581	-621.946	-1075.137	-7.026
Dead+Wind 90 deg - Service	59.140	11.220	0.012	-20.391	-1241.475	-14.672
Dead+Wind 120 deg - Service	59.140	10.179	5.892	605.197	-1119.579	-12.515
Dead+Wind 150 deg - Service	59.140	5.639	9.770	1031.552	-645.060	-10.135
Dead+Wind 180 deg - Service	59.140	0.012	10.861	1155.785	-38.621	-6.736
Dead+Wind 210 deg - Service	59.140	-5.468	9.497	1000.573	551.559	-3.521
Dead+Wind 240 deg - Service	59.140	-10.261	5.925	605.404	1050.394	7.026
Dead+Wind 270 deg - Service	59.140	-11.220	-0.012	-24.239	1168.081	14.672
Dead+Wind 300 deg - Service	59.140	-9.583	-5.548	-621.738	997.536	12.515
Dead+Wind 330 deg - Service	59.140	-5.639	-9.770	-1076.182	571.667	10.135

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.000	-59.140	0.000	-0.000	59.140	0.000	0.000%
2	-0.055	-70.969	-50.989	0.055	70.969	50.989	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
3	-0.055	-53.226	-50.989	0.055	53.226	50.989	0.000%
4	24.124	-70.969	-41.903	-24.124	70.969	41.903	0.000%
5	24.124	-53.226	-41.903	-24.124	53.226	41.903	0.000%
6	42.651	-70.969	-24.630	-42.651	70.969	24.630	0.000%
7	42.651	-53.226	-24.630	-42.651	53.226	24.630	0.000%
8	49.517	-70.969	0.055	-49.517	70.969	-0.055	0.000%
9	49.517	-53.226	0.055	-49.517	53.226	-0.055	0.000%
10	44.945	-70.969	26.018	-44.945	70.969	-26.018	0.000%
11	44.945	-53.226	26.018	-44.945	53.226	-26.018	0.000%
12	24.891	-70.969	43.120	-24.891	70.969	-43.120	0.000%
13	24.891	-53.226	43.120	-24.891	53.226	-43.120	0.000%
14	0.055	-70.969	47.919	-0.055	70.969	-47.919	0.000%
15	0.055	-53.226	47.919	-0.055	53.226	-47.919	0.000%
16	-24.124	-70.969	41.903	24.124	70.969	-41.903	0.000%
17	-24.124	-53.226	41.903	24.124	53.226	-41.903	0.000%
18	-45.310	-70.969	26.165	45.310	70.969	-26.165	0.000%
19	-45.310	-53.226	26.165	45.310	53.226	-26.165	0.000%
20	-49.517	-70.969	-0.055	49.517	70.969	0.055	0.000%
21	-49.517	-53.226	-0.055	49.517	53.226	0.055	0.000%
22	-42.287	-70.969	-24.483	42.287	70.969	24.483	0.000%
23	-42.287	-53.226	-24.483	42.287	53.226	24.483	0.000%
24	-24.891	-70.969	-43.120	24.891	70.969	43.120	0.000%
25	-24.891	-53.226	-43.120	24.891	53.226	43.120	0.000%
26	0.000	-164.818	0.000	-0.000	164.818	0.000	0.000%
27	-0.010	-164.818	-12.643	0.010	164.818	12.643	0.000%
28	6.060	-164.818	-10.517	-6.060	164.818	10.517	0.000%
29	10.518	-164.818	-6.073	-10.518	164.818	6.073	0.000%
30	12.560	-164.818	0.010	-12.560	164.818	-0.010	0.000%
31	11.309	-164.818	6.542	-11.309	164.818	-6.542	0.000%
32	6.331	-164.818	10.968	-6.331	164.818	-10.968	0.000%
33	0.010	-164.818	12.249	-0.010	164.818	-12.249	0.000%
34	-6.060	-164.818	10.517	6.060	164.818	-10.517	0.000%
35	-10.858	-164.818	6.270	10.858	164.818	-6.270	0.000%
36	-12.560	-164.818	-0.010	12.560	164.818	0.010	0.000%
37	-10.968	-164.818	-6.345	10.968	164.818	6.345	0.000%
38	-6.331	-164.818	-10.968	6.331	164.818	10.968	0.000%
39	-0.012	-59.140	-11.550	0.012	59.140	11.550	0.000%
40	5.468	-59.140	-9.497	-5.468	59.140	9.497	0.000%
41	9.664	-59.140	-5.581	-9.664	59.140	5.581	0.000%
42	11.220	-59.140	0.012	-11.220	59.140	-0.012	0.000%
43	10.179	-59.140	5.892	-10.179	59.140	-5.892	0.000%
44	5.639	-59.140	9.770	-5.639	59.140	-9.770	0.000%
45	0.012	-59.140	10.861	-0.012	59.140	-10.861	0.000%
46	-5.468	-59.140	9.497	5.468	59.140	-9.497	0.000%
47	-10.261	-59.140	5.925	10.261	59.140	-5.925	0.000%
48	-11.220	-59.140	-0.012	11.220	59.140	0.012	0.000%
49	-9.583	-59.140	-5.548	9.583	59.140	5.548	0.000%
50	-5.639	-59.140	-9.770	5.639	59.140	9.770	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	3.962	43	0.237	0.027
T2	160 - 155	2.991	43	0.212	0.026
T3	155 - 150	2.767	43	0.204	0.024
T4	150 - 145	2.552	43	0.195	0.023
T5	145 - 140	2.348	43	0.184	0.022
T6	140 - 133.333	2.157	43	0.173	0.021
T7	133.333 - 126.667	1.919	43	0.160	0.020
T8	126.667 - 120	1.701	43	0.145	0.018
T9	120 - 113.333	1.503	43	0.130	0.017
T10	113.333 -	1.326	43	0.117	0.016

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
	106.667				
T11	106.667 - 100	1.168	43	0.103	0.015
T12	100 - 80	1.025	43	0.095	0.014
T13	80 - 60	0.657	43	0.073	0.010
T14	60 - 40	0.375	43	0.054	0.008
T15	40 - 30	0.175	43	0.035	0.005
T16	30 - 20	0.106	43	0.025	0.004
T17	20 - 0	0.057	43	0.016	0.003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
182.000	19" Accelerator	43	3.962	0.237	0.027	116507
180.000	Lightning Rod 5/8" x 6'	43	3.962	0.237	0.027	116507
178.000	(2) LPA-80080/6CF	43	3.862	0.235	0.027	116507
165.000	7770.00 w/ Mount Pipe	43	3.225	0.219	0.026	38836
150.000	APXVTM14-ALU-I20 w/ Mount Pipe	43	2.552	0.195	0.023	29518
140.000	MX08FRO665-20 w/ Mount Pipe	43	2.157	0.173	0.021	28752
126.667	(4) L2x2x1/4 (RD)	43	1.701	0.145	0.018	26463
123.333	(4) L2x2x1/4 (RD)	43	1.599	0.137	0.018	26336
120.000	(4) L2x2x1/4 (RD)	43	1.503	0.130	0.017	25997
50.000	GPS_A	43	0.265	0.045	0.006	58721

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	17.288	10	1.019	0.120
T2	160 - 155	13.090	10	0.920	0.116
T3	155 - 150	12.114	10	0.887	0.110
T4	150 - 145	11.178	10	0.849	0.103
T5	145 - 140	10.285	10	0.804	0.098
T6	140 - 133.333	9.452	10	0.753	0.094
T7	133.333 - 126.667	8.411	10	0.697	0.088
T8	126.667 - 120	7.457	10	0.635	0.082
T9	120 - 113.333	6.591	10	0.569	0.076
T10	113.333 - 106.667	5.814	10	0.511	0.071
T11	106.667 - 100	5.123	10	0.450	0.066
T12	100 - 80	4.497	10	0.416	0.061
T13	80 - 60	2.885	10	0.320	0.047
T14	60 - 40	1.645	10	0.238	0.034
T15	40 - 30	0.771	10	0.152	0.024
T16	30 - 20	0.467	10	0.111	0.019
T17	20 - 0	0.253	19	0.070	0.015

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
182.000	19" Accelerator	10	17.288	1.019	0.120	29911

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.000	Lightning Rod 5/8" x 6'	10	17.288	1.019	0.120	29911
178.000	(2) LPA-80080/6CF	10	16.858	1.010	0.120	29911
165.000	7770.00 w/ Mount Pipe	10	14.104	0.948	0.119	9970
150.000	APXVTM14-ALU-I20 w/ Mount Pipe	10	11.178	0.849	0.103	6905
140.000	MX08FRO665-20 w/ Mount Pipe	10	9.452	0.753	0.094	6683
126.667	(4) L2x2x1/4 (RD)	10	7.457	0.635	0.082	6095
123.333	(4) L2x2x1/4 (RD)	10	7.013	0.601	0.079	6050
120.000	(4) L2x2x1/4 (RD)	10	6.591	0.569	0.076	5956
50.000	GPS_A	10	1.163	0.195	0.028	13391

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load Allowable	Allowable Ratio	Criteria
T1	180	Leg	A325N	0.625	4	4.423	20.340	0.217	1.05	Bolt Tension
		Diagonal	A325X	0.500	1	5.105	7.504	0.680	1.05	Gusset Bearing
		Top Girt	A325N	0.500	1	0.167	4.133	0.040	1.05	Member Bearing
T2	160	Diagonal	A325N	0.500	1	4.451	6.199	0.718	1.05	Member Bearing
T3	155	Diagonal	A325N	0.500	1	4.585	6.199	0.740	1.05	Member Bearing
T4	150	Diagonal	A325X	0.500	1	5.445	7.504	0.726	1.05	Gusset Bearing
T5	145	Leg	A325N	0.750	4	12.489	30.101	0.415	1.05	Bolt Tension
		Diagonal	A325N	0.500	1	5.570	7.504	0.742	1.05	Gusset Bearing
T6	140	Diagonal	A325N	0.500	2	3.370	11.011	0.306	1.05	Member Block Shear
T7	133.333	Diagonal	A325N	0.500	2	3.504	11.011	0.318	1.05	Member Block Shear
T8	126.667	Leg	A325N	0.875	4	20.538	41.556	0.494	1.05	Bolt Tension
		Diagonal	A325N	0.500	2	3.522	11.011	0.320	1.05	Member Block Shear
		Redund Horz 1 Bracing	A325N	0.625	1	1.746	9.108	0.192	1.05	Member Block Shear
T9	120	Redund Diag 1 Bracing	A325N	0.625	1	1.064	9.108	0.117	1.05	Member Block Shear
		Diagonal	A325N	0.500	2	3.605	13.050	0.276	1.05	Member Block Shear
T10	113.333	Diagonal	A325N	0.500	2	3.624	13.050	0.278	1.05	Member Block Shear
T11	106.667	Leg	A325N	0.875	4	28.769	41.556	0.692	1.05	Bolt Tension
		Diagonal	A325N	0.500	2	3.555	13.050	0.272	1.05	Member Block Shear
T12	100	Leg	A325N	1.000	4	36.024	54.517	0.661	1.05	Bolt Tension
		Diagonal	A325N	0.500	2	3.950	14.070	0.281	1.05	Member Block Shear
T13	80	Leg	A325N	1.000	4	42.505	54.517	0.780	1.05	Bolt Tension
		Diagonal	A325N	0.625	1	9.375	13.920	0.673	1.05	Gusset Bearing
T14	60	Leg	A325N	1.000	6	32.514	54.517	0.596	1.05	Bolt Tension
		Diagonal	A325N	0.625	1	10.102	13.920	0.726	1.05	Gusset Bearing
T15	40	Diagonal	A325N	0.625	1	10.074	13.920	0.724	1.05	Gusset Bearing
T16	30	Leg	A325N	1.000	6	36.721	54.517	0.674	1.05	Bolt Tension
		Diagonal	A325N	0.625	1	10.939	13.920	0.786	1.05	Gusset Bearing
T17	20	Diagonal	A325N	0.625	2	5.462	13.025	0.419	1.05	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2 STD	20.000	4.000	61.0	1.075	-26.206	36.842	0.711 ¹
T2	160 - 155	ROHN 2.5 EH	5.009	5.009	K=1.00 65.0	2.254	-35.350	74.429	0.475 ¹
T3	155 - 150	ROHN 2.5 EH	5.009	5.009	K=1.00 65.0	2.254	-43.741	74.427	0.588 ¹
T4	150 - 145	ROHN 2.5 EH	5.009	5.009	K=1.00 65.0	2.254	-53.793	74.427	0.723 ¹
T5	145 - 140	ROHN 2.5 EH	5.009	2.581	K=1.00 33.5	2.254	-63.708	93.410	0.682 ¹
T6	140 - 133.333	ROHN 3 EH	6.678	6.678	K=1.00 70.5	3.016	-75.455	94.342	0.800 ¹
T7	133.333 - 126.667	ROHN 3 EH	6.678	3.457	K=1.00 36.5	3.016	-89.011	123.118	0.723 ¹
T8	126.667 - 120	ROHN 3 EH	6.678	1.670	K=1.00 8.8	3.016	-100.685	134.948	0.746 ¹
T9	120 - 113.333	ROHN 3.5 EH	6.678	3.443	K=0.50 31.6	3.678	-114.070	153.863	0.741 ¹
T10	113.333 - 106.667	ROHN 3.5 EH	6.678	3.437	K=1.00 31.6	3.678	-125.783	153.899	0.817 ¹
T11	106.667 - 100	BT100140- Rohn 3.5EH w/ 2" SR	6.678	6.678	K=1.00 61.4	6.820	-138.334	232.935	0.594 ¹
T12	100 - 80	BT100140- Rohn 4EH w/ 2" SR	20.037	6.679	K=0.78 54.6	7.549	-172.302	273.092	0.631 ¹
T13	80 - 60	BT100140- Rohn 5EH w/ 2" SR (60-80)	20.033	10.017	K=0.80 65.5	9.253	-202.914	304.198	0.667 ¹
T14	60 - 40	BT100140- Rohn 5EH w/ 2" SR (40-60)	20.036	5.151	K=0.83 34.5	9.253	-233.537	381.660	0.612 ¹
T15	40 - 30	BT100140- Rohn 6EHS w/ 2" SR (30-40)	10.017	10.017	K=0.85 55.0	9.855	-250.927	355.524	0.706 ¹
T16	30 - 20	BT100140- Rohn 6EHS w/ 2" SR (20-30)	10.017	5.132	K=0.85 28.2	9.855	-265.219	418.472	0.634 ¹
T17	20 - 0	BT100140- Rohn 6EH w/ 2" SR	20.033	10.017	K=0.85 55.0	11.547	-297.529	416.534	0.714 ¹

¹ P_u / φP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	7.682	3.623	113.4	0.938	-5.294	20.877	0.254 ¹
T2	160 - 155	L1 3/4x1 3/4x3/16	8.454	4.131	K=1.02 144.3	0.621	-4.592	8.534	0.538 ¹
T3	155 - 150	L1 3/4x1 3/4x3/16	8.869	4.341	K=1.00 151.7	0.621	-4.502	7.728	0.582 ¹
T4	150 - 145	L2x2x1/4	9.296	4.553	K=1.00 139.7	0.938	-5.640	13.748	0.410 ¹
T5	145 - 140	2L1 3/4x1 3/4x3/16x3/16	9.732	4.876	K=1.00 185.2	1.242	-5.539	10.250	0.540 ¹
T6	140 - 133.333	2L 'a' > 28.068 in - 70 2L2x2x3/16x1/2	11.156	5.441	K=1.00 105.8	1.430	-6.930	32.698	0.212 ¹
T7	133.333 - 126.667	2L 'a' > 31.235 in - 82 2L2x2x3/16x1/2	11.706	5.881	K=1.00 114.3	1.430	-7.063	29.769	0.237 ¹
		2L 'a' > 33.766 in - 91							

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T8	126.667 - 120	2L2x2x3/16x1/2	6.277	6.105	86.0 K=1.00	1.430	-7.697	38.221	0.201 ¹
T9	120 - 113.333	2L2 1/2x2 1/2x3/16x1/2	12.843	6.425	100.2 K=1.00	1.805	-7.370	41.764	0.176 ¹
T10	113.333 - 106.667	2L 'a' > 36.772 in - 145 2L2 1/2x2 1/2x3/16x1/2	13.430	6.719	104.8 K=1.00	1.805	-7.624	39.969	0.191 ¹
T11	106.667 - 100	2L 'a' > 38.454 in - 157 2L2 1/2x2 1/2x3/16x1/2	14.025	6.849	106.8 K=1.00	1.805	-7.043	39.141	0.180 ¹
T12	100 - 80	2L 'a' > 39.199 in - 169 2L3x3x3/16x1/2	15.889	7.764	101.9 K=1.00	2.180	-7.813	46.595	0.168 ¹
T13	80 - 60	2L 'a' > 44.357 in - 178 2L3x3x3/16x1/4	19.100	9.452	127.6 K=1.00	2.180	-9.370	34.378	0.273 ¹
T14	60 - 40	2L 'a' > 54.001 in - 199 2L3x3x1/4x1/4	20.885	10.475	141.5 K=1.00	2.875	-10.539	39.600	0.266 ¹
T15	40 - 30	2L 'a' > 60.029 in - 213 2L3 1/2x3 1/2x1/4x1/4	21.789	10.747	125.0 K=1.00	3.375	-10.168	57.513	0.177 ¹
T16	30 - 20	2L 'a' > 61.473 in - 234 2L3 1/2x3 1/2x1/4x1/4	22.687	11.316	131.6 K=1.00	3.375	-11.889	52.338	0.227 ¹
T17	20 - 0	2L 'a' > 64.727 in - 243 L4x4x1/4	24.500	12.024	166.9 K=0.92	1.940	-11.317	19.935	0.568 ¹

¹ P_u / φP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T8	126.667 - 120	L2 1/2x2 1/2x1/4	10.297	5.003	156.1 K=1.00	1.190	-1.746	13.973	0.125 ¹

¹ P_u / φP_n controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T5	145 - 140	L2x2x1/4	8.340	8.100	159.6 K=1.00	0.938	-1.105	10.539	0.105 ¹
T7	133.333 - 126.667	L2x2x1/4	9.608	9.316	183.6 K=1.00	0.938	-1.544	7.967	0.194 ¹
T9	120 - 113.333	L2 1/2x2 1/2x1/4	10.965	10.631	165.9 K=1.00	1.190	-1.978	12.375	0.160 ¹
T10	113.333 - 106.667	L2 1/2x2 1/2x1/4	11.646	11.313	176.5 K=1.00	1.190	-2.181	10.929	0.200 ¹
T14	60 - 40	L3x3x1/4	18.319	17.855	230.4 K=1.00	1.440	-4.050	7.765	0.522 ¹
T16	30 - 20	L3 1/2x3 1/2x1/4	20.350	19.798	218.0 K=1.00	1.690	-4.600	10.182	0.452 ¹

¹ $P_u / \phi P_n$ controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	KI/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	6.521	6.115	184.6 K=1.00	0.484	-0.100	4.070	0.025 ¹

¹ $P_u / \phi P_n$ controls

Redundant Horizontal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	KI/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T8	126.667 - 120	L2x2x1/4	2.574	2.428	74.5 K=1.00	0.938	-1.746	27.870	0.063 ¹

¹ $P_u / \phi P_n$ controls

Redundant Diagonal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	KI/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T8	126.667 - 120	L2x2x1/4	3.138	2.963	90.9 K=1.00	0.938	-1.158	24.988	0.046 ¹

¹ $P_u / \phi P_n$ controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	KI/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	ROHN 2 STD	20.000	4.000	61.0	1.075	17.692	48.354	0.366 ¹
T2	160 - 155	ROHN 2.5 EH	5.009	5.009	65.0	2.254	26.217	101.409	0.259 ¹
T3	155 - 150	ROHN 2.5 EH	5.009	5.009	65.0	2.254	33.727	101.409	0.333 ¹
T4	150 - 145	ROHN 2.5 EH	5.009	5.009	65.0	2.254	41.112	101.409	0.405 ¹
T5	145 - 140	ROHN 2.5 EH	5.009	2.581	33.5	2.254	49.954	101.409	0.493 ¹
T6	140 - 133.333	ROHN 3 EH	6.678	6.678	70.5	3.016	59.490	135.717	0.438 ¹
T7	133.333 - 126.667	ROHN 3 EH	6.678	3.222	34.0	3.016	71.706	135.717	0.528 ¹
T8	126.667 - 120	ROHN 3 EH	6.678	1.670	17.6	3.016	82.277	135.717	0.606 ¹
T9	120 - 113.333	ROHN 3.5 EH	6.678	3.236	29.7	3.678	93.893	165.529	0.567 ¹
T10	113.333 - 106.667	ROHN 3.5 EH	6.678	3.241	29.8	3.678	104.374	165.529	0.631 ¹
T11	106.667 - 100	BT100140- Rohn 3.5EH	6.678	6.678	78.7	6.820	115.076	306.900	0.375 ¹

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio P _u / φP _n
T12	100 - 80	w/ 2" SR BT100140- Rohn 4EH w/ 2" SR	20.037	6.679	68.3	7.549	144.095	339.705	0.424 ¹
T13	80 - 60	BT100140- Rohn 5EH w/ 2" SR (60-80)	20.033	10.017	78.9	9.253	170.020	416.385	0.408 ¹
T14	60 - 40	BT100140- Rohn 5EH w/ 2" SR (40-60)	20.036	4.867	38.4	9.253	195.377	416.385	0.469 ¹
T15	40 - 30	BT100140- Rohn 6EHS w/ 2" SR (30-40)	10.017	10.017	64.7	9.855	209.149	443.471	0.472 ¹
T16	30 - 20	BT100140- Rohn 6EHS w/ 2" SR (20-30)	10.017	4.885	31.5	9.855	220.628	443.471	0.498 ¹
T17	20 - 0	BT100140- Rohn 6EH w/ 2" SR	20.033	10.017	63.6	11.547	246.501	519.615	0.474 ¹

