NSS NORTHEAST SITE SOLUTIONS
Turnkey Wireless Development

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 negligent.

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

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

NORTHEAST SITE SOLUTIONS, LLC
1053 FARMINGTON AVE STE G
FARMINGTON, CT 06032

WEBSTER BANK
51-7010/2111

4584

08/06/2021

*625.00

PAY TO THE ORDER OF Connecticut Siting Council $

EXACTLY SIX HUNDRED TWENTY-FIVE DOLLARS

DOLLARS

Connecticut Siting Council
10 Franklin Square
New Britain CT 06051

MEMO

Lisa Lori Allen
AUTHORIZED SIGNATURE

Photo Safe Deposit®
Details on Back.

⑈004584⑈ ⑆211170101⑆10 0010608887⑈

NORTHEAST SITE SOLUTIONS, LLC

4584

Check#: **4584** **Date:** **08/06/2021** **Vendor#:** **10023 Connecticut Siting Council Check Total:** ***625.00**

Invoice#	*Invoice Date*	*Job/Description*	*Balance*	*Retain*	*Discount*	*This Check*
806478 Crown Direct	08/06/2021	117 Crown Direct Z/P	625.00			625.00

NORTHEAST SITE SOLUTIONS, LLC

4584

Check#: **4584** **Date:** **08/06/2021** **Vendor#:** **10023 Connecticut Siting Council Check Total:** ***625.00**

Invoice#	*Invoice Date*	*Job/Description*	*Balance*	*Retain*	*Discount*	*This Check*
806478 Crown Direct	08/06/2021	117 Crown Direct Z/P	625.00			625.00

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.

DECISION AND ORDER

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 decison 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)

CERTIFICATION

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

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

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

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

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

ATTEST:

S Wood

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/ /
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	

Foundation	

Extra Features

Extra Features	Legend
No Data for Extra Features	

Land

Land Use

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

Land Line Valuation

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

Outbuildings

Outbuildings **Legend**

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


Filley Rd
Turkey Hill Rd
Valley Bible Evangelical Free
Valley Bible Evangelical Church
Plains Rd
Roaring Brook
Wigwam Brook
539 Plains Road
Chester Bowles Hwy
Turkey Hill Rd
Plains Rd
Ruth Hill Rd
4th Rd
Ruth Hill Rd
Ruth Hill
Turkey Hill Brook
Turkey Hill Cemetery
Roaring Brook
9
Cedar Lake Rd
Filley Rd
Dickinson Rd
Turkey Hill Rd
Rutty Ln
Chester Bowles Hwy
Cedar Lake Rd
N Cedar Lake Rd
Turkey Hill Rd

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:
- 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:
- 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

PROPERTY OWNER:	MICHAEL, JACQUELINE
ADDRESS:	4 PARK ROAD c/o ERIC POMERANTZ, ATTNY. SHARON, MA 02067
TOWER TYPE:	SELF SUPPORT TOWER
TOWER CO SITE ID:	806478
TOWER APP NUMBER:	553396
COUNTY:	MIDDLESEX
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