¹ P_u / φP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio P _u / φP _n
T1	180 - 160	L2x2x1/4	7.682	3.623	73.4	0.586	5.105	28.583	0.179 ¹
T2	160 - 155	L1 3/4x1 3/4x3/16	8.454	4.131	94.6	0.378	4.451	16.440	0.271 ¹
T3	155 - 150	L1 3/4x1 3/4x3/16	8.869	4.341	99.3	0.378	4.585	16.440	0.279 ¹
T4	150 - 145	L2x2x1/4	9.296	4.553	91.8	0.586	5.445	28.583	0.190 ¹
T5	145 - 140	2L1 3/4x1 3/4x3/16x3/16 2L 'a' > 28.068 in - 69	9.732	4.876	109.0	0.756	5.570	32.880	0.169 ¹
T6	140 - 133.333	2L2x2x3/16x1/2 2L 'a' > 31.235 in - 81	11.156	5.441	109.0	0.896	6.740	38.997	0.173 ¹
T7	133.333 - 126.667	2L2x2x3/16x1/2 2L 'a' > 33.766 in - 90	11.706	5.881	114.3	0.896	7.007	38.997	0.180 ¹
T8	126.667 - 120	2L2x2x3/16x1/2	6.277	6.105	71.4	0.896	7.044	38.997	0.181 ¹
T9	120 - 113.333	2L2 1/2x2 1/2x3/16x1/2 2L 'a' > 36.772 in - 144	12.843	6.425	99.1	1.178	7.210	51.231	0.141 ¹
T10	113.333 - 106.667	2L2 1/2x2 1/2x3/16x1/2 2L 'a' > 38.454 in - 156	13.430	6.719	103.6	1.178	7.248	51.231	0.141 ¹
T11	106.667 - 100	2L2 1/2x2 1/2x3/16x1/2 2L 'a' > 39.199 in - 168	14.025	6.849	108.2	1.178	7.111	51.231	0.139 ¹
T12	100 - 80	2L3x3x3/16x1/2 2L 'a' > 44.357 in - 177	15.889	7.764	101.3	1.459	7.901	63.466	0.124 ¹
T13	80 - 60	2L3x3x3/16x1/4 2L 'a' > 54.001 in - 198	19.100	9.452	122.3	1.424	9.375	61.937	0.151 ¹
T14	60 - 40	2L3x3x1/4x1/4 2L 'a' > 57.451 in - 223	19.977	10.025	129.3	1.875	10.102	91.406	0.111 ¹
T15	40 - 30	2L3 1/2x3 1/2x1/4x1/4 2L 'a' > 61.473 in - 235	21.789	10.747	119.5	2.250	10.074	109.688	0.092 ¹
T16	30 - 20	2L3 1/2x3 1/2x1/4x1/4 2L 'a' > 64.727 in - 244	22.687	11.316	124.4	2.250	10.939	109.688	0.100 ¹
T17	20 - 0	L4x4x1/4	24.500	12.024	117.3	1.314	10.925	64.076	0.170 ¹

¹ P_u / φP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio P _u / φP _n
T8	126.667 - 120	L2 1/2x2 1/2x1/4	10.297	5.003	117.1	1.190	1.746	38.556	0.045 ¹

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
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¹ P_u / φP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T5	145 - 140	L2x2x1/4	8.340	8.100	159.6	0.704	1.105	34.296	0.032 ¹
T7	133.333 - 126.667	L2x2x1/4	9.608	9.316	183.6	0.704	1.544	34.296	0.045 ¹
T9	120 - 113.333	L2 1/2x2 1/2x1/4	10.965	10.631	165.9	1.190	1.978	38.556	0.051 ¹
T10	113.333 - 106.667	L2 1/2x2 1/2x1/4	11.646	11.313	176.5	1.190	2.181	38.556	0.057 ¹
T14	60 - 40	L3x3x1/4	17.276	16.812	216.9	1.440	4.050	46.656	0.087 ¹
T16	30 - 20	L3 1/2x3 1/2x1/4	20.350	19.798	218.0	1.690	4.600	54.756	0.084 ¹

¹ P_u / φP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	6.521	6.115	121.2	0.305	0.167	13.254	0.013 ¹

¹ P_u / φP_n controls

Redundant Horizontal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T8	126.667 - 120	L2x2x1/4	2.574	2.428	47.8	0.563	1.746	24.485	0.071 ¹

¹ P_u / φP_n controls

Redundant Diagonal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T8	126.667 - 120	L2x2x1/4	3.138	2.963	58.4	0.563	1.064	24.485	0.043 ¹

¹ P_u / φP_n controls

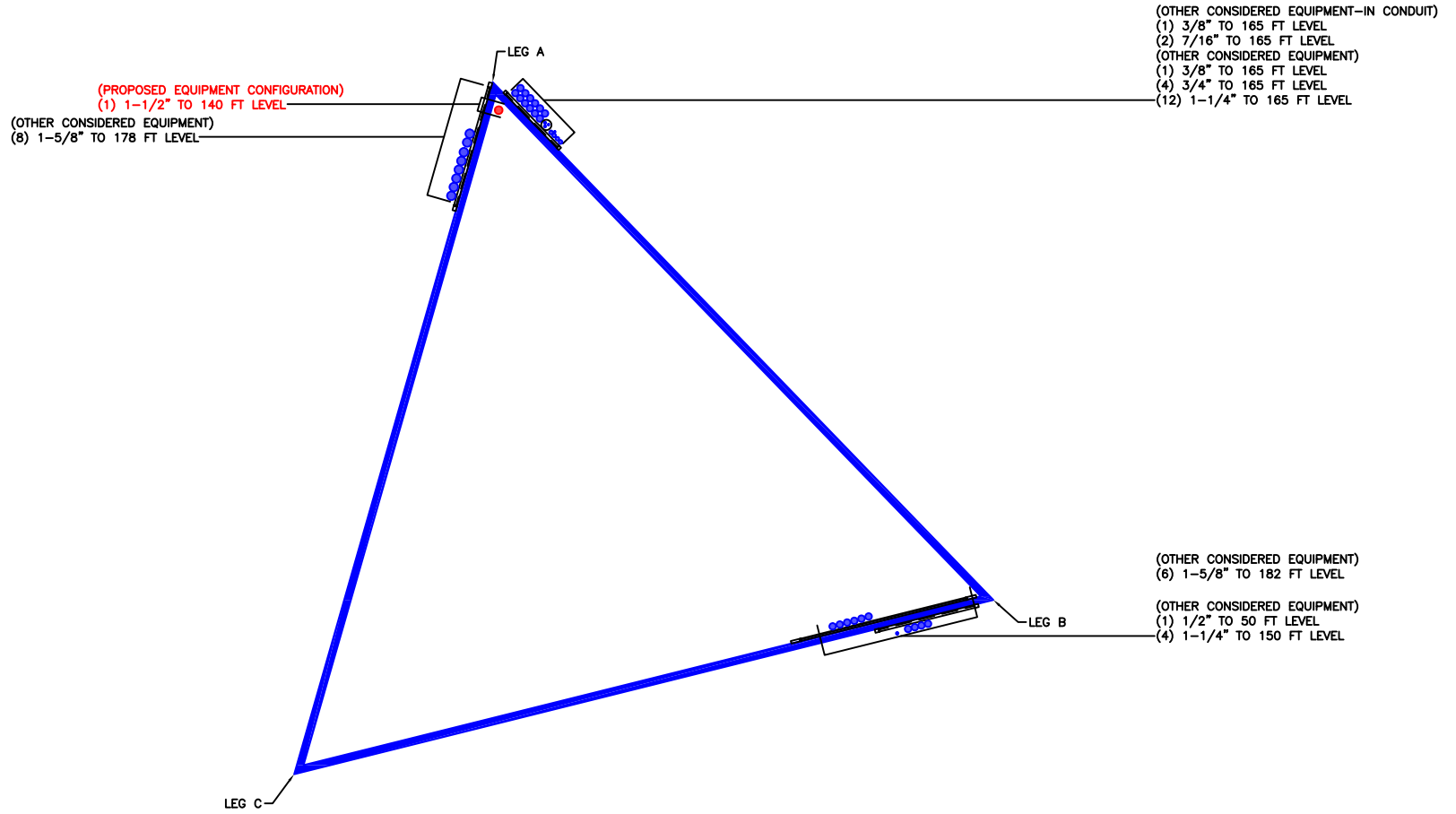
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail	
T1	180 - 160	Leg	ROHN 2 STD	2	-26.206	38.684	67.7	Pass	
T2	160 - 155	Leg	ROHN 2.5 EH	38	-35.350	78.151	45.2	Pass	
T3	155 - 150	Leg	ROHN 2.5 EH	47	-43.741	78.148	56.0	Pass	
T4	150 - 145	Leg	ROHN 2.5 EH	56	-53.793	78.149	68.8	Pass	
T5	145 - 140	Leg	ROHN 2.5 EH	65	-63.708	98.081	65.0	Pass	
T6	140 - 133.333	Leg	ROHN 3 EH	77	-75.455	99.059	76.2	Pass	
T7	133.333 - 126.667	Leg	ROHN 3 EH	86	-89.011	129.274	68.9	Pass	
T8	126.667 - 120	Leg	ROHN 3 EH	98	-100.685	141.695	71.1	Pass	
T9	120 - 113.333	Leg	ROHN 3.5 EH	140	-114.070	161.556	70.6	Pass	
T10	113.333 - 106.667	Leg	ROHN 3.5 EH	152	-125.783	161.594	77.8	Pass	
T11	106.667 - 100	Leg	BT100140- Rohn 3.5EH w/ 2" SR	164	-138.334	244.582	56.6	Pass	
T12	100 - 80	Leg	BT100140- Rohn 4EH w/ 2" SR	173	-172.302	286.747	60.1	Pass	
T13	80 - 60	Leg	BT100140- Rohn 5EH w/ 2" SR (60-80)	194	-202.914	319.408	63.5	Pass	
T14	60 - 40	Leg	BT100140- Rohn 5EH w/ 2" SR (40-60)	209	-233.537	400.743	58.3	Pass	
T15	40 - 30	Leg	BT100140- Rohn 6EHS w/ 2" SR (30-40)	230	-250.927	373.300	67.2	Pass	
T16	30 - 20	Leg	BT100140- Rohn 6EHS w/ 2" SR (20-30)	239	-265.219	439.396	60.4	Pass	
T17	20 - 0	Leg	BT100140- Rohn 6EH w/ 2" SR	251	-297.529	437.361	68.0	Pass	
T1	180 - 160	Diagonal	L2x2x1/4	10	-5.294	21.921	24.2	Pass	
T2	160 - 155	Diagonal	L1 3/4x1 3/4x3/16	43	-4.592	8.960	51.2	Pass	
T3	155 - 150	Diagonal	L1 3/4x1 3/4x3/16	52	-4.502	8.115	55.5	Pass	
T4	150 - 145	Diagonal	L2x2x1/4	61	-5.640	14.435	39.1	Pass	
T5	145 - 140	Diagonal	2L1 3/4x1 3/4x3/16x3/16	70	-5.539	10.763	51.5	Pass	
T6	140 - 133.333	Diagonal	2L2x2x3/16x1/2	82	-6.930	34.333	20.2	Pass	
T7	133.333 - 126.667	Diagonal	2L2x2x3/16x1/2	91	-7.063	31.258	22.6	Pass	
T8	126.667 - 120	Diagonal	2L2x2x3/16x1/2	108	-7.697	40.133	19.2	Pass	
T9	120 - 113.333	Diagonal	2L2 1/2x2 1/2x3/16x1/2	145	-7.370	43.852	16.8	Pass	
T10	113.333 - 106.667	Diagonal	2L2 1/2x2 1/2x3/16x1/2	157	-7.624	41.968	18.2	Pass	
T11	106.667 - 100	Diagonal	2L2 1/2x2 1/2x3/16x1/2	169	-7.043	41.098	17.1	Pass	
T12	100 - 80	Diagonal	2L3x3x3/16x1/2	178	-7.813	48.925	16.0	Pass	
T13	80 - 60	Diagonal	2L3x3x3/16x1/4	199	-9.370	36.097	26.0	Pass	
T14	60 - 40	Diagonal	2L3x3x1/4x1/4	213	-10.539	41.581	25.3	Pass	
T15	40 - 30	Diagonal	2L3 1/2x3 1/2x1/4x1/4	234	-10.168	60.389	16.8	Pass	
T16	30 - 20	Diagonal	2L3 1/2x3 1/2x1/4x1/4	243	-11.889	54.955	21.6	Pass	
T17	20 - 0	Diagonal	L4x4x1/4	255	-11.317	20.932	54.1	Pass	
T8	126.667 - 120	Horizontal	L2 1/2x2 1/2x1/4	100	-1.746	14.671	11.9	Pass	
T5	145 - 140	Secondary Horizontal	L2x2x1/4	73	-1.105	11.066	10.0	Pass	
T7	133.333 - 126.667	Secondary Horizontal	L2x2x1/4	94	-1.544	8.365	18.5	Pass	
T9	120 - 113.333	Secondary Horizontal	L2 1/2x2 1/2x1/4	148	-1.978	12.994	15.2	Pass	
T10	113.333 - 106.667	Secondary Horizontal	L2 1/2x2 1/2x1/4	160	-2.181	11.476	19.0	Pass	
T14	60 - 40	Secondary Horizontal	L3x3x1/4	217	-4.050	8.153	49.7	Pass	
T16	30 - 20	Secondary Horizontal	L3 1/2x3 1/2x1/4	247	-4.600	10.692	43.0	Pass	
T1	180 - 160	Top Girt	L2x2x1/8	6	-0.100	4.273	2.3	Pass	
T8	126.667 - 120	Redund Horz 1 Bracing	L2x2x1/4	105	1.746	25.709	6.8	Pass	
T8	126.667 - 120	Redund Diag 1 Bracing	L2x2x1/4	129	-1.158	26.237	4.4	Pass	
							Summary		
							Leg (T10)	77.8	Pass
							Diagonal (T3)	55.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						Horizontal (T8)	11.9	Pass
						Secondary Horizontal (T14)	49.7	Pass
						Top Girt (T1)	2.3	Pass
						Redund Horz 1 Bracing (T8)	6.8	Pass
						Redund Diag 1 Bracing (T8)	4.4	Pass
						Bolt Checks	74.8	Pass
						RATING =	77.8	Pass

***NOTE: Above stress ratios for reinforced sections are approximate. More exact calculations are presented in Appendix C.**

APPENDIX B
BASE LEVEL DRAWING



APPENDIX C
ADDITIONAL CALCULATIONS

Pipe with SR on Heel 100' to 110'

LOADS

Compression: $C_u := 115.076 \text{kip}$

Apply TIA-222-H Section 15.5?

No
Yes

Tension: $T_u := 144.095 \text{kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 4 \text{in}$

Nominal Thickness: $T_L := 0.318 \text{in}$

Yield Strength: $F_{y_L} := 50 \text{ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ksi}$

Unbraced Length: $L_{u_L} := 80.1 \text{in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{in}$

Yield Strength: $F_{y_R} := 105 \text{ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{in}$ (0.001in if Fully Welded)

End Connection Type: Fixed
 Free

Intermediate Connection Type: Bolted
 Welded (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check: Yes
 No

Consider Reinforcement for Tension?: Yes
 No

Consider Components as Composite?: Yes
 No

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 12.58$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 3.36 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 3.68 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 6.28 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 1.31 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 2 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 2 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 6.28 \cdot \text{in}^4$$

$$I_{yy} := I_L = 6.28 \cdot \text{in}^4$$

$$r_{xL} := r_L = 1.31 \cdot \text{in}$$

$$r_{yL} := r_L = 1.31 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 3.14 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia:
$$I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$$

Section Modulus:
$$S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$$

Radius of Gyration:
$$r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$$

Gap:
$$g := 10 \text{in} - \left(\frac{D_R}{2} \right) - \left(\frac{D_{L_out}}{2} \right)$$

$$g = 7 \cdot \text{in}$$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area:
$$A_T := A_L + A_R = 6.82 \cdot \text{in}^2$$

Centroid:
$$x_{\text{bar}1} := x_{\text{bar}_L} + D_R = 4 \cdot \text{in}$$

$$x_{\text{bar}2} := x_{\text{bar}_R} + g = 8 \cdot \text{in}$$

$$A_L \cdot x_{\text{bar}1} = 14.71 \cdot \text{in}^3$$

$$A_R \cdot x_{\text{bar}2} = 25.13 \cdot \text{in}^3$$

$$A_{x_{\text{total}}} := A_L \cdot x_{\text{bar}1} + A_R \cdot x_{\text{bar}2} = 39.85 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{\text{total}}}}{A_T} = 5.84 \cdot \text{in}$$

Moments of Inertia:
$$I_x := I_{xx} + I_R = 7.07 \cdot \text{in}^4$$

$$I_{\text{bar}_yL} := I_{yy} + A_L \cdot (x_0 - x_{\text{bar}1})^2 = 18.77 \cdot \text{in}^4$$

$$I_{\text{bar}_yR} := I_R + A_R \cdot (x_0 - x_{\text{bar}2})^2 = 15.41 \cdot \text{in}^4$$

$$I_y := I_{\text{bar}_yL} + I_{\text{bar}_yR} = 34.18 \cdot \text{in}^4$$

Radii of Gyration:
$$r_x := \sqrt{\frac{I_x}{A_T}} = 1.02 \cdot \text{in}$$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 2.24 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 3.68 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 6.28 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 6.28 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 1.307 \cdot \text{in}$$

$$r_{yL} = 1.31 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 6.82 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 7.07 \cdot \text{in}^4$$

$$I_y = 34.18 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.018 \cdot \text{in}$$

$$r_y = 2.239 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 3.53 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 3.53 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 3.8 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 5.85 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 12.58$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 61.3$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{D_R} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{D_R} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \frac{0.337E}{0.5 \cdot D_R} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 78.7$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{r_o} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{r_o}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 100.14$$

$$KL_{r_m} := \begin{cases} \sqrt{KL_{r_o}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 106.66$$

Spacing Requirement Verification:

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{r_o} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 160.2$$

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq KL_{r_m} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 160.2$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'y_L = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 76.16 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'y_L}{F_{e_L}} \right) \cdot F'y_L & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'y_L}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 37.99 \cdot \text{ksi}$$

$$A_L = 3.68 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 125.76 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 39.58\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 49.35\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 49.35\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 47.0%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F'y_L \cdot A_L & \text{if Crushing} = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing} = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 165.53 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}}$ if Tension = "No" = 46.95.%
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}}\right)$ otherwise

TensionYielding :=	TensionYielding if S15Allowable = "No" = 44.7.%
	$\frac{TensionYielding}{1.05}$ if S15Allowable = "Yes"

TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 3.68 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rn_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 179.32 \cdot \text{kip}$

$\phi T_{rn_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rn_L}}$ if Tension = "No" = 43.34.%
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rn_R}}\right)$ otherwise

TensionRupture :=	TensionRupture if S15Allowable = "No" = 41.3.%
	$\frac{TensionRupture}{1.05}$ if S15Allowable = "Yes"

ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 47.0%

CrushingStrength = 0.0%

TensionYielding = 44.72.0%

TensionRupture = 41.28.0%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 47.0%

Pipe with SR on Heel 80' to 100'

LOADS

Compression: $C_u := 172.302 \text{ kip}$

Apply TIA-222-H Section 15.5?

Tension: $T_u := 144.095 \text{ kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 4.5 \text{ in}$

Nominal Thickness: $T_L := 0.337 \text{ in}$

Yield Strength: $F_{y_L} := 50 \text{ ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ ksi}$

Unbraced Length: $L_{u_L} := 80.2 \text{ in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{ in}$

Yield Strength: $F_{y_R} := 105 \text{ ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{ in}$ (0.001 in if Fully Welded)

End Connection Type:

Intermediate Connection Type:
 (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check:

Consider Reinforcement for Tension?:

Consider Components as Composite?:

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 13.35$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 3.83 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 4.41 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 9.61 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 1.48 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 2.25 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 2.25 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 9.61 \cdot \text{in}^4$$

$$I_{yy} := I_L = 9.61 \cdot \text{in}^4$$

$$r_{xL} := r_L = 1.48 \cdot \text{in}$$

$$r_{yL} := r_L = 1.48 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 4.27 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia: $I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$

Section Modulus: $S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$

Radius of Gyration: $r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$

Gap: $g := 10 \text{in} - \left(\frac{D_R}{2}\right) - \left(\frac{D_{L_out}}{2}\right)$
 $g = 6.75 \cdot \text{in}$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area: $A_T := A_L + A_R = 7.55 \cdot \text{in}^2$

Centroid: $x_{\text{bar}1} := x_{\text{bar}_L} + D_R = 4.25 \cdot \text{in}$

$$x_{\text{bar}2} := x_{\text{bar}_R} + g = 7.75 \cdot \text{in}$$

$$A_L \cdot x_{\text{bar}1} = 18.73 \cdot \text{in}^3$$

$$A_R \cdot x_{\text{bar}2} = 24.35 \cdot \text{in}^3$$

$$A_{x_{\text{total}}} := A_L \cdot x_{\text{bar}1} + A_R \cdot x_{\text{bar}2} = 43.08 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{\text{total}}}}{A_T} = 5.71 \cdot \text{in}$$

Moments of Inertia: $I_x := I_{xx} + I_R = 10.4 \cdot \text{in}^4$

$$I_{\text{bar}_yL} := I_{yy} + A_L \cdot (x_0 - x_{\text{bar}1})^2 = 18.96 \cdot \text{in}^4$$

$$I_{\text{bar}_yR} := I_R + A_R \cdot (x_0 - x_{\text{bar}2})^2 = 13.9 \cdot \text{in}^4$$

$$I_y := I_{\text{bar}_yL} + I_{\text{bar}_yR} = 32.86 \cdot \text{in}^4$$

Radii of Gyration: $r_x := \sqrt{\frac{I_x}{A_T}} = 1.17 \cdot \text{in}$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 2.09 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 4.41 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 9.61 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 9.61 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 1.477 \cdot \text{in}$$

$$r_{yL} = 1.48 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 7.55 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 10.4 \cdot \text{in}^4$$

$$I_y = 32.86 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.174 \cdot \text{in}$$

$$r_y = 2.087 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 4.62 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 4.62 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 3.76 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 5.76 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 13.35$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 54.31$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{\frac{D_R}{0.5 \cdot D_R} \cdot F_{y_R}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{\frac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 68.34$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{r_o} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{r_o}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 92.22$$

$$KL_{r_m} := \begin{cases} \sqrt{KL_{r_o}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 99.27$$

Spacing Requirement Verification:

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{r_o} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 160.4$$

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq KL_{r_m} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 160.4$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'_{y_L} = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 97.03 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'_{y_L}}{F_{e_L}} \right) \cdot F'_{y_L} & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'_{y_L}}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 40.3 \cdot \text{ksi}$$

$$A_L = 4.41 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 159.86 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 53.54\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 62.93\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 62.93\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 59.9%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F_{y_L} \cdot A_L & \text{if Crushing} = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing} = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 198.33 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}}$ if Tension = "No" = 42.42.%
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}}\right)$ otherwise

TensionYielding :=	TensionYielding if S15Allowable = "No" = 40.4.%
	$\frac{TensionYielding}{1.05}$ if S15Allowable = "Yes"

TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 4.41 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rn_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 214.86 \cdot \text{kip}$

$\phi T_{rn_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rn_L}}$ if Tension = "No" = 39.15.%
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rn_R}}\right)$ otherwise

TensionRupture :=	TensionRupture if S15Allowable = "No" = 37.3.%
	$\frac{TensionRupture}{1.05}$ if S15Allowable = "Yes"

ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 59.93·%

CrushingStrength = 0·%

TensionYielding = 40.4·%

TensionRupture = 37.29·%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 59.93·%

Pipe with SR on Heel 60' to 80'

LOADS

Compression: $C_u := 202.914 \text{kip}$

Apply TIA-222-H Section 15.5?

No
Yes

Tension: $T_u := 170.020 \text{kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 5.563 \text{in}$

Nominal Thickness: $T_L := 0.375 \text{in}$

Yield Strength: $F_{y_L} := 50 \text{ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ksi}$

Unbraced Length: $L_{u_L} := 120.2 \text{in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{in}$

Yield Strength: $F_{y_R} := 105 \text{ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{in}$ (0.001 in if Fully Welded)

End Connection Type: Fixed
 Free

Intermediate Connection Type: Bolted
 Welded (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check: Yes
 No

Consider Reinforcement for Tension?: Yes
 No

Consider Components as Composite?: Yes
 No

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 14.83$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 4.81 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 6.11 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 20.67 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 1.84 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 2.78 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 2.78 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 20.67 \cdot \text{in}^4$$

$$I_{yy} := I_L = 20.67 \cdot \text{in}^4$$

$$r_{xL} := r_L = 1.84 \cdot \text{in}$$

$$r_{yL} := r_L = 1.84 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 7.43 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia:
$$I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$$

Section Modulus:
$$S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$$

Radius of Gyration:
$$r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$$

Gap:
$$g := 10 \text{in} - \left(\frac{D_R}{2} \right) - \left(\frac{D_{L_out}}{2} \right)$$

$$g = 6.22 \cdot \text{in}$$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area:
$$A_T := A_L + A_R = 9.25 \cdot \text{in}^2$$

Centroid:
$$x_{\text{bar}1} := x_{\text{bar}_L} + D_R = 4.78 \cdot \text{in}$$

$$x_{\text{bar}2} := x_{\text{bar}_R} + g = 7.22 \cdot \text{in}$$

$$A_L \cdot x_{\text{bar}1} = 29.22 \cdot \text{in}^3$$

$$A_R \cdot x_{\text{bar}2} = 22.68 \cdot \text{in}^3$$

$$A_{x_{\text{total}}} := A_L \cdot x_{\text{bar}1} + A_R \cdot x_{\text{bar}2} = 51.9 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{\text{total}}}}{A_T} = 5.61 \cdot \text{in}$$

Moments of Inertia:
$$I_x := I_{xx} + I_R = 21.46 \cdot \text{in}^4$$

$$I_{\text{bar}_yL} := I_{yy} + A_L \cdot (x_0 - x_{\text{bar}1})^2 = 24.85 \cdot \text{in}^4$$

$$I_{\text{bar}_yR} := I_R + A_R \cdot (x_0 - x_{\text{bar}2})^2 = 8.93 \cdot \text{in}^4$$

$$I_y := I_{\text{bar}_yL} + I_{\text{bar}_yR} = 33.78 \cdot \text{in}^4$$

Radii of Gyration:
$$r_x := \sqrt{\frac{I_x}{A_T}} = 1.52 \cdot \text{in}$$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.91 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 6.11 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 20.67 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 20.67 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 1.839 \cdot \text{in}$$

$$r_{yL} = 1.84 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 9.25 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 21.46 \cdot \text{in}^4$$

$$I_y = 33.78 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.523 \cdot \text{in}$$

$$r_y = 1.911 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 7.71 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 7.71 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 4.11 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 6.02 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 14.83$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 65.36$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{\frac{D_R}{0.5 \cdot D_R} \cdot F_{y_R}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{\frac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 78.94$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{rO} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{rO}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 100.33$$

$$KL_{rm} := \begin{cases} \sqrt{KL_{rO}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 106.84$$

Spacing Requirement Verification:

$$KL_{r_{max}} := \begin{cases} KL_{rm} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{rO} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 240.4$$

$$KL_{r_{max}} := \begin{cases} KL_{rm} & \text{if } \frac{a_i}{r_i} \leq KL_{rm} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 240.4$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'y_L = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 67 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'y_L}{F_{e_L}} \right) \cdot F'y_L & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'y_L}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 36.59 \cdot \text{ksi}$$

$$A_L = 6.11 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 201.25 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 51.44\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 66.6\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 66.6\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 63.4%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F'y_L \cdot A_L & \text{if Crushing} = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing} = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 275.04 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}}$ if Tension = "No" = 40.83. %
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}}\right)$ otherwise

TensionYielding :=	TensionYielding if S15Allowable = "No" = 38.9. %
	$\frac{\text{TensionYielding}}{1.05}$ if S15Allowable = "Yes"

TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 6.11 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rn_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 297.96 \cdot \text{kip}$

$\phi T_{rn_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rn_L}}$ if Tension = "No" = 37.69. %
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rn_R}}\right)$ otherwise

TensionRupture :=	TensionRupture if S15Allowable = "No" = 35.9. %
	$\frac{\text{TensionRupture}}{1.05}$ if S15Allowable = "Yes"

ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 63.42·%

CrushingStrength = 0·%

TensionYielding = 38.89·%

TensionRupture = 35.89·%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 63.42·%

Pipe with SR on Heel 40' to 60'

LOADS

Compression: $C_u := 233.537 \text{kip}$

Apply TIA-222-H Section 15.5?

Tension: $T_u := 195.377 \text{kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 5.563 \text{in}$

Nominal Thickness: $T_L := 0.375 \text{in}$

Yield Strength: $F_{y_L} := 50 \text{ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ksi}$

Unbraced Length: $L_{u_L} := 61.8 \text{in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{in}$

Yield Strength: $F_{y_R} := 105 \text{ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{in}$ (0.001in if Fully Welded)

End Connection Type:

Intermediate Connection Type:
 (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check:

Consider Reinforcement for Tension?:

Consider Components as Composite?:

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 14.83$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 4.81 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 6.11 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 20.67 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 1.84 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 2.78 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 2.78 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 20.67 \cdot \text{in}^4$$

$$I_{yy} := I_L = 20.67 \cdot \text{in}^4$$

$$r_{xL} := r_L = 1.84 \cdot \text{in}$$

$$r_{yL} := r_L = 1.84 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 7.43 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia:

$$I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$$

Section Modulus:

$$S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$$

Radius of Gyration:

$$r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$$

Gap:

$$g := 10 \text{in} - \left(\frac{D_R}{2} \right) - \left(\frac{D_{L_out}}{2} \right)$$
$$g = 6.22 \cdot \text{in}$$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area:

$$A_T := A_L + A_R = 9.25 \cdot \text{in}^2$$

Centroid:

$$x_{\text{bar}1} := x_{\text{bar}_L} + D_R = 4.78 \cdot \text{in}$$

$$x_{\text{bar}2} := x_{\text{bar}_R} + g = 7.22 \cdot \text{in}$$

$$A_L \cdot x_{\text{bar}1} = 29.22 \cdot \text{in}^3$$

$$A_R \cdot x_{\text{bar}2} = 22.68 \cdot \text{in}^3$$

$$A_{x_{\text{total}}} := A_L \cdot x_{\text{bar}1} + A_R \cdot x_{\text{bar}2} = 51.9 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{\text{total}}}}{A_T} = 5.61 \cdot \text{in}$$

Moments of Inertia:

$$I_x := I_{xx} + I_R = 21.46 \cdot \text{in}^4$$

$$I_{\text{bar}_yL} := I_{yy} + A_L \cdot (x_0 - x_{\text{bar}1})^2 = 24.85 \cdot \text{in}^4$$

$$I_{\text{bar}_yR} := I_R + A_R \cdot (x_0 - x_{\text{bar}2})^2 = 8.93 \cdot \text{in}^4$$

$$I_y := I_{\text{bar}_yL} + I_{\text{bar}_yR} = 33.78 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x := \sqrt{\frac{I_x}{A_T}} = 1.52 \cdot \text{in}$$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.91 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 6.11 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 20.67 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 20.67 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 1.839 \cdot \text{in}$$

$$r_{yL} = 1.84 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 9.25 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 21.46 \cdot \text{in}^4$$

$$I_y = 33.78 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.523 \cdot \text{in}$$

$$r_y = 1.911 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 7.71 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 7.71 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 4.11 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 6.02 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 14.83$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 33.6$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{\frac{D_R}{0.5 \cdot D_R} \cdot F_{y_R}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{\frac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 40.59$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{r_o} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{r_o}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 74.04$$

$$KL_{r_m} := \begin{cases} \sqrt{KL_{r_o}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 82.65$$

Spacing Requirement Verification:

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{r_o} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 123.6$$

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq KL_{r_m} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 123.6$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'_{y_L} = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 253.45 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'_{y_L}}{F_{e_L}} \right) \cdot F'_{y_L} & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'_{y_L}}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 46.04 \cdot \text{ksi}$$

$$A_L = 6.11 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 253.24 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 59.2\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 60.91\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 60.91\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 58.0%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F_{y_L} \cdot A_L & \text{if Crushing = "Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing = "Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 275.04 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}} \quad \text{if Tension = "No"} \quad = 46.92\%$ $\max \left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}} \right) \quad \text{otherwise}$
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TensionYielding :=	$\text{TensionYielding} \quad \text{if S15Allowable = "No"} \quad = 44.7\%$ $\frac{\text{TensionYielding}}{1.05} \quad \text{if S15Allowable = "Yes"}$
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TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 6.11 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rn_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 297.96 \cdot \text{kip}$

$\phi T_{rn_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rn_L}} \quad \text{if Tension = "No"} \quad = 43.31\%$ $\max \left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rn_R}} \right) \quad \text{otherwise}$
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TensionRupture :=	$\text{TensionRupture} \quad \text{if S15Allowable = "No"} \quad = 41.2\%$ $\frac{\text{TensionRupture}}{1.05} \quad \text{if S15Allowable = "Yes"}$
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ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 58.01·%

CrushingStrength = 0·%

TensionYielding = 44.69·%

TensionRupture = 41.25·%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 58.01·%

Pipe with SR on Heel 30' to 40'

LOADS

Compression: $C_u := 250.927 \text{kip}$

Apply TIA-222-H Section 15.5?

Tension: $T_u := 209.149 \text{kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 6.625 \text{in}$

Nominal Thickness: $T_L := 0.432 \text{in}$

Yield Strength: $F_{y_L} := 50 \text{ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ksi}$

Unbraced Length: $L_{u_L} := 120.2 \text{in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{in}$

Yield Strength: $F_{y_R} := 105 \text{ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{in}$ (0.001in if Fully Welded)

End Connection Type:

Intermediate Connection Type:
 (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check:

Consider Reinforcement for Tension?:

Consider Components as Composite?:

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 15.34$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 5.76 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 8.4 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 40.49 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 2.19 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 3.31 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 3.31 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 40.49 \cdot \text{in}^4$$

$$I_{yy} := I_L = 40.49 \cdot \text{in}^4$$

$$r_{xL} := r_L = 2.19 \cdot \text{in}$$

$$r_{yL} := r_L = 2.19 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 12.22 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia: $I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$

Section Modulus: $S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$

Radius of Gyration: $r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$

Gap: $g := 10 \text{in} - \left(\frac{D_R}{2}\right) - \left(\frac{D_{L_out}}{2}\right)$
 $g = 5.69 \cdot \text{in}$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area: $A_T := A_L + A_R = 11.55 \cdot \text{in}^2$

Centroid: $x_{bar1} := x_{bar_L} + D_R = 5.31 \cdot \text{in}$

$$x_{bar2} := x_{bar_R} + g = 6.69 \cdot \text{in}$$

$$A_L \cdot x_{bar1} = 44.65 \cdot \text{in}^3$$

$$A_R \cdot x_{bar2} = 21.01 \cdot \text{in}^3$$

$$A_{x_{total}} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 65.66 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{total}}}{A_T} = 5.69 \cdot \text{in}$$

Moments of Inertia: $I_x := I_{xx} + I_R = 41.28 \cdot \text{in}^4$

$$I_{bar_yL} := I_{yy} + A_L \cdot (x_0 - x_{bar1})^2 = 41.67 \cdot \text{in}^4$$

$$I_{bar_yR} := I_R + A_R \cdot (x_0 - x_{bar2})^2 = 3.93 \cdot \text{in}^4$$

$$I_y := I_{bar_yL} + I_{bar_yR} = 45.6 \cdot \text{in}^4$$

Radii of Gyration: $r_x := \sqrt{\frac{I_x}{A_T}} = 1.89 \cdot \text{in}$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.99 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 8.4 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 40.49 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 40.49 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 2.195 \cdot \text{in}$$

$$r_{yL} = 2.19 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 11.55 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 41.28 \cdot \text{in}^4$$

$$I_y = 45.6 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.891 \cdot \text{in}$$

$$r_y = 1.987 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 12.46 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 12.46 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 5.93 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 8.02 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 15.34$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 54.76$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{\frac{D_R}{0.5 \cdot D_R} \cdot F_{y_R}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{\frac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 63.57$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{rO} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{rO}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 88.75$$

$$KL_{rm} := \begin{cases} \sqrt{KL_{rO}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 96.05$$

Spacing Requirement Verification:

$$KL_{r_{max}} := \begin{cases} KL_{rm} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{rO} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 240.4$$

$$KL_{r_{max}} := \begin{cases} KL_{rm} & \text{if } \frac{a_i}{r_i} \leq KL_{rm} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 240.4$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A_{rw} := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'_{y_L} = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 95.44 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'_{y_L}}{F_{e_L}} \right) \cdot F'_{y_L} & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'_{y_L}}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 40.15 \cdot \text{ksi}$$

$$A_L = 8.4 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 303.75 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 50.97\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 60.13\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 60.13\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 57.3%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F_{y_L} \cdot A_L & \text{if Crushing} = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing} = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 378.22 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}} \text{ if Tension = "No" } = 40.25\%$ $\max \left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}} \right) \text{ otherwise}$	
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TensionYielding :=	TensionYielding if S15Allowable = "No" = 38.3%	
	$\frac{\text{TensionYielding}}{1.05}$ if S15Allowable = "Yes"	

TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 8.4 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rn_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 409.74 \cdot \text{kip}$

$\phi T_{rn_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rn_L}} \text{ if Tension = "No" } = 37.16\%$ $\max \left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rn_R}} \right) \text{ otherwise}$	
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TensionRupture :=	TensionRupture if S15Allowable = "No" = 35.4%	
	$\frac{\text{TensionRupture}}{1.05}$ if S15Allowable = "Yes"	

ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 57.27·%

CrushingStrength = 0·%

TensionYielding = 38.34·%

TensionRupture = 35.39·%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 57.27·%

Pipe with SR on Heel 20' to 30'

LOADS

Compression: $C_u := 265.219 \text{kip}$

Apply TIA-222-H Section 15.5?

Tension: $T_u := 220.628 \text{kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 6.625 \text{in}$

Nominal Thickness: $T_L := 0.432 \text{in}$

Yield Strength: $F_{y_L} := 50 \text{ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ksi}$

Unbraced Length: $L_{u_L} := 61.6 \text{in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{in}$

Yield Strength: $F_{y_R} := 105 \text{ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{in}$ (0.001in if Fully Welded)

End Connection Type:

Intermediate Connection Type:
 (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check:

Consider Reinforcement for Tension?:

Consider Components as Composite?:

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 15.34$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 5.76 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 8.4 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 40.49 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 2.19 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 3.31 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 3.31 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 40.49 \cdot \text{in}^4$$

$$I_{yy} := I_L = 40.49 \cdot \text{in}^4$$

$$r_{xL} := r_L = 2.19 \cdot \text{in}$$

$$r_{yL} := r_L = 2.19 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 12.22 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia:
$$I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$$

Section Modulus:
$$S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$$

Radius of Gyration:
$$r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$$

Gap:
$$g := 10 \text{in} - \left(\frac{D_R}{2} \right) - \left(\frac{D_{L_out}}{2} \right)$$

$$g = 5.69 \cdot \text{in}$$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area:
$$A_T := A_L + A_R = 11.55 \cdot \text{in}^2$$

Centroid:
$$x_{\text{bar}1} := x_{\text{bar}_L} + D_R = 5.31 \cdot \text{in}$$

$$x_{\text{bar}2} := x_{\text{bar}_R} + g = 6.69 \cdot \text{in}$$

$$A_L \cdot x_{\text{bar}1} = 44.65 \cdot \text{in}^3$$

$$A_R \cdot x_{\text{bar}2} = 21.01 \cdot \text{in}^3$$

$$A_{x_{\text{total}}} := A_L \cdot x_{\text{bar}1} + A_R \cdot x_{\text{bar}2} = 65.66 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{\text{total}}}}{A_T} = 5.69 \cdot \text{in}$$

Moments of Inertia:
$$I_x := I_{xx} + I_R = 41.28 \cdot \text{in}^4$$

$$I_{\text{bar}_yL} := I_{yy} + A_L \cdot (x_0 - x_{\text{bar}1})^2 = 41.67 \cdot \text{in}^4$$

$$I_{\text{bar}_yR} := I_R + A_R \cdot (x_0 - x_{\text{bar}2})^2 = 3.93 \cdot \text{in}^4$$

$$I_y := I_{\text{bar}_yL} + I_{\text{bar}_yR} = 45.6 \cdot \text{in}^4$$

Radii of Gyration:
$$r_x := \sqrt{\frac{I_x}{A_T}} = 1.89 \cdot \text{in}$$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.99 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 8.4 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 40.49 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 40.49 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 2.195 \cdot \text{in}$$

$$r_{yL} = 2.19 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 11.55 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 41.28 \cdot \text{in}^4$$

$$I_y = 45.6 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.891 \cdot \text{in}$$

$$r_y = 1.987 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 12.46 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 12.46 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 5.93 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 8.02 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 15.34$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 28.07$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{\frac{D_R}{0.5 \cdot D_R} \cdot F_{y_R}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{\frac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 32.58$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{r_o} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{r_o}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 69.97$$

$$KL_{r_m} := \begin{cases} \sqrt{KL_{r_o}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 79.03$$

Spacing Requirement Verification:

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{r_o} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 123.2$$

$$KL_{r_m} := \begin{cases} KL_{r_m} & \text{if } \frac{a_i}{r_i} \leq KL_{r_m} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 123.2$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'_{y_L} = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 363.38 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'_{y_L}}{F_{e_L}} \right) \cdot F'_{y_L} & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'_{y_L}}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 47.2 \cdot \text{ksi}$$

$$A_L = 8.4 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 357.06 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 53.88\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 54.07\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 54.07\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 51.5%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F_{y_L} \cdot A_L & \text{if Crushing} = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing} = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 378.22 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}}$ if Tension = "No" = 42.46.%
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}}\right)$ otherwise

TensionYielding :=	TensionYielding if S15Allowable = "No" = 40.4.%
	$\frac{\text{TensionYielding}}{1.05}$ if S15Allowable = "Yes"

TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 8.4 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rm_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 409.74 \cdot \text{kip}$

$\phi T_{rm_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rm_L}}$ if Tension = "No" = 39.2.%
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rm_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rm_R}}\right)$ otherwise

TensionRupture :=	TensionRupture if S15Allowable = "No" = 37.3.%
	$\frac{\text{TensionRupture}}{1.05}$ if S15Allowable = "Yes"

ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 51.49·%

CrushingStrength = 0·%

TensionYielding = 40.44·%

TensionRupture = 37.33·%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 51.49·%

Pipe with SR on Heel 0' to 20'

LOADS

Compression: $C_u := 297.529 \text{ kip}$

Apply TIA-222-H Section 15.5?

Tension: $T_u := 246.501 \text{ kip}$

EXISTING PIPE LEG INPUTS

Outside Diameter: $D_{L_out} := 6.625 \text{ in}$

Nominal Thickness: $T_L := 0.432 \text{ in}$

Yield Strength: $F_{y_L} := 50 \text{ ksi}$

Ultimate Strength: $F_{u_L} := 65 \text{ ksi}$

Unbraced Length: $L_{u_L} := 120.204 \text{ in}$

REINFORCEMENT INPUTS

Diameter: $D_R := 2 \text{ in}$

Yield Strength: $F_{y_R} := 105 \text{ ksi}$

Ultimate Strength: $F_{u_R} := 125 \text{ ksi}$

Intermediate Spacing: $L_{u_R} := 36 \text{ in}$ (0.001 in if Fully Welded)

End Connection Type:

Intermediate Connection Type:
 (Fully tightened bolted connections are considered the same as welded)

Leg Crushing Check:

Consider Reinforcement for Tension?:

Consider Components as Composite?:

EXISTING PIPE LEG PROPERTIES

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 15.34$

Inside Diameter: $D_{L_in} := D_{L_out} - 2 \cdot T_L = 5.76 \cdot \text{in}$

Area: $A_L := \frac{\pi}{4} \cdot (D_{L_out}^2 - D_{L_in}^2) = 8.4 \cdot \text{in}^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot (D_{L_out}^4 - D_{L_in}^4) = 40.49 \cdot \text{in}^4$

Radius of Gyration: $r_L := \sqrt{\frac{D_{L_out}^2 + D_{L_in}^2}{4}} = 2.19 \cdot \text{in}$

Centroid Coordinates: $x_L := 0.5D_{L_out} = 3.31 \cdot \text{in}$

$$y_L := 0.5D_{L_out} = 3.31 \cdot \text{in}$$

Location of Centroid of Cross-Section

Distance of Centroid of Cross-Section from Reference Axis: $x_{\text{bar}_L} := x_L$

Pipe Properties

$$I_{xx} := I_L = 40.49 \cdot \text{in}^4$$

$$I_{yy} := I_L = 40.49 \cdot \text{in}^4$$

$$r_{xL} := r_L = 2.19 \cdot \text{in}$$

$$r_{yL} := r_L = 2.19 \cdot \text{in}$$

Section Moduli

$$S_L := \frac{I_L}{x_{\text{bar}_L}} = 12.22 \cdot \text{in}^3$$

SOLID ROUND REINFORCEMENT PROPERTIES

Centroid: $x_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$

$$y_{\text{bar}_R} := 0.5D_R = 1 \cdot \text{in}$$

Area: $A_R := \frac{\pi D_R^2}{4} = 3.14 \cdot \text{in}^2$

Moment of Inertia:
$$I_R := \frac{\pi D_R^4}{64} = 0.79 \cdot \text{in}^4$$

Section Modulus:
$$S_R := \frac{\pi D_R^3}{32} = 0.79 \cdot \text{in}^3$$

Radius of Gyration:
$$r_R := \frac{D_R}{4} = 0.5 \cdot \text{in}$$

Gap:
$$g := 10 \text{in} - \left(\frac{D_R}{2} \right) - \left(\frac{D_{L_out}}{2} \right)$$

$$g = 5.69 \cdot \text{in}$$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area:
$$A_T := A_L + A_R = 11.55 \cdot \text{in}^2$$

Centroid:
$$x_{\text{bar}1} := x_{\text{bar}_L} + D_R = 5.31 \cdot \text{in}$$

$$x_{\text{bar}2} := x_{\text{bar}_R} + g = 6.69 \cdot \text{in}$$

$$A_L \cdot x_{\text{bar}1} = 44.65 \cdot \text{in}^3$$

$$A_R \cdot x_{\text{bar}2} = 21.01 \cdot \text{in}^3$$

$$A_{x_{\text{total}}} := A_L \cdot x_{\text{bar}1} + A_R \cdot x_{\text{bar}2} = 65.66 \cdot \text{in}^3$$

$$x_0 := \frac{A_{x_{\text{total}}}}{A_T} = 5.69 \cdot \text{in}$$

Moments of Inertia:
$$I_x := I_{xx} + I_R = 41.28 \cdot \text{in}^4$$

$$I_{\text{bar}_yL} := I_{yy} + A_L \cdot (x_0 - x_{\text{bar}1})^2 = 41.67 \cdot \text{in}^4$$

$$I_{\text{bar}_yR} := I_R + A_R \cdot (x_0 - x_{\text{bar}2})^2 = 3.93 \cdot \text{in}^4$$

$$I_y := I_{\text{bar}_yL} + I_{\text{bar}_yR} = 45.6 \cdot \text{in}^4$$

Radii of Gyration:
$$r_x := \sqrt{\frac{I_x}{A_T}} = 1.89 \cdot \text{in}$$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.99 \cdot \text{in}$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$$A_L = 8.4 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xL} := I_{xx} = 40.49 \cdot \text{in}^4$$

$$I_{yL} := I_{yy} = 40.49 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xL} = 2.195 \cdot \text{in}$$

$$r_{yL} = 2.19 \cdot \text{in}$$

SOLID ROD RIENFORCEMENT

Area:

$$A_R = 3.14 \cdot \text{in}^2$$

Moment of Inertias:

$$I_{xR} := I_R = 0.79 \cdot \text{in}^4$$

$$I_{yR} := I_R = 0.79 \cdot \text{in}^4$$

Radii of Gyration:

$$r_{xR} := r_R = 0.5 \cdot \text{in}$$

$$r_{yR} := r_R = 0.5 \cdot \text{in}$$

COMPOSITE SECTION

Area:

$$A_T = 11.55 \cdot \text{in}^2$$

Moment of Inertias:

$$I_x = 41.28 \cdot \text{in}^4$$

$$I_y = 45.6 \cdot \text{in}^4$$

Radii of Gyration:

$$r_x = 1.891 \cdot \text{in}$$

$$r_y = 1.987 \cdot \text{in}$$

Elastic Section Moduli:

$$S_{x_top} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 12.46 \cdot \text{in}^3$$

$$S_{x_bot} := \frac{I_x}{\max(0.5D_{L_out}, 0.5 \cdot D_R)} = 12.46 \cdot \text{in}^3$$

$$S_{y_right} := \frac{I_y}{0.5D_{L_out} + g + D_R - x_{bar_L}} = 5.93 \cdot \text{in}^3$$

$$S_{y_left} := \frac{I_y}{x_0} = 8.02 \cdot \text{in}^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

Steel Modulus of Elasticity: $E := 29000\text{ksi}$

Diameter to Thickness Ratio: $\frac{D_{L_out}}{T_L} = 15.34$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_L} := \begin{cases} F_{y_L} & \text{if } \frac{D_{L_out}}{T_L} \leq 0.114 \frac{E}{F_{y_L}} \\ \left(\frac{0.0379E}{\frac{D_{L_out}}{T_L} \cdot F_{y_L}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 0.448 \frac{E}{F_{y_L}} \\ \frac{0.337E}{\frac{D_{L_out}}{T_L}} & \text{if } 0.448 \frac{E}{F_{y_L}} < \frac{D_{L_out}}{T_L} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 50\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL_{rL} := \frac{K_L \cdot L_{u_L}}{r_L} = 54.77$

REINFORCEMENT DATA

$$\frac{D_R}{0.5 \cdot D_R} = 2$$

Effective Yield Stress (TIA-222-H Section 4.5.4.1):

$$F'_{y_R} := \begin{cases} F_{y_R} & \text{if } \frac{D_R}{0.5 \cdot D_R} \leq 0.114 \frac{E}{F_{y_R}} \\ \left(\frac{0.0379E}{\frac{D_R}{0.5 \cdot D_R} \cdot F_{y_R}} + \frac{2}{3} \right) \cdot F_{y_L} & \text{if } 0.114 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 0.448 \frac{E}{F_{y_R}} \\ \frac{0.337E}{\frac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \frac{E}{F_{y_R}} < \frac{D_R}{0.5 \cdot D_R} \leq 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

Effective Length Factor: $K_R := \begin{cases} 1.0 & \text{if Intermediate} = \text{"Bolted"} \\ 0.8 & \text{if Intermediate} = \text{"Welded"} \end{cases}$

Effective Slenderness Ratio: $KL_{rR} := \frac{K_R \cdot L_{u_R}}{\min(r_{xR}, r_{yR})} = 72$

BUILT-UP MEMBER (TIA-222-H Section 4.5.3):

Minimum Radius of Gyration of Individual Component:

$$r_i := \min(r_{xL}, r_{yL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Radius of Gyration of Individual Component About its Centroidal Axis Parallel to the Axis of Buckling under consideration for the Built-Up Member:

$$r_{ib} := \min(r_{xL}, r_{xR}, r_{yR}) = 0.5 \cdot \text{in}$$

Distance between Connectors: $a_i := L_{u_R} = 36 \cdot \text{in}$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

Effective Slenderness Ratio of Built-up Member Acting as a Unit:

$$KL_{rO} := \frac{1.0 \cdot \max(L_{u_L}, L_{u_R})}{\min(r_x, r_y)} = 63.58$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL_{rO} & \text{if } \frac{a_i}{r_i} \leq 40 \\ \sqrt{KL_{rO}^2 + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 88.75$$

$$KL_{rm} := \begin{cases} \sqrt{KL_{rO}^2 + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 96.05$$

Spacing Requirement Verification:

$$KL_{r_{max}} := \begin{cases} KL_{rm} & \text{if } \frac{a_i}{r_i} \leq 0.75 \cdot KL_{rO} \\ \frac{\max(K_L \cdot L_{u_L}, K_R \cdot L_{u_R})}{r_{ib}} & \text{otherwise} \end{cases} = 240.41$$

$$KL_{r_{max}} := \begin{cases} KL_{rm} & \text{if } \frac{a_i}{r_i} \leq KL_{rm} \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 240.41$$

COMPRESSIVE STRENGTH
(REINFORCEMENT)
[AISC 15th Ed. Section E3]

$$F_y := \min(F_y_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL_{rR}^2} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658 \left(\frac{F_y}{F_e}\right) \cdot F_y & \text{if } \frac{F_y}{F_e} \leq 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A_w := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
 (Reinforcement):

$$\phi C_{n_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot \text{kip}$$

COMPRESSIVE STRENGTH
(ORIGINAL LEG)
 [TIA-222-H Section 4.5.4.2]

$$F'_{y_L} = 50 \cdot \text{ksi}$$

$$F_{e_L} := \frac{\pi^2 \cdot E}{KL_{rL}^2} = 95.43 \cdot \text{ksi}$$

$$F_{cr_L} := \begin{cases} 0.658 \left(\frac{F'_{y_L}}{F_{e_L}} \right) \cdot F'_{y_L} & \text{if } KL_{rL} \leq 4.71 \sqrt{\frac{E}{F'_{y_L}}} \\ 0.877 \cdot F_{e_L} & \text{otherwise} \end{cases} = 40.15 \cdot \text{ksi}$$

$$A_L = 8.4 \cdot \text{in}^2$$

Reduction Factor
 (Original Leg):

$$\phi_{c_L} := 0.9$$

Design Compressive Strength
 (Original Leg):

$$\phi C_{n_L} := \phi_{c_L} \cdot A_L \cdot F_{cr_L} = 303.74 \cdot \text{kip}$$

$$C_{\text{reinf}} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n_R}} = 60.44\% \quad C_{\text{Leg}} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n_L}} = 71.3\%$$

$$\text{CompressiveStrength} := \max(C_{\text{reinf}}, C_{\text{Leg}}) = 71.3\%$$

CompressiveStrength :=	CompressiveStrength if S15Allowable = "No" = 67.9%
	$\frac{\text{CompressiveStrength}}{1.05}$ if S15Allowable = "Yes"

Crushing Strength:

$$\phi C_{u_Crushing} := \begin{cases} \phi_c \cdot F_{y_L} \cdot A_L & \text{if Crushing} = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{cases} = \text{"N/A"} \cdot \text{kip}$$

$$\text{CrushingStrength} := \begin{cases} \frac{C_u}{\phi C_{u_Crushing}} & \text{if Crushing} = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0\%$$

CrushingStrength :=	CrushingStrength if S15Allowable = "No" = 0.0%
	$\frac{\text{CrushingStrength}}{1.05}$ if S15Allowable = "Yes"

Flexural-Torsional Buckling:

Flexural_Torsional :=	"Redesign" if $L_{u_L} \leq L_{u_R}$ = 0.0%
	0% otherwise

TENSION YIELDING STRENGTH (TIA-222-H Section 4.6.3)

Reduction Factor: $\phi_{ty} := 0.9$

Design Strengths: $\phi T_{yn_L} := \phi_{ty} \cdot A_L \cdot F_{y_L} = 378.22 \cdot \text{kip}$

$\phi T_{yn_R} := \phi_{ty} \cdot A_R \cdot F_{y_R} = 296.88 \cdot \text{kip}$

TensionYielding :=	$\frac{T_u}{\phi T_{yn_L}}$ if Tension = "No" = 47.44. %
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{yn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{yn_R}}\right)$ otherwise

TensionYielding :=	TensionYielding if S15Allowable = "No" = 45.2. %
	$\frac{TensionYielding}{1.05}$ if S15Allowable = "Yes"

TENSION RUPTURE STRENGTH (TIA-222-H Section 4.6.3 and 4.6.3.2)

Reduction Factor: $\phi_{tr} := 0.75$

Net Areas: $U := 1.0$

$A_{n_L} := A_L \cdot U = 8.4 \cdot \text{in}^2$

$A_{n_R} := A_R \cdot U = 3.14 \cdot \text{in}^2$

Design Strengths: $\phi T_{rn_L} := \phi_{tr} \cdot A_{n_L} \cdot F_{u_L} = 409.74 \cdot \text{kip}$

$\phi T_{rn_R} := \phi_{tr} \cdot A_{n_R} \cdot F_{u_R} = 294.52 \cdot \text{kip}$

TensionRupture :=	$\frac{T_u}{\phi T_{rn_L}}$ if Tension = "No" = 43.79. %
	$\max\left(\frac{T_u \frac{A_L}{A_T}}{\phi T_{rn_L}}, \frac{T_u \frac{A_R}{A_T}}{\phi T_{rn_R}}\right)$ otherwise

TensionRupture :=	TensionRupture if S15Allowable = "No" = 41.7. %
	$\frac{TensionRupture}{1.05}$ if S15Allowable = "Yes"

ANALYSIS / DESIGN SUMMARY

CompressiveStrength = 67.91·%

CrushingStrength = 0·%

TensionYielding = 45.18·%

TensionRupture = 41.71·%

RATING := max(CompressiveStrength, CrushingStrength, TensionYielding, TensionRupture)

RATING = 67.91·%

Self Support Anchor Rod Capacity



Site Info	
BU #	806478
Site Name	HRT 080 953381
Order #	553396 Rev. 0

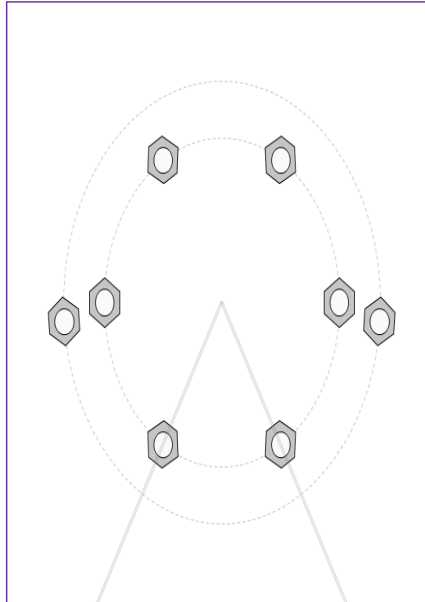
Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	See Custom Sheet
I_{ar} (in)	See Custom Sheet

Applied Loads		
	Comp.	Uplift
Axial Force (kips)	305.12	252.61
Shear Force (kips)	32.39	27.54

*TIA-222-H Section 15.5 Applied

Considered Eccentricity	
Leg Mod Eccentricity (in)	0.000
Anchor Rod N.A Shift (in)	-0.185
Total Eccentricity (in)	-0.185

*Anchor Rod Eccentricity Applied



Connection Properties	Analysis Results
-----------------------	------------------

Anchor Rod Data	
GROUP 1:	(6) 1" \emptyset bolts (A449 N; $F_y=92$ ksi, $F_u=120$ ksi) on 12.625" BC
I_{ar} (in):	0
GROUP 2:	(2) 1" \emptyset bolts (A193 Gr. B7 N; $F_y=105$ ksi, $F_u=125$ ksi) on 17" BC
pos. (deg):	355, 185
I_{ar} (in):	0

Anchor Rod Summary		<i>(units of kips, kip-in)</i>	
GROUP 1:			
$Pu_t = 33.77$	$\phi Pn_t = 54.54$	Stress Rating	
$Vu = 4.59$	$\phi Vn = 35.34$	59.0%	
$Mu = n/a$	$\phi Mn = n/a$	Pass	
GROUP 2:			
$Pu_t = 31.36$	$\phi Pn_t = 56.81$	Stress Rating	
$Vu = 0$	$\phi Vn = 36.82$	52.6%	
$Mu = n/a$	$\phi Mn = n/a$	Pass	

Pier and Pad Foundation



BU # :	806478
Site Name:	HRT 080 953381
App. Number:	553396 Rev. 0

TIA-222 Revision:	H
Tower Type:	Self Support

Top & Bot. Pad Rein. Different?:	<input type="checkbox"/>
Block Foundation?:	<input type="checkbox"/>
Rectangular Pad?:	<input type="checkbox"/>

Superstructure Analysis Reactions		
Compression, P_{comp} :	305.12	kips
Compression Shear, V_{u_comp} :	32.39	kips
Uplift, P_{uplift} :	252.61	kips
Uplift Shear, V_{u_uplift} :	27.54	kips
Tower Height, H :	180	ft
Base Face Width, BW :	22.86	ft
BP Dist. Above Fdn, bp_{dist} :	2.5	in

Foundation Analysis Checks				
	Capacity	Demand	Rating*	Check
Uplift (kips)	250.12	252.61	96.2%	Pass
Lateral (Sliding) (kips)	73.36	27.54	35.8%	Pass
Bearing Pressure (ksf)	23.38	7.30	29.7%	Pass
Pier Flexure (Comp.) (kip*ft)	2060.10	259.12	12.0%	Pass
Pier Flexure (Tension) (kip*ft)	1155.70	220.32	18.2%	Pass
Pier Compression (kip)	8751.60	341.12	3.7%	Pass
Pad Flexure (kip*ft)	337.92	29.05	8.2%	Pass
Pad Shear - 1-way (kips)	139.60	0.00	0.0%	Pass
Pad Shear - 2-way (Comp) (ksi)	0.164	0.017	9.8%	Pass
Flexural 2-way (Comp) (kip*ft)	675.84	155.47	21.9%	Pass
Pad Shear - 2-way (Uplift) (ksi)	0.164	0.052	30.0%	Pass
Flexural 2-way (Tension) (kip*ft)	675.84	132.19	18.6%	Pass

*Rating per TIA-222-H Section 15.5

Soil Rating*:	96.2%
Structural Rating*:	30.0%

Pier Properties		
Pier Shape:	Square	
Pier Diameter, $dpier$:	5	ft
Ext. Above Grade, E :	0.3333333	ft
Pier Rebar Size, Sc :	8	
Pier Rebar Quantity, mc :	18	
Pier Tie/Spiral Size, St :	3	
Pier Tie/Spiral Quantity, mt :	7	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier} :	3	in

Pad Properties		
Depth, D :	9.6666667	ft
Pad Width, W_1 :	7.3333333	ft
Pad Thickness, T :	2	ft
Pad Rebar Size (Bottom dir. 2), Sp_2 :	9	
Pad Rebar Quantity (Bottom dir. 2), mp_2 :	4	
Pad Clear Cover, cc_{pad} :	3	in

Material Properties		
Rebar Grade, F_y :	60	ksi
Concrete Compressive Strength, F'_c :	3	ksi
Dry Concrete Density, δ_c :	150	pcf

Soil Properties		
Total Soil Unit Weight, γ :	122	pcf
Ultimate Net Bearing, Q_{net} :	30.000	ksf
Cohesion, C_u :	0.000	ksf
Friction Angle, ϕ :	32	degrees
SPT Blow Count, N_{blows} :		
Base Friction, μ :	0.4	
Neglected Depth, N :	3.33	ft
Foundation Bearing on Rock?	Yes	
Groundwater Depth, gw :	N/A	ft

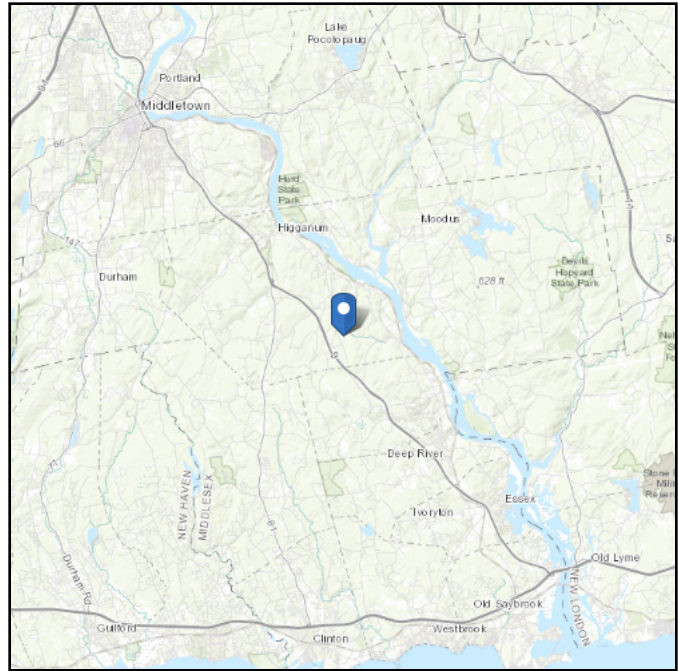
<-- Toggle between Gross and Net

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 504.12 ft (NAVD 88)
Latitude: 41.443056
Longitude: -72.506222



Wind

Results:

Wind Speed:	130 Vmph per jurisdiction requirement
10-year MRI	78 Vmph
25-year MRI	88 Vmph
50-year MRI	96 Vmph
100-year MRI	105 Vmph

Data Source: ASCE/SEI 7-10 Fig. 26.5-1A and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

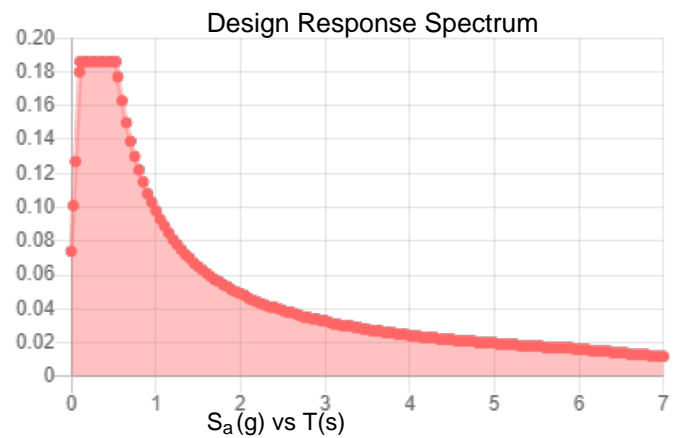
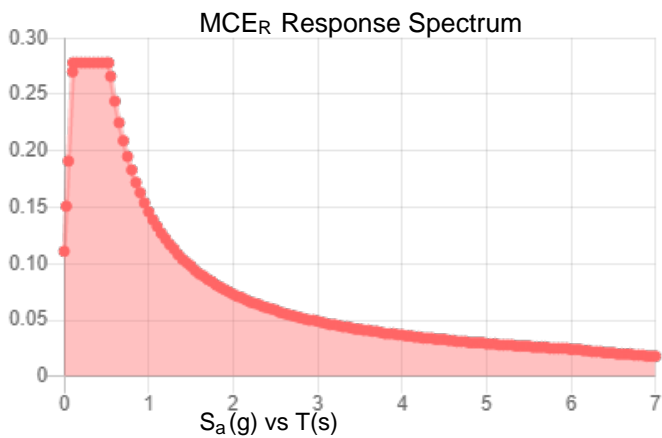
Site is in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Site Soil Class: D - Stiff Soil

Results:

S_S :	0.174	S_{DS} :	0.186
S_1 :	0.061	S_{D1} :	0.098
F_a :	1.6	T_L :	6
F_v :	2.4	PGA :	0.088
S_{MS} :	0.278	PGA_M :	0.141
S_{M1} :	0.146	F_{PGA} :	1.6
		I_e :	1

Seismic Design Category B



Data Accessed:

Wed Mar 31 2021

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

Ice

Results:

Ice Thickness: 0.75 in.
Concurrent Temperature: 15 F
Gust Speed: 50 mph

Data Source: Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8

Date Accessed: Wed Mar 31 2021

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

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Exhibit E

Mount Analysis

Date: **July 30, 2021**

Darcy Tarr
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
(704) 405-6589



Trylon
1825 W. Walnut Hill Lane,
Suite 302
Irving, TX 75038
214-930-1730

Subject: **Mount Replacement Analysis Report**

Carrier Designation: **Dish Network Dish 5G**
Carrier Site Number: BOBDL00053A
Carrier Site Name: CT-CCI-T-806478

Crown Castle Designation: **Crown Castle BU Number:** 806478
Crown Castle Site Name: HRT 080 953381
Crown Castle JDE Job Number: 645651
Crown Castle Order Number: 553396 Rev. 1

Engineering Firm Designation: **Trylon Report Designation:** 189058

Site Data: **539 Plains Rd., Haddam, Middlesex County, CT, 06438**
Latitude 41°26'35.00" Longitude -72°30'22.40"

Structure Information: **Tower Height & Type:** **180.0 ft Self Support**
Mount Elevation: **140.0 ft**
Mount Type: **8.0 ft Sector Frame**

Dear Darcy Tarr,

Trylon is pleased to submit this "**Mount Replacement Analysis Report**" to determine the structural integrity of Dish Network's antenna mounting system with the proposed appurtenance and equipment addition on the abovementioned supporting tower structure. Analysis of the existing supporting tower structure is to be completed by others and therefore is not part of this analysis. Analysis of the antenna mounting system as a tie-off point for fall protection or rigging is not part of this document.

The purpose of the analysis is to determine acceptability of the mount stress level. Based on our analysis we have determined the mount stress level to be:

Sector Frame **Sufficient***
***Sufficient upon completion of the changes listed in the 'Recommendations' section of this report.**

This analysis utilizes an ultimate 3-second gust wind speed of 130 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Mount analysis prepared by: Aura Baltoiu

Respectfully Submitted by:
Cliff Abernathy, P.E.

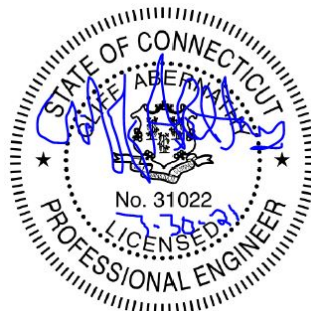


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Supplemental Drawings

1) INTRODUCTION

This is a proposed 3 sector 8.0 ft Sector Frame, designed by Commscope.

2) ANALYSIS CRITERIA

Building Code:	2015 IBC
TIA-222 Revision:	TIA-222-H
Risk Category:	II
Ultimate Wind Speed:	130 mph
Exposure Category:	B
Topographic Factor at Base:	1.00
Topographic Factor at Mount:	1.00
Ice Thickness:	1.5 in
Wind Speed with Ice:	50 mph
Seismic S_s:	0.175
Seismic S₁:	0.061
Live Loading Wind Speed:	30 mph
Man Live Load at Mid/End-Points:	250 lb
Man Live Load at Mount Pipes:	500 lb

Table 1 - Proposed Equipment Configuration

Mount Centerline (ft)	Antenna Centerline (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Mount / Modification Details
140.0	140.0	3	JMA WIRELESS	MX08FRO665-20	8.0 ft Sector Frame [Commscope, MTC3975083]
		3	FUJITSU	TA08025-B604	
		3	FUJITSU	TA08025-B605	
		1	RAYCAP	RDIDC-9181-PF-48	

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Remarks	Reference	Source
Crown Application	Dish Network Application	553396, Rev.1	CCI Sites
Mount Manufacturer Drawings	Commscope	MTC3975083	Trylon
Exposure Category Determination	Crown Castle	5968160	CCI Sites

3.1) Analysis Method

RISA-3D (Version 17.0.4), a commercially available analysis software package, was used to create a three-dimensional model of the antenna mounting system and calculate member stresses for various loading cases.

A tool internally developed, using Microsoft Excel, by Trylon was used to calculate wind loading on all appurtenances, dishes, and mount members for various load cases. Selected output from the analysis is included in Appendix B.

This analysis was performed in accordance with Crown Castle's ENG-SOW-10208 *Tower Mount Analysis* (Revision B).

3.2) Assumptions

- 1) The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- 2) The configuration of antennas, mounts, and other appurtenances are as specified in Table 1 and the referenced drawings.
- 3) 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.
- 4) The analysis will be required to be revised if the existing conditions in the field differ from those shown in the above-referenced documents or assumed in this analysis. No allowance was made for any damaged, missing, or rusted members.
- 5) Prior structural modifications to the tower mounting system are assumed to be installed as shown per available data.
- 6) Steel grades have been assumed as follows, unless noted otherwise:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Rectangular)	ASTM A500 (GR B-46)
Pipe	ASTM A53 (GR 35)
Connection Bolts	ASTM A325

This analysis may be affected if any assumptions are not valid or have been made in error. Tylon should be notified to determine the effect on the structural integrity of the antenna mounting system.

4) ANALYSIS RESULTS

Table 3 - Mount Component Stresses vs. Capacity (Sector Frame, Worst Case Sectors)

Notes	Component	Critical Member	Centerline (ft)	% Capacity	Pass / Fail
1,2	Mount Pipe(s)	MP1	140.0	19.3	Pass
	Horizontal(s)	BH		40.0	Pass
	Standoff(s)	SA4		46.4	Pass
	Bracing(s)	B1		28.9	Pass
	Plate(s)	MP9		48.0	Pass
	Vertical(s)	V4		22.3	Pass
	Tieback(s)	MP25		23.8	Pass
	Mount Connection(s)	-		53.4	Pass

Structure Rating (max from all components) =	53.4%
---	--------------

Notes:

- 1) See additional documentation in "Appendix C - Software Analysis Output" for calculations supporting the % capacity consumed.
- 2) Rating per TIA-222-H, Section 15.5

Table 4 - Tieback Connection Data Table

Tower Connection Node No.	Existing / Proposed	Resultant End Reaction (lb)	Connected Member Type	Connected Member Size	Member Compressive Capacity (lb) ³	Notes
N86A	Proposed	695.8	Leg	ROHN 2.5 EH	4,670.5	1

Notes:

- 1) Tieback connection point is within 25% of either end of the connected tower member
- 2) Tieback connection point is NOT within 25% of either end of the connected tower member
- 3) Reduced member compressive capacity according to CED-STD-10294 *Standard for Installation of Mounts and Appurtenances*

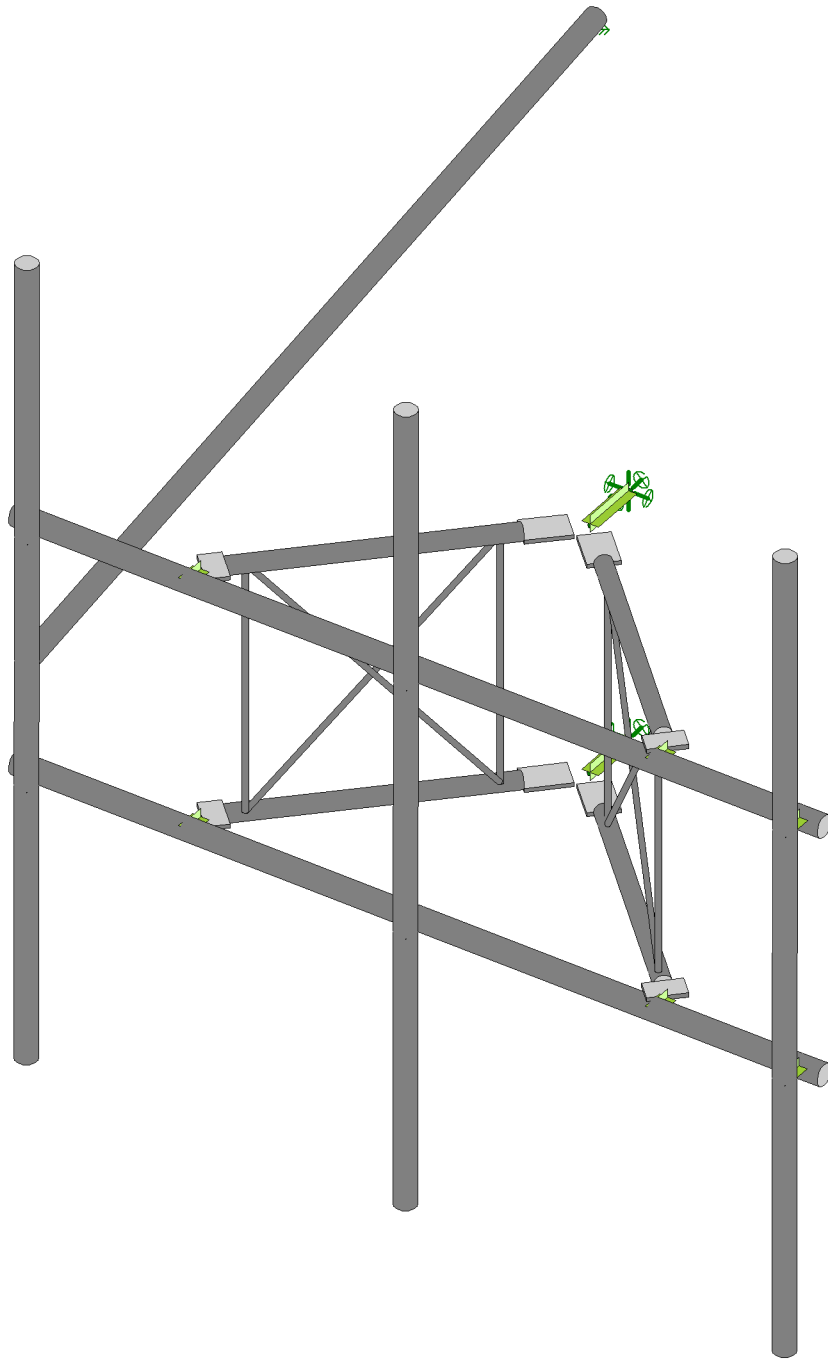
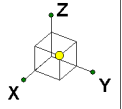
4.1) Recommendations

The mount has sufficient capacity to carry the proposed loading configuration. In order for the results of the analysis to be considered valid, the proposed mount listed below must be installed.

1. Commscope, MTC3975083. The connection point needs to be within 25% ends of tower leg.

No structural modifications are required at this time, provided that the above-listed changes are implemented.

APPENDIX A
WIRE FRAME AND RENDERED MODELS

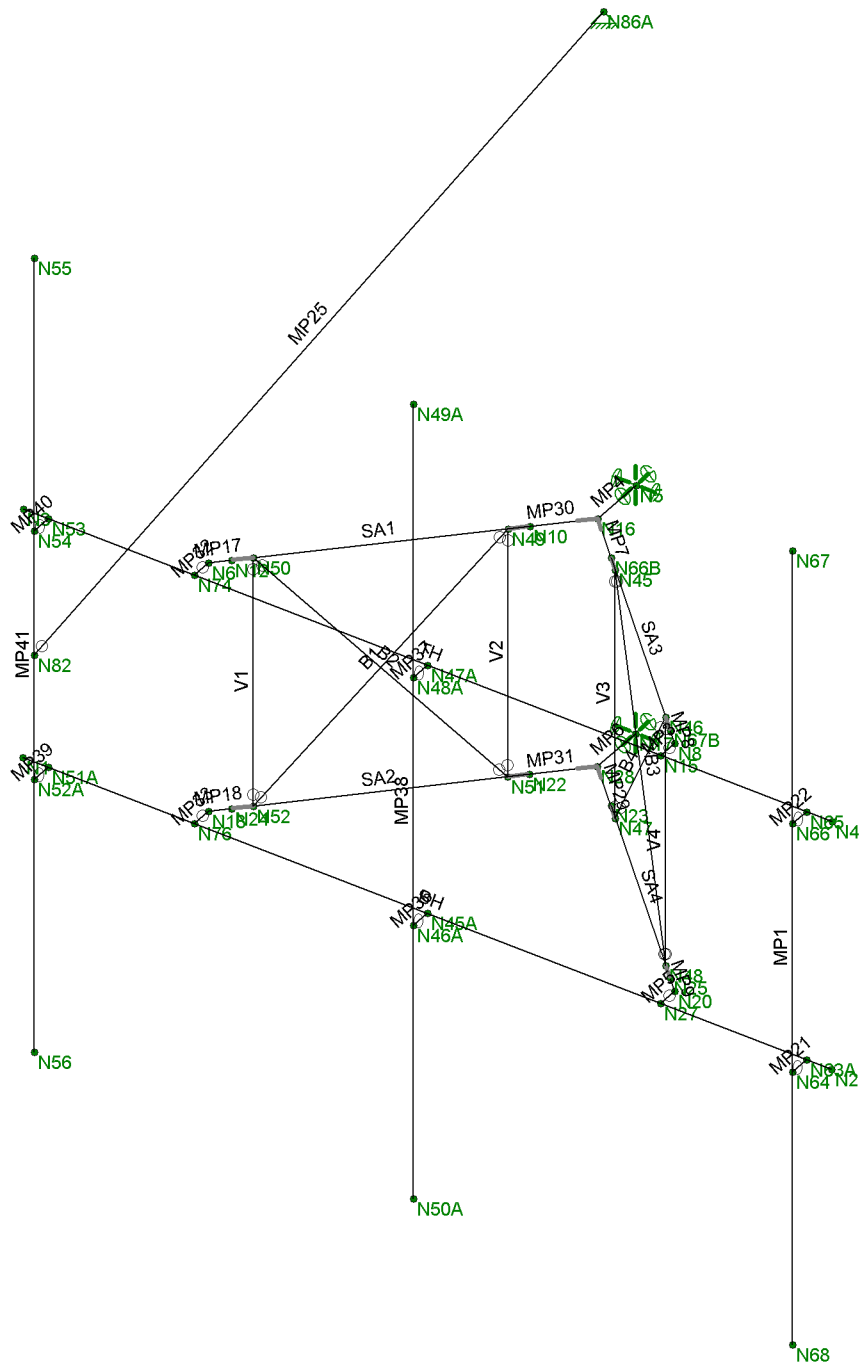
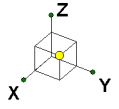


Envelope Only Solution

Trylon
AB
189058

806478

SK - 1
July 30, 2021 at 2:45 PM
806478.r3d



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SK - 2
July 30, 2021 at 2:45 PM
806478.r3d

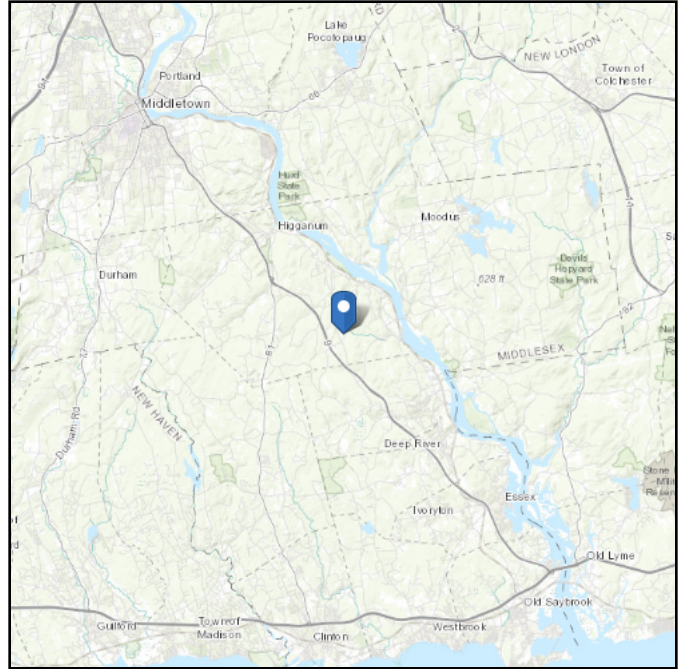
APPENDIX B
SOFTWARE INPUT CALCULATIONS

ASCE 7 Hazards Report

Address:
No Address at This
Location

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 504.12 ft (NAVD 88)
Latitude: 41.443056
Longitude: -72.506222



Ice

Results:

Ice Thickness: 0.75 in.
Concurrent Temperature: 15 F
Gust Speed: 50 mph

Data Source: Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8

Date Accessed: Wed Jul 28 2021

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

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Trylon

1825 W. Walnut Hill Lane Suite 120
Irving, TX 75038

TIA LOAD CALCULATOR 2.0

PROJECT DATA	
Job Code:	189058
Carrier Site ID:	BOBDL00053A
Carrier Site Name:	CT-CCI-T-806478

CODES AND STANDARDS	
Building Code:	2015 IBC
Local Building Code:	2018 CSBC
Design Standard:	TIA-222-H

STRUCTURE DETAILS		
Mount Type:	Sector Frame	--
Mount Elevation:	140.0	ft.
Number of Sectors:	3	--
Structure Type:	Self Support Tower	--
Structure Height:	180.0	ft.

ANALYSIS CRITERIA		
Structure Risk Category:	II	--
Exposure Category:	B	--
Site Class:	D - Stiff Soil	--
Ground Elevation:	504.12	ft.

TOPOGRAPHIC DATA		
Topographic Category:	1.00	--
Topographic Feature:	N/A	--
Crest Point Elevation:	0.00	ft.
Base Point Elevation:	0.00	ft.
Crest to Mid-Height (L/2):	0.00	ft.
Distance from Crest (x):	0.00	ft.
Base Topo Factor (K_{zt}):	1.00	--
Mount Topo Factor (K_{zt}):	1.00	--

WIND PARAMETERS		
Design Wind Speed:	130	mph
Wind Escalation Factor (K_s):	1.00	--
Velocity Coefficient (K_z):	1.09	--
Directionality Factor (K_d):	0.95	--
Gust Effect Factor (G _h):	1.00	--
Shielding Factor (K_a):	0.90	--
Velocity Pressure (q_z):	43.91	psf

ICE PARAMETERS		
Design Ice Wind Speed:	50	mph
Design Ice Thickness (t_i):	1.50	in
Importance Factor (I_i):	1.00	--
Ice Velocity Pressure (q_{zi}):	43.91	psf
Mount Ice Thickness (t_{iz}):	1.73	in

WIND STRUCTURE CALCULATIONS		
Flat Member Pressure:	79.03	psf
Round Member Pressure:	47.42	psf
Ice Wind Pressure:	7.45	psf

SEISMIC PARAMETERS		
Importance Factor (I_e):	1.00	--
Short Period Accel. (S_s):	0.175	g
1 Second Accel. (S_1):	0.061	g
Short Period Des. (S_{DS}):	0.19	g
1 Second Des. (S_{D1}):	0.10	g
Short Period Coeff. (F_a):	1.60	--
1 Second Coeff. (F_v):	2.40	--
Response Coefficient (C_s):	0.09	--
Amplification Factor (A_S):	1.20	--

LOAD COMBINATIONS [LRFD]

#	Description
1	1.4DL
2	1.2DL + 1WL 0 AZI
3	1.2DL + 1WL 30 AZI
4	1.2DL + 1WL 45 AZI
5	1.2DL + 1WL 60 AZI
6	1.2DL + 1WL 90 AZI
7	1.2DL + 1WL 120 AZI
8	1.2DL + 1WL 135 AZI
9	1.2DL + 1WL 150 AZI
10	1.2DL + 1WL 180 AZI
11	1.2DL + 1WL 210 AZI
12	1.2DL + 1WL 225 AZI
13	1.2DL + 1WL 240 AZI
14	1.2DL + 1WL 270 AZI
15	1.2DL + 1WL 300 AZI
16	1.2DL + 1WL 315 AZI
17	1.2DL + 1WL 330 AZI
18	0.9DL + 1WL 0 AZI
19	0.9DL + 1WL 30 AZI
20	0.9DL + 1WL 45 AZI
21	0.9DL + 1WL 60 AZI
22	0.9DL + 1WL 90 AZI
23	0.9DL + 1WL 120 AZI
24	0.9DL + 1WL 135 AZI
25	0.9DL + 1WL 150 AZI
26	0.9DL + 1WL 180 AZI
27	0.9DL + 1WL 210 AZI
28	0.9DL + 1WL 225 AZI
29	0.9DL + 1WL 240 AZI
30	0.9DL + 1WL 270 AZI
31	0.9DL + 1WL 300 AZI
32	0.9DL + 1WL 315 AZI
33	0.9DL + 1WL 330 AZI
34	1.2DL + 1DLi + 1WLi 0 AZI
35	1.2DL + 1DLi + 1WLi 30 AZI
36	1.2DL + 1DLi + 1WLi 45 AZI
37	1.2DL + 1DLi + 1WLi 60 AZI
38	1.2DL + 1DLi + 1WLi 90 AZI
39	1.2DL + 1DLi + 1WLi 120 AZI
40	1.2DL + 1DLi + 1WLi 135 AZI
41	1.2DL + 1DLi + 1WLi 150 AZI

#	Description
42	1.2DL + 1DLi + 1WLi 180 AZI
43	1.2DL + 1DLi + 1WLi 210 AZI
44	1.2DL + 1DLi + 1WLi 225 AZI
45	1.2DL + 1DLi + 1WLi 240 AZI
46	1.2DL + 1DLi + 1WLi 270 AZI
47	1.2DL + 1DLi + 1WLi 300 AZI
48	1.2DL + 1DLi + 1WLi 315 AZI
49	1.2DL + 1DLi + 1WLi 330 AZI
50	(1.2+0.2Sds) + 1.0E 0 AZI
51	(1.2+0.2Sds) + 1.0E 30 AZI
52	(1.2+0.2Sds) + 1.0E 45 AZI
53	(1.2+0.2Sds) + 1.0E 60 AZI
54	(1.2+0.2Sds) + 1.0E 90 AZI
55	(1.2+0.2Sds) + 1.0E 120 AZI
56	(1.2+0.2Sds) + 1.0E 135 AZI
57	(1.2+0.2Sds) + 1.0E 150 AZI
58	(1.2+0.2Sds) + 1.0E 180 AZI
59	(1.2+0.2Sds) + 1.0E 210 AZI
60	(1.2+0.2Sds) + 1.0E 225 AZI
61	(1.2+0.2Sds) + 1.0E 240 AZI
62	(1.2+0.2Sds) + 1.0E 270 AZI
63	(1.2+0.2Sds) + 1.0E 300 AZI
64	(1.2+0.2Sds) + 1.0E 315 AZI
65	(1.2+0.2Sds) + 1.0E 330 AZI
66	(0.9-0.2Sds) + 1.0E 0 AZI
67	(0.9-0.2Sds) + 1.0E 30 AZI
68	(0.9-0.2Sds) + 1.0E 45 AZI
69	(0.9-0.2Sds) + 1.0E 60 AZI
70	(0.9-0.2Sds) + 1.0E 90 AZI
71	(0.9-0.2Sds) + 1.0E 120 AZI
72	(0.9-0.2Sds) + 1.0E 135 AZI
73	(0.9-0.2Sds) + 1.0E 150 AZI
74	(0.9-0.2Sds) + 1.0E 180 AZI
75	(0.9-0.2Sds) + 1.0E 210 AZI
76	(0.9-0.2Sds) + 1.0E 225 AZI
77	(0.9-0.2Sds) + 1.0E 240 AZI
78	(0.9-0.2Sds) + 1.0E 270 AZI
79	(0.9-0.2Sds) + 1.0E 300 AZI
80	(0.9-0.2Sds) + 1.0E 315 AZI
81	(0.9-0.2Sds) + 1.0E 330 AZI
82-88	1.2D + 1.5 Lv1

#	Description
89	1.2D + 1.5Lm + 1.0Wm 0 AZI - MP1
90	1.2D + 1.5Lm + 1.0Wm 30 AZI - MP1
91	1.2D + 1.5Lm + 1.0Wm 45 AZI - MP1
92	1.2D + 1.5Lm + 1.0Wm 60 AZI - MP1
93	1.2D + 1.5Lm + 1.0Wm 90 AZI - MP1
94	1.2D + 1.5Lm + 1.0Wm 120 AZI - MP1
95	1.2D + 1.5Lm + 1.0Wm 135 AZI - MP1
96	1.2D + 1.5Lm + 1.0Wm 150 AZI - MP1
97	1.2D + 1.5Lm + 1.0Wm 180 AZI - MP1
98	1.2D + 1.5Lm + 1.0Wm 210 AZI - MP1
99	1.2D + 1.5Lm + 1.0Wm 225 AZI - MP1
100	1.2D + 1.5Lm + 1.0Wm 240 AZI - MP1
101	1.2D + 1.5Lm + 1.0Wm 270 AZI - MP1
102	1.2D + 1.5Lm + 1.0Wm 300 AZI - MP1
103	1.2D + 1.5Lm + 1.0Wm 315 AZI - MP1
104	1.2D + 1.5Lm + 1.0Wm 330 AZI - MP1
105	1.2D + 1.5Lm + 1.0Wm 0 AZI - MP2
106	1.2D + 1.5Lm + 1.0Wm 30 AZI - MP2
107	1.2D + 1.5Lm + 1.0Wm 45 AZI - MP2
108	1.2D + 1.5Lm + 1.0Wm 60 AZI - MP2
109	1.2D + 1.5Lm + 1.0Wm 90 AZI - MP2
110	1.2D + 1.5Lm + 1.0Wm 120 AZI - MP2
111	1.2D + 1.5Lm + 1.0Wm 135 AZI - MP2
112	1.2D + 1.5Lm + 1.0Wm 150 AZI - MP2
113	1.2D + 1.5Lm + 1.0Wm 180 AZI - MP2
114	1.2D + 1.5Lm + 1.0Wm 210 AZI - MP2
115	1.2D + 1.5Lm + 1.0Wm 225 AZI - MP2
116	1.2D + 1.5Lm + 1.0Wm 240 AZI - MP2
117	1.2D + 1.5Lm + 1.0Wm 270 AZI - MP2
118	1.2D + 1.5Lm + 1.0Wm 300 AZI - MP2
119	1.2D + 1.5Lm + 1.0Wm 315 AZI - MP2
120	1.2D + 1.5Lm + 1.0Wm 330 AZI - MP2

#	Description
121	1.2D + 1.5Lm + 1.0Wm 0 AZI - MP3
122	1.2D + 1.5Lm + 1.0Wm 30 AZI - MP3
123	1.2D + 1.5Lm + 1.0Wm 45 AZI - MP3
124	1.2D + 1.5Lm + 1.0Wm 60 AZI - MP3
125	1.2D + 1.5Lm + 1.0Wm 90 AZI - MP3
126	1.2D + 1.5Lm + 1.0Wm 120 AZI - MP3
127	1.2D + 1.5Lm + 1.0Wm 135 AZI - MP3
128	1.2D + 1.5Lm + 1.0Wm 150 AZI - MP3
129	1.2D + 1.5Lm + 1.0Wm 180 AZI - MP3
130	1.2D + 1.5Lm + 1.0Wm 210 AZI - MP3
131	1.2D + 1.5Lm + 1.0Wm 225 AZI - MP3
132	1.2D + 1.5Lm + 1.0Wm 240 AZI - MP3
133	1.2D + 1.5Lm + 1.0Wm 270 AZI - MP3
134	1.2D + 1.5Lm + 1.0Wm 300 AZI - MP3
135	1.2D + 1.5Lm + 1.0Wm 315 AZI - MP3
136	1.2D + 1.5Lm + 1.0Wm 330 AZI - MP3
137	1.2D + 1.5Lm + 1.0Wm 0 AZI - MP4
138	1.2D + 1.5Lm + 1.0Wm 30 AZI - MP4
139	1.2D + 1.5Lm + 1.0Wm 45 AZI - MP4
140	1.2D + 1.5Lm + 1.0Wm 60 AZI - MP4
141	1.2D + 1.5Lm + 1.0Wm 90 AZI - MP4
142	1.2D + 1.5Lm + 1.0Wm 120 AZI - MP4
143	1.2D + 1.5Lm + 1.0Wm 135 AZI - MP4
144	1.2D + 1.5Lm + 1.0Wm 150 AZI - MP4
145	1.2D + 1.5Lm + 1.0Wm 180 AZI - MP4
146	1.2D + 1.5Lm + 1.0Wm 210 AZI - MP4
147	1.2D + 1.5Lm + 1.0Wm 225 AZI - MP4
148	1.2D + 1.5Lm + 1.0Wm 240 AZI - MP4
149	1.2D + 1.5Lm + 1.0Wm 270 AZI - MP4
150	1.2D + 1.5Lm + 1.0Wm 300 AZI - MP4
151	1.2D + 1.5Lm + 1.0Wm 315 AZI - MP4
152	1.2D + 1.5Lm + 1.0Wm 330 AZI - MP4

*This page shows an example of maintenance loads for (4) pipes, the number of mount pipe LCs may vary per site

APPENDIX C
SOFTWARE ANALYSIS OUTPUT

APPENDIX D
ADDITIONAL CALCUATIONS

BOLT TOOL 1.5.2

Project Data	
Job Code:	189058
Carrier Site ID:	BOBDL00053A
Carrier Site Name:	CT-CCI-T-806478

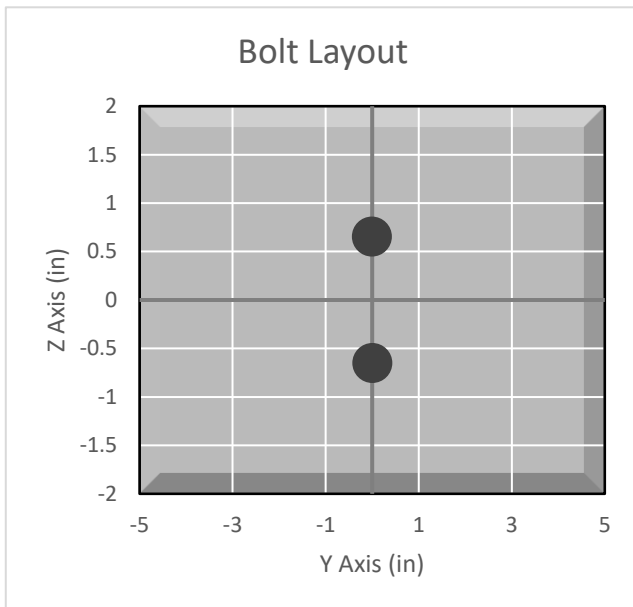
Code	
Design Standard:	TIA-222-H
Slip Check:	No
Pretension Standard:	AISC

Bolt Properties		
Connection Type:	Bolt	
Diameter:	0.625	in
Grade:	A325	--
Yield Strength (Fy):	92	ksi
Ultimate Strength (Fu):	120	ksi
Number of Bolts:	2	--
Threads Included:	Yes	--
Double Shear:	No	--
Connection Pipe Size:	-	in

Connection Description
Stand-off arm to Tower connection kit

Bolt Check*		
Tensile Capacity (ϕT_n):	20340.1	lbs
Shear Capacity (ϕV_n):	13805.8	lbs
Tension Force (T_u):	0.0	lbs
Shear Force (V_u):	7734.4	lbs
Tension Usage:	0.0%	--
Shear Usage:	53.4%	--
Interaction:	53.4%	Pass
Controlling Member:	MP6	--
Controlling LC:	87	--

*Rating per TIA-222-H Section 15.5

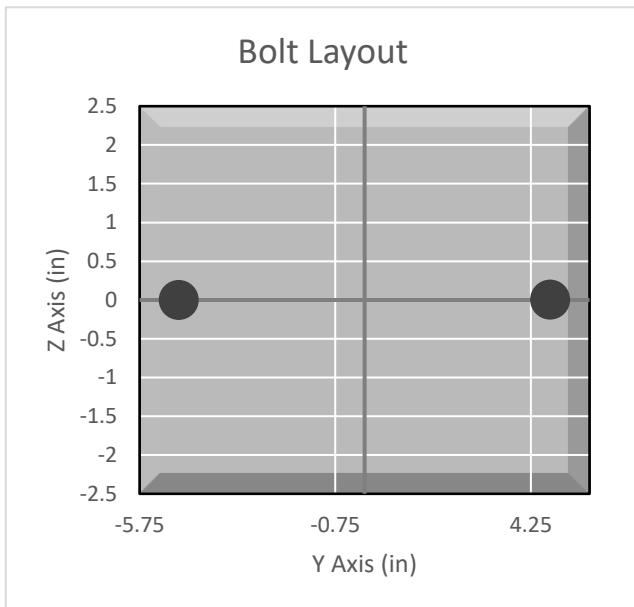


BOLT TOOL 1.5.2

Project Data	
Job Code:	189058
Carrier Site ID:	BOBDL00053A
Carrier Site Name:	CT-CCI-T-806478

Code	
Design Standard:	TIA-222-H
Slip Check:	Yes
Pretension Standard:	TIA-222-H

Bolt Properties		
Connection Type:	Threaded Rod	
Diameter:	0.75	in
Grade:	A307	--
Yield Strength (Fy):	36	ksi
Ultimate Strength (Fu):	60	ksi
Number of Bolts:	2	--
Threads Included:	Yes	--
Double Shear:	No	--
Connection Pipe Size:	9.5	in



Connection Description
Mount to Tower

Bolt Check*		
Tensile Capacity (ϕT_n):	15050.7	lbs
Shear Capacity (ϕV_n):	9940.2	lbs
Tension Force (T_u):	623.0	lbs
Shear Force (V_u):	958.8	lbs
Tension Usage:	3.9%	--
Shear Usage:	9.2%	--
Interaction:	9.2%	Pass
Controlling Member:	MP4	--
Controlling LC:	96	--

*Rating per TIA-222-H Section 15.5

Slip Check*		
Sliding Capacity (ϕR_{ns}):	9648.3	lbs
Torsion Capacity (ϕR_{nr}):	3819.1	lb-ft
Sliding Force (V_{us}):	895.4	lbs
Torsional Force (T_{ur}):	0.0	lb-ft
Sliding Usage:	8.8%	--
Torsion Usage:	0.0%	--
Interaction:	8.8%	Pass
Controlling Member:	MP4	--
Controlling LC:	41	--

*Rating per TIA-222-H Section 15.5

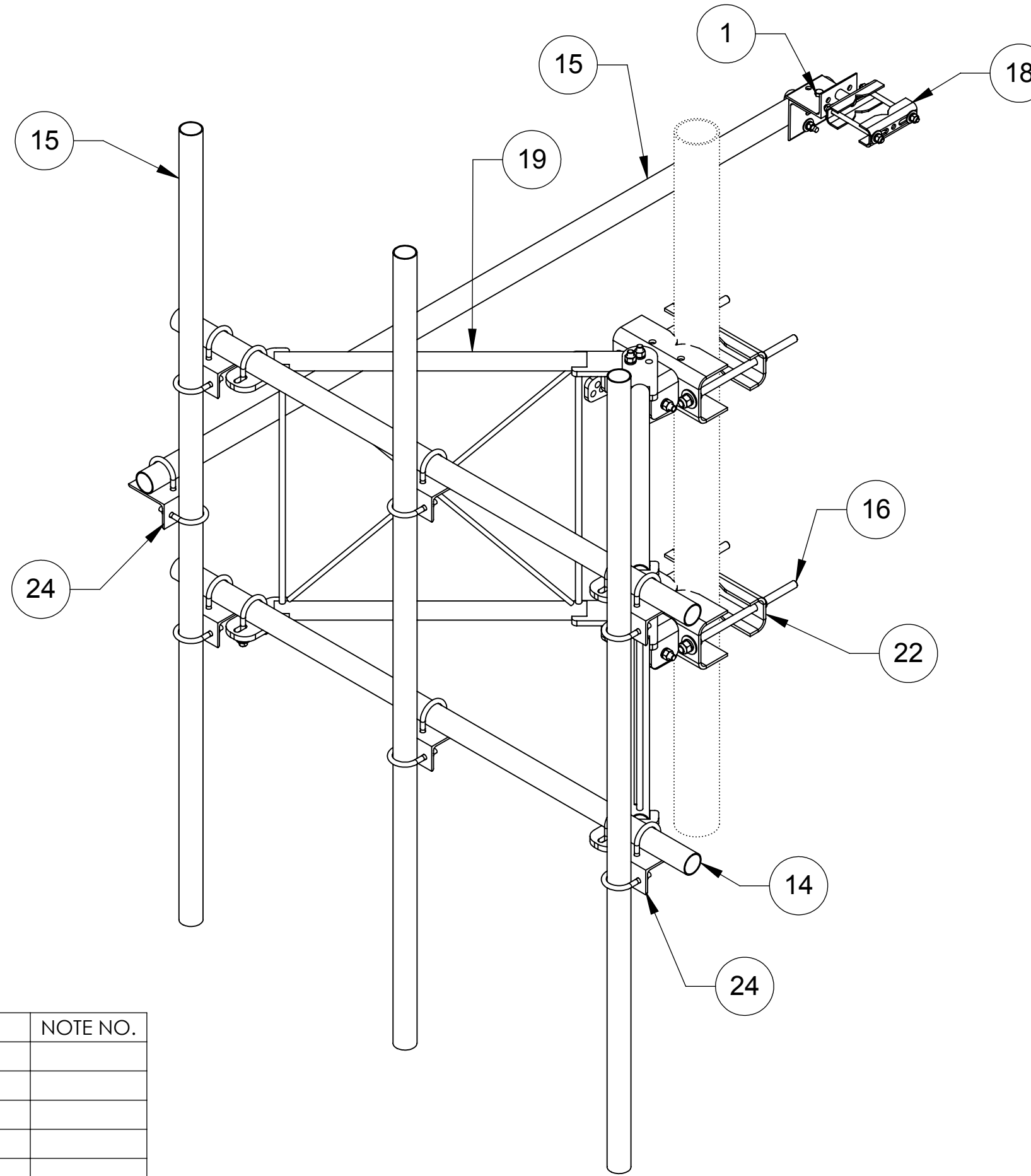
APPENDIX E
SUPPLEMENTAL DRAWINGS

NOTES:
1.0 ALL METRIC DIMENSIONS ARE IN BRACKETS.

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REVISIONS				
REV.	ECN	DESCRIPTION	BY	DATE
PRE		REVIEW	DRH	01/28/21



ITEM	PART NO.	DESCRIPTION	QTY.	WEIGHT	NOTE NO.
1	GB-04125	1/2" X 1-1/4" GALV BOLT KIT	1	0.12 LBS	
2	GB-04265	1/2" X 2-3/4" GALV BOLT KIT	1	0.20 LBS	
3	GB-05225	5/8" X 2-1/4" GALV BOLT KIT	8	0.28 LBS	
4	GB-05305	5/8" X 3" GALV BOLT KIT	4	0.35 LBS	
5	GN-04	1/2" GALV HEX NUT	4	0.04 LBS	
6	GN-06	3/4" GALV HEX NUT	12	0.15 LBS	
7	GUB-4240	1/2" X 2-1/2" X 4" GALV U-BOLT	19	0.56 LBS	
8	GWF-04	1/2" GALV FLAT WASHER	4	0.03 LBS	
9	GWF-05	5/8" GALV FLAT WASHER	4	0.06 LBS	
10	GWF-06	3/4" GALV FLAT WASHER	8	0.10 LBS	
11	GWL-04	1/2" GALV LOCK WASHER	4	0.01 LBS	
12	GWL-06	3/4" GALV LOCK WASHER	8	0.04 LBS	
13	MT-379-8	1/2" X 8" GALV THREADED ROD	2	0.44 LBS	
14	MT-651-96	2.375" OD x 96" PIPE	2	17.29 LBS	
15	MT-651-96	Ø 2.375" OD X 96" PIPE	4	23.05 LBS	
16	MT38416	Threaded Rod Galv 3/4" x 16"	4	1.99 LBS	
17	OS15034	3/4" X 1-1/2" OFFSET COLLAR	1	0.14 LBS	
18	SAB01	FORMED CLAMP	2	1.35 LBS	
19	SFV01	WELDMENT, SF-V STANDOFF ARM	2	36.81 LBS	
20	SFV02	SFV AZIMUTH BRACKET	3	6.70 LBS	
21	SFV03	SFV TAPER BRACKET	1	7.49 LBS	
22	SMU2080.06	CLAMP PLATE	2	6.96 LBS	
23	SMU208004	MOUNT	2	12.15 LBS	
24	XA2020.01	ANTENNA MOUNT ANGLE	9	2.65 LBS	

DENSITY	0.28	lbs/in ³
MASS	400.61	lbs
VOLUME	1421.66	in ³
SURFACE AREA		in ²
HEIGHT		
LENGTH		
WIDTH		

COMMSCOPE, INC. OF NORTH CAROLINA								
TOLERANCES			SAP MATERIAL MASTER					
0 PLACE	X ± .25	2 PLACE	.XX ± .06	MTC3975083				
1 PLACE	.X ± .12	ANGLES	± 2°					
FINISH			MATERIAL					
GALV A123			A1011/A1018, A500, A529					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS INTERPRET PER ISO STANDARDS HANDBOOK TECHNICAL DRAWINGS VOLUMES 1 & 2, THIRD EDITION (2002)	NAME	DATE	TITLE					
	CE	RDLS	7/14/17	SECTOR FRAME, 8' FACE, (3) 96" PIPES				
	RW							
	RV							
	AD							
	RE	TP	7/14/17	SCALE	DOCUMENT NO.			
ECN			1:12	MTC3975083				
SIZE	WORK AREA	MODEL		DRAWING				
C		VERSION	STATUS	REVISION	VERSION	STATUS	REVISION	SHEET
							PRE	1 OF 2

4

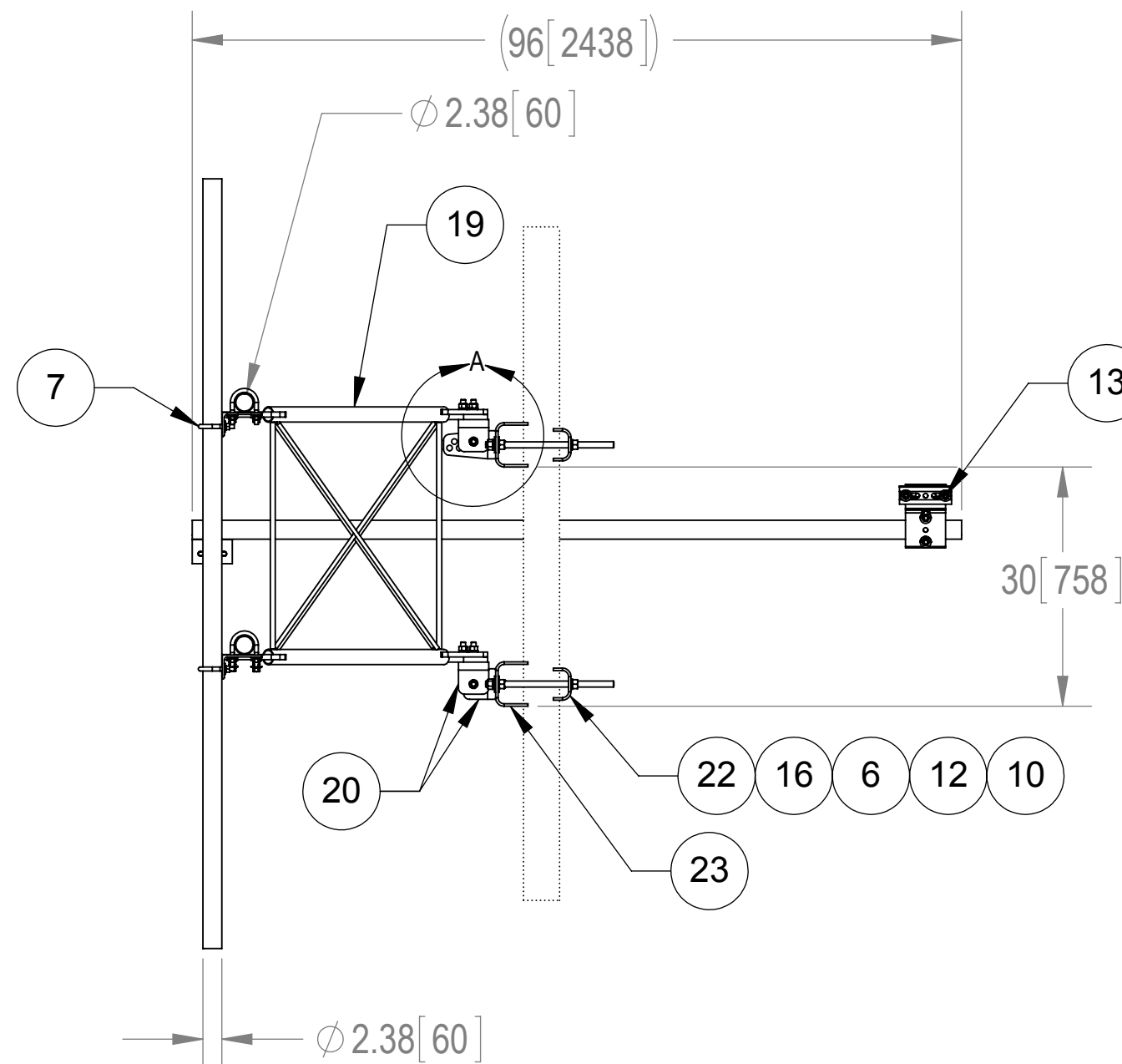
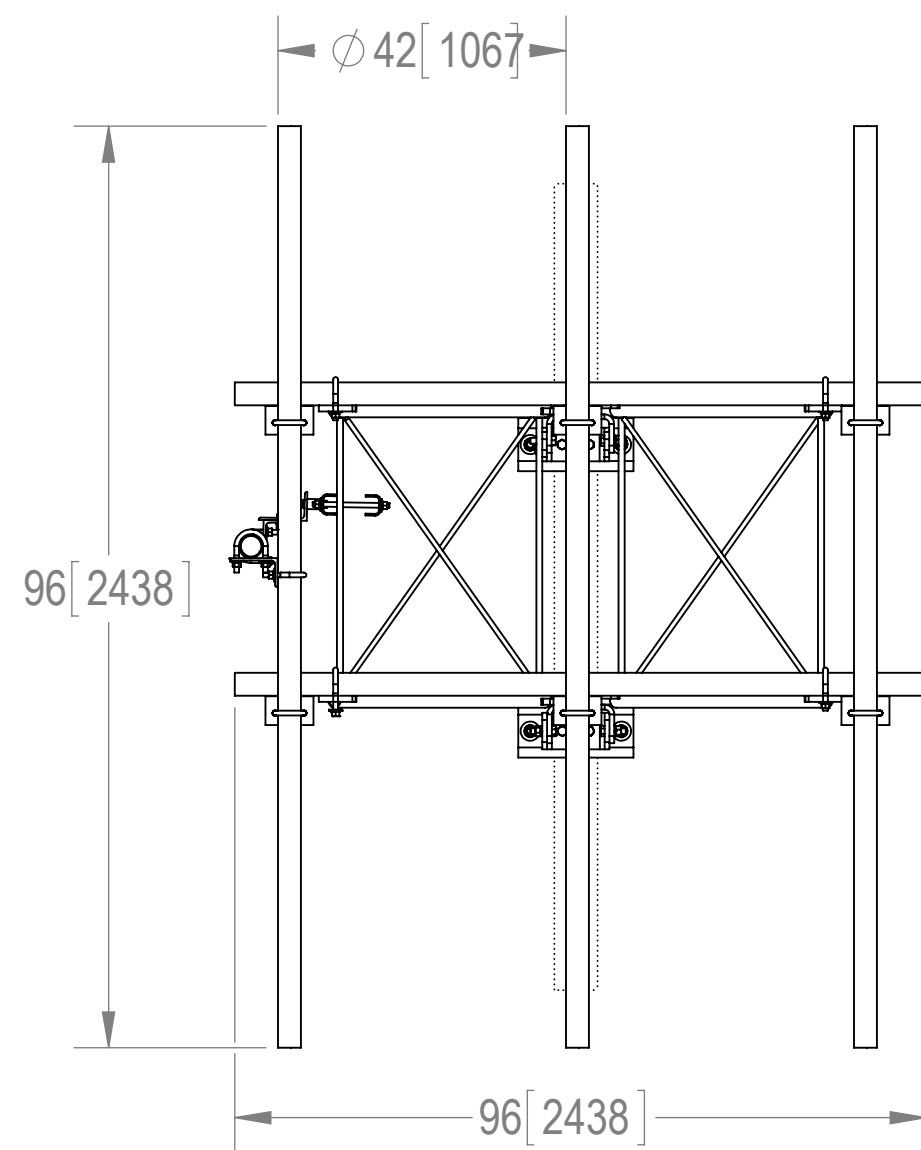
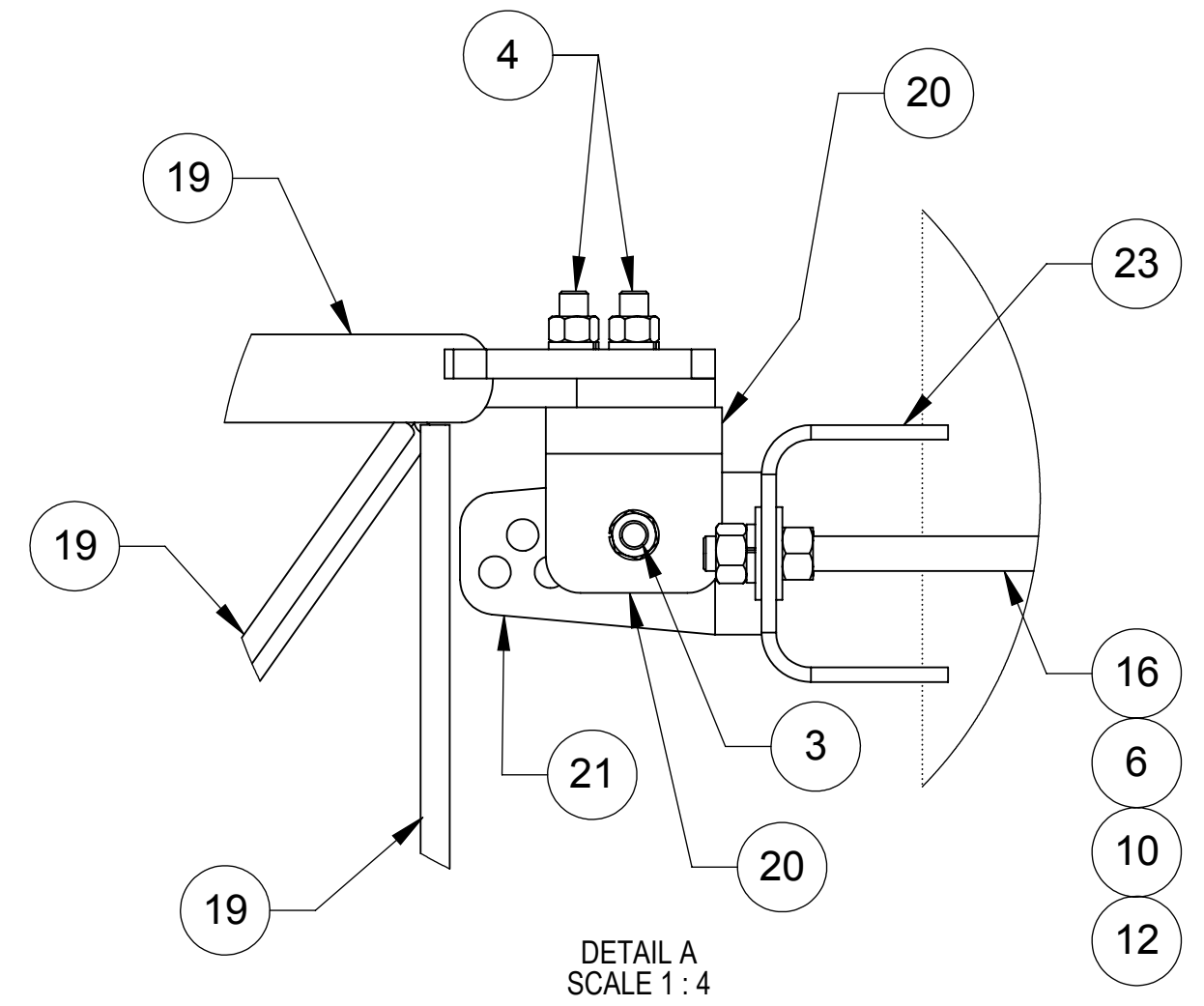
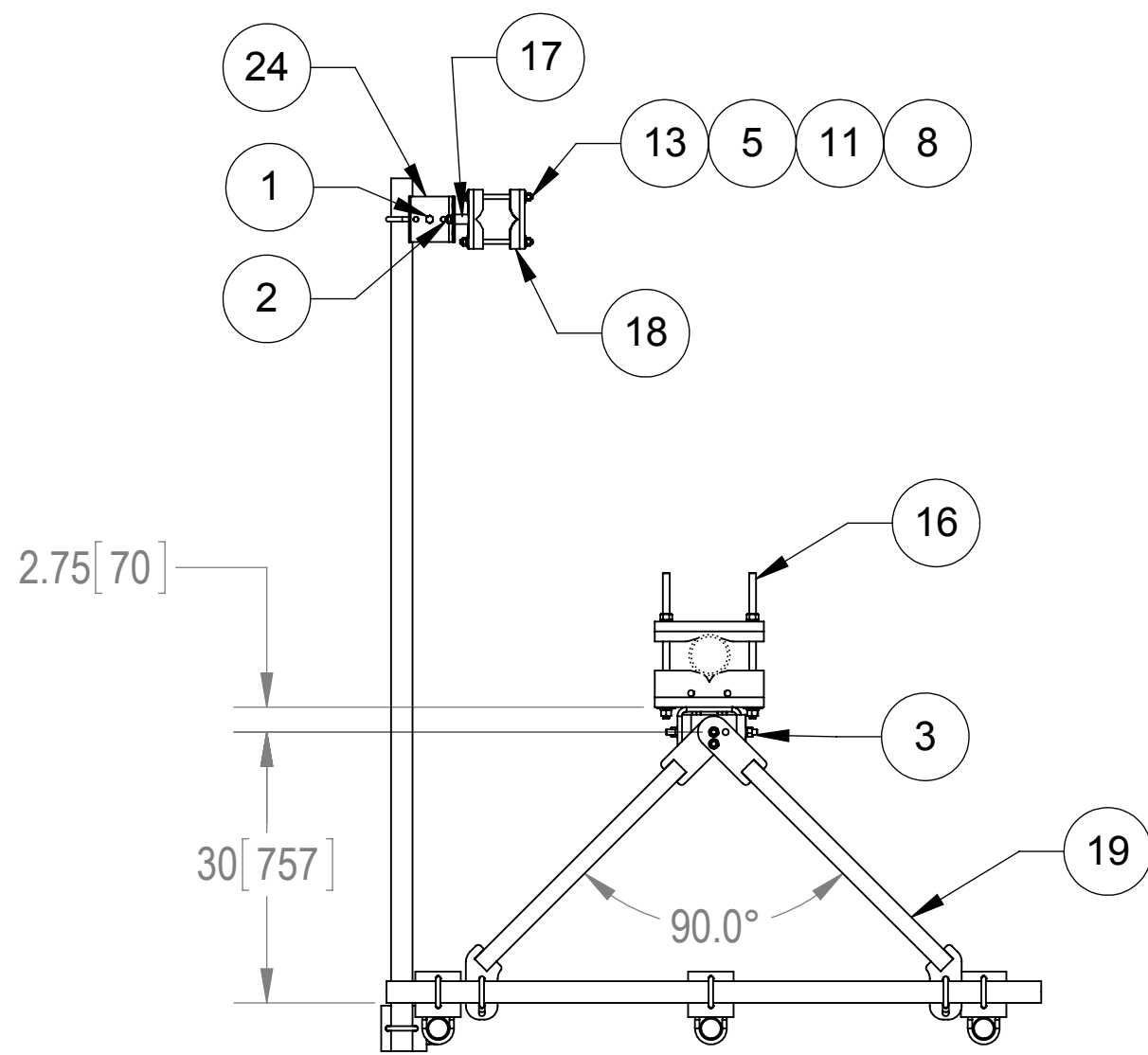
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2

1

NOTES:

1.0 ALL METRIC DIMENSIONS ARE IN BRACKETS.



COMMSCOPE, INC. OF NORTH CAROLINA			
TITLE			
SECTOR FRAME, 8' FACE, (3) 96" PIPES			
SIZE	SCALE	DOCUMENT NO.	
C	1:20	MTC3975083	
DRAWING		VERSION	REVISION
			PRE
			SHEET
			2 OF 2

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4

3

2

1

Exhibit F

Power Density/RF Emissions Report



RF EMISSIONS COMPLIANCE REPORT

Crown Castle on behalf of Dish Wireless

Crown Castle Site Name: HRT 080 953381
Crown Castle Site BU Number: 806478
Dish Wireless Site Name: CT-CCI-T-806478
Dish Wireless Site ID: BOBDL00053A
Application ID: 553396
539 Plains Road
Haddam, CT
5/27/2021

Report Status:

Dish Wireless is Compliant

Signed 27 May 2021

Prepared By:

Site Safe, LLC

Engineering Statement in Re:
Electromagnetic Energy Analysis
Crown Castle
Haddam, CT

My signature on the cover of this document indicates:

That I am registered as a Professional Engineer in the jurisdiction indicated; and

That I have extensive professional experience in the wireless communications engineering industry; and

That I am an employee of Site Safe, LLC in Vienna, Virginia; and

That I am thoroughly familiar with the Rules and Regulations of the Federal Communications Commission ("the FCC" and "the FCC Rules") both in general and specifically as they apply to the FCC's Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields; and

That the technical information serving as the basis for this report was supplied by Crown Castle on behalf of Dish Wireless (see attached Site Summary and Carrier documents) and that Dish Wireless' installation involves communications equipment, antennas and associated technical equipment at a location referred to as "HRT 080 953381" ("the site"); and

That Dish Wireless proposes to operate at the site with transmit antennas listed in the carrier summary and with a maximum effective radiated power as specified by Dish Wireless and shown on the worksheet and that worst-case 100% duty cycle has been assumed; and

That this analysis has been performed with the assumption that the ground immediately surrounding the tower is primarily flat or falling; and

That at this time, the FCC requires that certain licensees address specific levels of radio frequency energy to which workers or members of the public might possibly be exposed (at §1.1307(b) of the FCC Rules); and

That such consideration of possible exposure of humans to radio frequency energy must utilize the standards set by the FCC, which is the federal agency having jurisdiction over communications facilities; and

That the FCC rules define two tiers of permissible exposure guidelines: 1) "uncontrolled environments," which defines situations in which persons may not be aware of (the "general public"), or may not be able to control their exposure to a transmission facility; and 2) "controlled environments," which defines situations in which persons are aware of their potential for exposure (industry personnel); and

That this statement specifically addresses the uncontrolled environment (which is more conservative than the controlled environment) and the limit set forth in the FCC rules for licensees of Dish Wireless' operating frequencies as shown on the attached antenna worksheet; and

That when applying the uncontrolled environment standards, the predicted Maximum Power Density at two meters above ground level from the proposed T-Mobile operation is no more than 0.998% of the maximum permissible exposure limits in any accessible area on the ground; and

That it is understood per FCC Guidelines and OET 65 Appendix A, that regardless of the existent radio frequency environment, only those licensees whose contributions exceed 5% of the exposure limit pertinent to their operation(s) bear any responsibility for bringing any non-compliant area(s) into compliance; and

That when applying the uncontrolled environment standards, the cumulative predicted energy density from the proposed operation is no more than 5.843% of the maximum in any accessible area up to two meters above the ground per OET 65; and

That the calculations provided in this report are based on data provided by the client and antenna pattern data supplied by the antenna manufacturer, in accordance with FCC guidelines listed in OET 65. Horizontal and vertical antenna patterns are combined for modeling purposes to accurately reflect the energy two meters above ground level where on-axis energy refers to maximum energy two meters above the ground along the azimuth of the antenna and where area energy refers to the maximum energy anywhere two meters above the ground regardless of the antenna azimuth, accounting for cumulative energy from multiple antennas for the carrier(s) and frequency range(s) indicated; and

That the Occupational Safety and Health Administration has policies in place which address worker safety in and around communications sites, thus individual companies will be responsible for their employees' training regarding radio frequency safety; and

In summary, it is stated here that the proposed operation at the site will not result in exposure of the public to excessive levels of radio frequency energy as defined in the FCC Rules and Regulations, specifically 47 CFR 1.1307(b), and that Dish Wireless' proposed operation is completely compliant.

Finally, it is stated that access to the tower should be restricted to communication industry professionals and approved contractor personnel trained in radio frequency safety and that this instant analysis addresses exposure levels at two meters above ground level and does not address exposure levels on the tower or in the immediate proximity of the antennas.

**Crown Castle
HRT 080 953381
Site Summary**

Carrier	Area Maximum Percentage MPE
AT&T Mobility, LLC	0.120 %
AT&T Mobility, LLC	0.179 %
AT&T Mobility, LLC	0.171 %
AT&T Mobility, LLC	0.247 %
AT&T Mobility, LLC	0.238 %
Dish Wireless (Proposed)	0.269 %
Dish Wireless (Proposed)	0.269 %
Dish Wireless (Proposed)	0.460 %
Sprint (T-Mobile)	0.167 %
Sprint (T-Mobile)	0.167 %
Sprint (T-Mobile)	0.185 %
Sprint (T-Mobile)	0.186 %
Sprint (T-Mobile)	0.294 %
T-Mobile	0.118 %
T-Mobile	0.101 %
T-Mobile	0.213 %
T-Mobile	0.157 %
Verizon Wireless	1.323 %
Verizon Wireless	0.250 %
Verizon Wireless	0.261 %
Verizon Wireless	0.179 %
Verizon Wireless	0.289 %
Composite Site MPE:	5.843 %

AT&T Mobility, LLC
HRT 080 953381
Carrier Summary

Frequency: 2300 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.20118 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.12012 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Quintel	QS66512-2	167	25	2858	0.549601	0.054960	1.115436	0.111544
Quintel	QS66512-2	167	145	2858	0.549601	0.054960	1.115436	0.111544
Quintel	QS66512-2	167	255	2858	0.549601	0.054960	1.115436	0.111544

AT&T Mobility, LLC
HRT 080 953381
Carrier Summary

Frequency: 1900 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.78697 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.17870 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Quintel	QS66512-2	167	25	4170	0.786959	0.078696	1.605963	0.160596
Quintel	QS66512-2	167	145	4170	0.786959	0.078696	1.605963	0.160596
Quintel	QS66512-2	167	255	4170	0.786959	0.078696	1.605963	0.160596

AT&T Mobility, LLC
HRT 080 953381
Carrier Summary

Frequency: 763 MHz
Maximum Permissible Exposure (MPE): 508.67 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 0.86925 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.17089 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
CCI Antennas	OPA65R-BU6D	167	25	2450	0.683072	0.134287	0.711989	0.139972
CCI Antennas	OPA65R-BU6D	167	145	2450	0.683072	0.134287	0.711989	0.139972
CCI Antennas	OPA65R-BU6D	167	255	2450	0.683072	0.134287	0.711989	0.139972

AT&T Mobility, LLC
HRT 080 953381
Carrier Summary

Frequency: 737 MHz
Maximum Permissible Exposure (MPE): 491.33 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.21547 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.24738 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
CCI Antennas	DMP65R-BU8D	167	25	2692	0.554930	0.112944	1.023674	0.208346
CCI Antennas	DMP65R-BU8D	167	145	2692	0.554930	0.112944	1.023674	0.208346
CCI Antennas	DMP65R-BU8D	167	255	2692	0.554930	0.112944	1.023674	0.208346

AT&T Mobility, LLC
HRT 080 953381
Carrier Summary

Frequency: 850 MHz
Maximum Permissible Exposure (MPE): 566.67 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.34628 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.23758 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Powerwave	7770	167	23	547	0.183603	0.032401	0.288224	0.050863
CCI Antennas	DMP65R-BU8D	167	25	2885	0.579229	0.102217	1.070732	0.188953
Powerwave	7770	167	143	547	0.183603	0.032401	0.288224	0.050863
CCI Antennas	DMP65R-BU8D	167	145	2885	0.579229	0.102217	1.070732	0.188953
Powerwave	7770	167	263	547	0.183603	0.032401	0.288224	0.050863
CCI Antennas	DMP65R-BU8D	167	255	2885	0.579229	0.102217	1.070732	0.188953

Dish Wireless (Proposed)
HRT 080 953381
Carrier Summary

Frequency: 2100 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 2.68959 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.26896 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
JMA Wireless	MX08FRO665-20	140	0	6904	1.457963	0.145796	2.645873	0.264587
JMA Wireless	MX08FRO665-20	140	120	6904	1.457963	0.145796	2.645873	0.264587
JMA Wireless	MX08FRO665-20	140	240	6904	1.457963	0.145796	2.645873	0.264587

Dish Wireless (Proposed)
HRT 080 953381
Carrier Summary

Frequency: 1900 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 2.68959 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.26896 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
JMA Wireless	MX08FRO665-20	140	0	6904	1.457963	0.145796	2.645873	0.264587
JMA Wireless	MX08FRO665-20	140	120	6904	1.457963	0.145796	2.645873	0.264587
JMA Wireless	MX08FRO665-20	140	240	6904	1.457963	0.145796	2.645873	0.264587

Dish Wireless (Proposed)
HRT 080 953381
Carrier Summary

Frequency: 600 MHz
Maximum Permissible Exposure (MPE): 400 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.83981 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.45995 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
JMA Wireless	MX08FRO665-20	140	0	3229	1.099910	0.274978	1.753881	0.438470
JMA Wireless	MX08FRO665-20	140	120	3229	1.099910	0.274978	1.753881	0.438470
JMA Wireless	MX08FRO665-20	140	240	3229	1.099910	0.274978	1.753881	0.438470

**Sprint (T-Mobile)
HRT 080 953381
Carrier Summary**

Frequency: 1990 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.66684 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.16668 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	NNVV-65B-R4	150	90	2781	1.015331	0.101533	1.327968	0.132797
Commscope	NNVV-65B-R4	150	190	2781	1.015331	0.101533	1.327968	0.132797
Commscope	NNVV-65B-R4	150	310	2781	1.015331	0.101533	1.327968	0.132797

**Sprint (T-Mobile)
HRT 080 953381
Carrier Summary**

Frequency: 1900 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.66684 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.16668 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	NNVV-65B-R4	150	90	2781	1.015331	0.101533	1.327968	0.132797
Commscope	NNVV-65B-R4	150	190	2781	1.015331	0.101533	1.327968	0.132797
Commscope	NNVV-65B-R4	150	310	2781	1.015331	0.101533	1.327968	0.132797

Sprint (T-Mobile)
HRT 080 953381
Carrier Summary

Frequency: 866 MHz
Maximum Permissible Exposure (MPE): 577.33 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.06632 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.18470 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	NNVV-65B-R4	150	90	1901	0.794576	0.137629	0.813287	0.140870
Commscope	NNVV-65B-R4	150	190	1901	0.794576	0.137629	0.813287	0.140870
Commscope	NNVV-65B-R4	150	310	1901	0.794576	0.137629	0.813287	0.140870

**Sprint (T-Mobile)
HRT 080 953381
Carrier Summary**

Frequency: 862 MHz
Maximum Permissible Exposure (MPE): 574.67 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.06632 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.18555 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	NNVV-65B-R4	150	90	1901	0.794576	0.138267	0.813287	0.141523
Commscope	NNVV-65B-R4	150	190	1901	0.794576	0.138267	0.813287	0.141523
Commscope	NNVV-65B-R4	150	310	1901	0.794576	0.138267	0.813287	0.141523

**Sprint (T-Mobile)
HRT 080 953381
Carrier Summary**

Frequency: 2500 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 2.93944 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.29394 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
RFS	APXVTM14-C-I20	150	90	6168	0.993202	0.099320	1.880311	0.188031
RFS	APXVTM14-C-I20	150	190	6168	0.993202	0.099320	1.880311	0.188031
RFS	APXVTM14-C-I20	150	310	6168	0.993202	0.099320	1.880311	0.188031

**T-Mobile
HRT 080 953381
Carrier Summary**

Frequency: 2100 MHz
 Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
 Maximum power density at ground level: 1.17692 $\mu\text{W}/\text{cm}^2$
 Highest percentage of Maximum Permissible Exposure: 0.11769 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
RFS	APXVAARR18_43-U-NA20	186	60	5783	0.808312	0.080831	1.140913	0.114091
RFS	APXVAARR18_43-U-NA20	186	180	5783	0.808312	0.080831	1.140913	0.114091
RFS	APXVAARR18_43-U-NA20	186	300	5783	0.808312	0.080831	1.140913	0.114091

**T-Mobile
HRT 080 953381
Carrier Summary**

Frequency: 1900 MHz
 Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
 Maximum power density at ground level: 1.00653 $\mu\text{W}/\text{cm}^2$
 Highest percentage of Maximum Permissible Exposure: 0.10065 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
RFS	APXVAARR18_43-U-NA20	186	60	4437	0.486440	0.048644	0.925607	0.092561
RFS	APXVAARR18_43-U-NA20	186	180	4437	0.486440	0.048644	0.925607	0.092561
RFS	APXVAARR18_43-U-NA20	186	300	4437	0.486440	0.048644	0.925607	0.092561

**T-Mobile
HRT 080 953381
Carrier Summary**

Frequency: 700 MHz
 Maximum Permissible Exposure (MPE): 466.67 $\mu\text{W}/\text{cm}^2$
 Maximum power density at ground level: 0.99491 $\mu\text{W}/\text{cm}^2$
 Highest percentage of Maximum Permissible Exposure: 0.21320 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
RFS	APXVAARR18_43-U-NA20	186	60	3035	0.708116	0.151739	0.907167	0.194393
RFS	APXVAARR18_43-U-NA20	186	180	3035	0.708116	0.151739	0.907167	0.194393
RFS	APXVAARR18_43-U-NA20	186	300	3035	0.708116	0.151739	0.907167	0.194393

**T-Mobile
HRT 080 953381
Carrier Summary**

Frequency: 600 MHz
 Maximum Permissible Exposure (MPE): 400 $\mu\text{W}/\text{cm}^2$
 Maximum power density at ground level: 0.62981 $\mu\text{W}/\text{cm}^2$
 Highest percentage of Maximum Permissible Exposure: 0.15745 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
RFS	APXVAARR18_43-U-NA20	186	60	1007	0.267115	0.066779	0.304628	0.076157
RFS	APXVAARR18_43-U-NA20	186	60	1007	0.267115	0.066779	0.304628	0.076157
RFS	APXVAARR18_43-U-NA20	186	180	1007	0.267115	0.066779	0.304628	0.076157
RFS	APXVAARR18_43-U-NA20	186	180	1007	0.267115	0.066779	0.304628	0.076157
RFS	APXVAARR18_43-U-NA20	186	300	1007	0.267115	0.066779	0.304628	0.076157
RFS	APXVAARR18_43-U-NA20	186	300	1007	0.267115	0.066779	0.304628	0.076157

**Verizon Wireless
HRT 080 953381
Carrier Summary**

Frequency: 3700 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 13.23477 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 1.32348 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Samsung	MT6407-77A	179	30	43155	5.636861	0.563686	12.739309	1.273931
Samsung	MT6407-77A	179	150	43155	5.636861	0.563686	12.739309	1.273931
Samsung	MT6407-77A	179	270	43155	5.636861	0.563686	12.739309	1.273931

**Verizon Wireless
HRT 080 953381
Carrier Summary**

Frequency: 2100 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 2.49895 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.24989 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	JAHH-65B-R3B	179	30	6069	1.381200	0.138120	2.409170	0.240917
Commscope	JAHH-65B-R3B	179	150	6069	1.381200	0.138120	2.409170	0.240917
Commscope	JAHH-65B-R3B	179	270	6069	1.381200	0.138120	2.409170	0.240917

**Verizon Wireless
HRT 080 953381
Carrier Summary**

Frequency: 1900 MHz
Maximum Permissible Exposure (MPE): 1000 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 2.60820 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.26082 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	JAHH-65B-R3B	179	30	5890	1.539974	0.153997	2.495434	0.249543
Commscope	JAHH-65B-R3B	179	150	5890	1.539974	0.153997	2.495434	0.249543
Commscope	JAHH-65B-R3B	179	270	5890	1.539974	0.153997	2.495434	0.249543

**Verizon Wireless
HRT 080 953381
Carrier Summary**

Frequency: 751 MHz
Maximum Permissible Exposure (MPE): 500.67 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 0.89650 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.17906 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Commscope	JAHH-65B-R3B	179	30	2661	0.570290	0.113906	0.818852	0.163552
Commscope	JAHH-65B-R3B	179	150	2661	0.570290	0.113906	0.818852	0.163552
Commscope	JAHH-65B-R3B	179	270	2661	0.570290	0.113906	0.818852	0.163552

**Verizon Wireless
HRT 080 953381
Carrier Summary**

Frequency: 850 MHz
Maximum Permissible Exposure (MPE): 566.67 $\mu\text{W}/\text{cm}^2$
Maximum power density at ground level: 1.63813 $\mu\text{W}/\text{cm}^2$
Highest percentage of Maximum Permissible Exposure: 0.28908 %

Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	On Axis		Area	
					Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE	Max Power Density ($\mu\text{W}/\text{cm}^2$)	Percent of MPE
Antel	LPA-80080-6CF	179	30	1005	0.206955	0.036521	0.316733	0.055894
Commscope	JAHH-65B-R3B	179	30	3120	0.571593	0.100869	0.928318	0.163821
Antel	LPA-80080-6CF	179	30	1005	0.206955	0.036521	0.316733	0.055894
Antel	LPA-80080-6CF	179	150	1005	0.206955	0.036521	0.316733	0.055894
Commscope	JAHH-65B-R3B	179	150	3120	0.571593	0.100869	0.928318	0.163821
Antel	LPA-80080-6CF	179	150	1005	0.206955	0.036521	0.316733	0.055894
Antel	LPA-80080-6CF	179	270	1005	0.206955	0.036521	0.316733	0.055894
Commscope	JAHH-65B-R3B	179	270	3120	0.571593	0.100869	0.928318	0.163821
Antel	LPA-80080-6CF	179	270	1005	0.206955	0.036521	0.316733	0.055894

Exhibit G

Letter of Authorization



4545 E River Rd, Suite 320
West Henrietta, NY 14586

Phone: (585) 445-5896
Fax: (724) 416-4461
www.crowncastle.com

Crown Castle Letter of Authorization

CT - CONNECTICUT SITING COUNCIL

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

**Re: Tower Share Application
Crown Castle telecommunications site at:
539 PLAINS RD, HADDAM, CT 06438**

CROWN ATLANTIC COMPANY LLC ("Crown Castle") hereby authorizes DISH WIRELESS, LLC, including their Agent, to act as our Agent in the processing of all zoning applications, building permits and approvals through the CT - CONNECTICUT SITING COUNCIL for the existing wireless communications site described below:


**Crown Site ID/Name: 806478/HRT 080 953381
Customer Site ID: BOBDL00053A/CT-CCI-T-806478
Site Address: 539 PLAINS RD, HADDAM, CT 06438**

Crown Castle

By:  Date: 7/29/2021
Richard Zajac
Site Acquisition Specialist

Exhibit H

Recipient Mailings



**UNITED STATES
POSTAL SERVICE®**

Click-N-Ship®

P

usps.com 9405 5036 9930 0005 0393 63 0079 5000 0031 4586
US POSTAGE
 Flat Rate Envoy

U.S. POSTAGE PAID
click-n-ship®

09/15/2021 Mailed from 01566

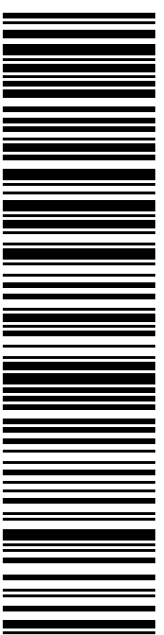
PRIORITY MAIL 2-DAY™

Expected Delivery Date: 09/18/21
 Re#: DS-806478
0006

R013

SHIP TO: RICH ZAJAC
 CROWN CASTLE
 4545 E RIVER RD
 STE 320
 W HENRIETTA NY 14586-9024

USPS TRACKING #



9405 5036 9930 0005 0393 63

Electronic Rate Approved #038555749



Cut on dotted line.

Instructions

1. Each Click-N-Ship® label is unique. Labels are to be used as printed and used only once. DO NOT PHOTO COPY OR ALTER LABEL.
2. Place your label so it does not wrap around the edge of the package.
3. Adhere your label to the package. A self-adhesive label is recommended. If tape or glue is used, DO NOT TAPE OVER BARCODE. Be sure all edges are secure.
4. To mail your package with PC Postage®, you may schedule a Package Pickup online, hand to your letter carrier, take to a Post Office™, or drop in a USPS collection box.
5. Mail your package on the "Ship Date" you selected when creating this label.

Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0005 0393 63

Trans. #: 543688001	Priority Mail® Postage: \$7.95
Print Date: 09/15/2021	Total: \$7.95
Ship Date: 09/15/2021	
Expected Delivery Date: 09/18/2021	


From: DEBORAH CHASE Re#: DS-806478
 NORTHEAST SITE SOLUTIONS
 420 MAIN ST
 STE 1
 STURBRIDGE MA 01566-1359

To: RICH ZAJAC
 CROWN CASTLE
 4545 E RIVER RD
 STE 320
 W HENRIETTA NY 14586-9024

* Retail Pricing Priority Mail rates apply. There is no fee for USPS Tracking® service on Priority Mail service with use of this electronic rate shipping label. Refunds for unused postage paid labels can be requested online 30 days from the print date.



Thank you for shipping with the United States Postal Service!
 Check the status of your shipment on the USPS Tracking® page at usps.com



**UNITED STATES
POSTAL SERVICE®**

Click-N-Ship®

P

usps.com 9405 5036 9930 0005 0393 87 0155 0000 0010 6438
US POSTAGE
 MD Flat Rate Box

U.S. POSTAGE PAID
Click-N-Ship®

09/15/2021 Mailed from 01566


PRIORITY MAIL 2-DAY™

Expected Delivery Date: 09/18/21
 Re#: DS-806478
0004

R002

SHIP TO: GARY VIVIAN
 BUILDING OFFICIAL
 30 FIELD PARK DR
 HADDAM CT 06438-1140

USPS TRACKING #



9405 5036 9930 0005 0393 87

Electronic Rate Approved #038555749



Cut on dotted line.

Instructions

1. Each Click-N-Ship® label is unique. Labels are to be used as printed and used only once. DO NOT PHOTO COPY OR ALTER LABEL.
2. Place your label so it does not wrap around the edge of the package.
3. Adhere your label to the package. A self-adhesive label is recommended. If tape or glue is used, DO NOT TAPE OVER BARCODE. Be sure all edges are secure.
4. To mail your package with PC Postage®, you may schedule a Package Pickup online, hand to your letter carrier, take to a Post Office™, or drop in a USPS collection box.
5. Mail your package on the "Ship Date" you selected when creating this label.

Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0005 0393 87

Trans. #: 543688001	Priority Mail® Postage: \$15.50
Print Date: 09/15/2021	Total: \$15.50
Ship Date: 09/15/2021	
Expected Delivery Date: 09/18/2021	

From: DEBORAH CHASE
 NORTHEAST SITE SOLUTIONS
 420 MAIN ST
 STE 1
 STURBRIDGE MA 01566-1359


Re#: DS-806478

To: GARY VIVIAN
 BUILDING OFFICIAL
 30 FIELD PARK DR
 HADDAM CT 06438-1140

* Retail Pricing Priority Mail rates apply. There is no fee for USPS Tracking® service on Priority Mail service with use of this electronic rate shipping label. Refunds for unused postage paid labels can be requested online 30 days from the print date.



Thank you for shipping with the United States Postal Service!
 Check the status of your shipment on the USPS Tracking® page at usps.com



UNITED STATES POSTAL SERVICE®

Click-N-Ship®

P

usps.com 9405 5036 9930 0005 0393 94 0155 0000 0041 5317

US POSTAGE

MD Flat Rate Box

09/15/2021

Mailed from 01566

U.S. POSTAGE PAID

click-n-ship®

PRIORITY MAIL 3-DAY™

Expected Delivery Date: 09/20/21

Re#: DS-806478

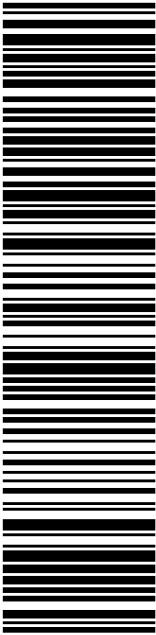
0004

C033

SHIP TO:

539 PLAINS RD LLC C/O CROWN ATLANTIC
 4017 WASHINGTON RD
 MCMURRAY PA 15317-2510

USPS TRACKING #



9405 5036 9930 0005 0393 94

Electronic Rate Approved #038555749



Cut on dotted line.

Instructions

1. Each Click-N-Ship® label is unique. Labels are to be used as printed and used only once. DO NOT PHOTO COPY OR ALTER LABEL.
2. Place your label so it does not wrap around the edge of the package.
3. Adhere your label to the package. A self-adhesive label is recommended. If tape or glue is used, DO NOT TAPE OVER BARCODE. Be sure all edges are secure.
4. To mail your package with PC Postage®, you may schedule a Package Pickup online, hand to your letter carrier, take to a Post Office™, or drop in a USPS collection box.
5. Mail your package on the "Ship Date" you selected when creating this label.

Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0005 0393 94

Trans. #: 543688001	Priority Mail® Postage: \$15.50
Print Date: 09/15/2021	Total: \$15.50
Ship Date: 09/15/2021	
Expected Delivery Date: 09/20/2021	

From: DEBORAH CHASE Re#: DS-806478
 NORTHEAST SITE SOLUTIONS
 420 MAIN ST
 STE 1
 STURBRIDGE MA 01566-1359

To: 539 PLAINS RD LLC C/O CROWN ATLANTIC
 4017 WASHINGTON RD
 MCMURRAY PA 15317-2510

* Retail Pricing Priority Mail rates apply. There is no fee for USPS Tracking® service on Priority Mail service with use of this electronic rate shipping label. Refunds for unused postage paid labels can be requested online 30 days from the print date.



Thank you for shipping with the United States Postal Service!
 Check the status of your shipment on the USPS Tracking® page at usps.com

806478 - Haddam



FISKDALE
458 MAIN ST
FISKDALE, MA 01518-9998
(800)275-8777

09/17/2021 10:12 AM

Product	Qty	Unit Price	Price
Prepaid Mail	1		\$0.00
Southington, CT 06489			
Weight: 1 lb 14.80 oz			
Acceptance Date:			
Fri 09/17/2021			
Tracking #:			
9405 5036 9930 0005 4339 70			
Prepaid Mail	1		\$0.00
West Henrietta, NY 14586			
Weight: 0 lb 2.00 oz			
Acceptance Date:			
Fri 09/17/2021			
Tracking #:			
9405 5036 9930 0005 4339 63			
Prepaid Mail	1		\$0.00
Southington, CT 06489			
Weight: 1 lb 14.90 oz			
Acceptance Date:			
Fri 09/17/2021			
Tracking #:			
9405 5036 9930 0005 4339 87			
Prepaid Mail	1		\$0.00
West Henrietta, NY 14586			
Weight: 0 lb 2.00 oz			
Acceptance Date:			
Fri 09/17/2021			
Tracking #:			
9405 5036 9930 0005 0393 63			
Grand Total:			\$0.00