PROJECT DIRECTORY

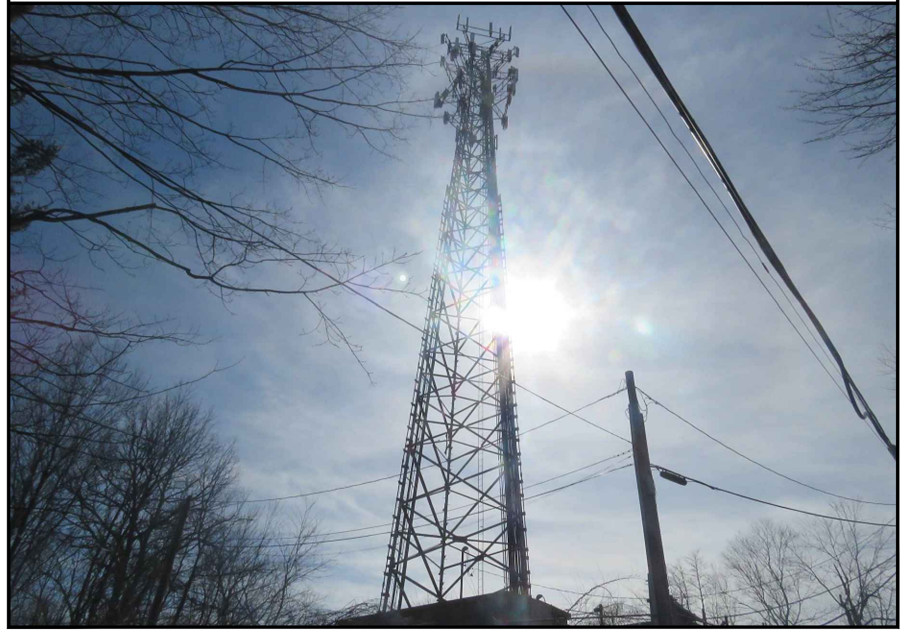
APPLICANT:	DISH WIRELESS, LLC. 5701 SOUTH SANTA FE DRIVE LITTLETON, CO 80120
TOWER OWNER:	CROWN CASTLE USA INC. 2000 CORPORATE DRIVE CANONSBURG, PA 15317 (877) 486–9377
SITE DESIGNER:	INFINIGY 2500 W. HIGGINS RD. STE. 500 HOFFMAN ESTATES, IL 60169 (847) 648–4068
SITE ACQUISITION:	NICHOLAS CURRY TBD
CONSTRUCTION MANAGER:	JAVIER SOTO TBD
RF ENGINEER:	BOSSENER CHARLES

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

SITE PHOTO



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

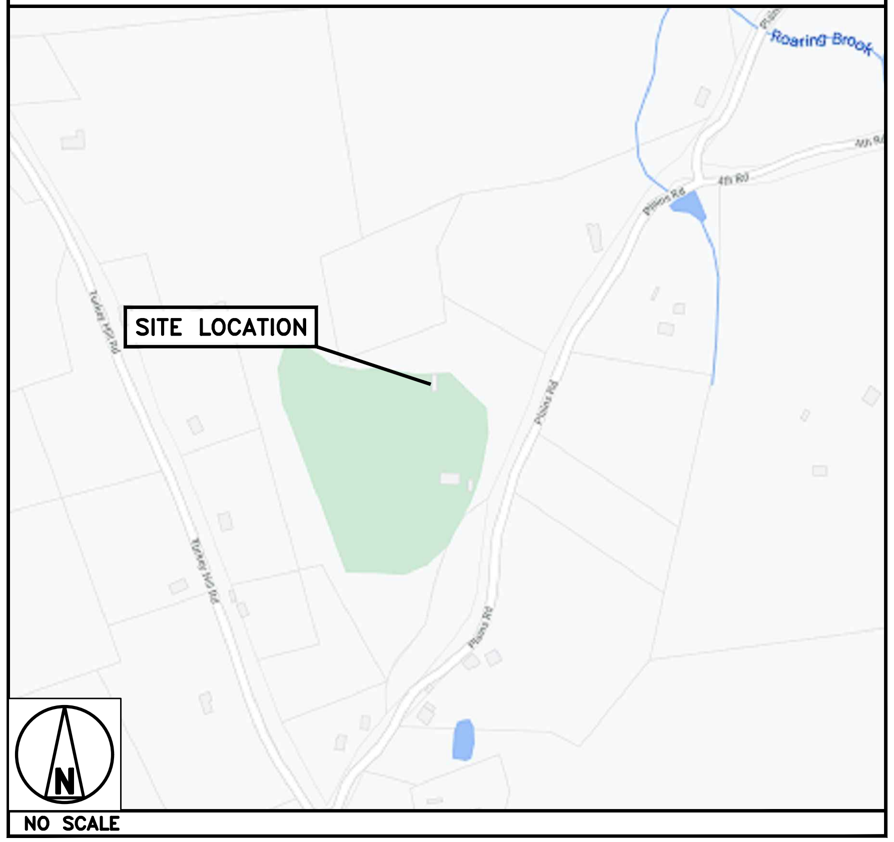
SHEET INDEX

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

811

VICINITY MAP



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.

dish wireless.

5701 SOUTH SANTA FE DRIVE
LITTLETON, CO 80120

CROWN CASTLE
2000 CORPORATE DRIVE
CANONSBURG, PA 15317

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

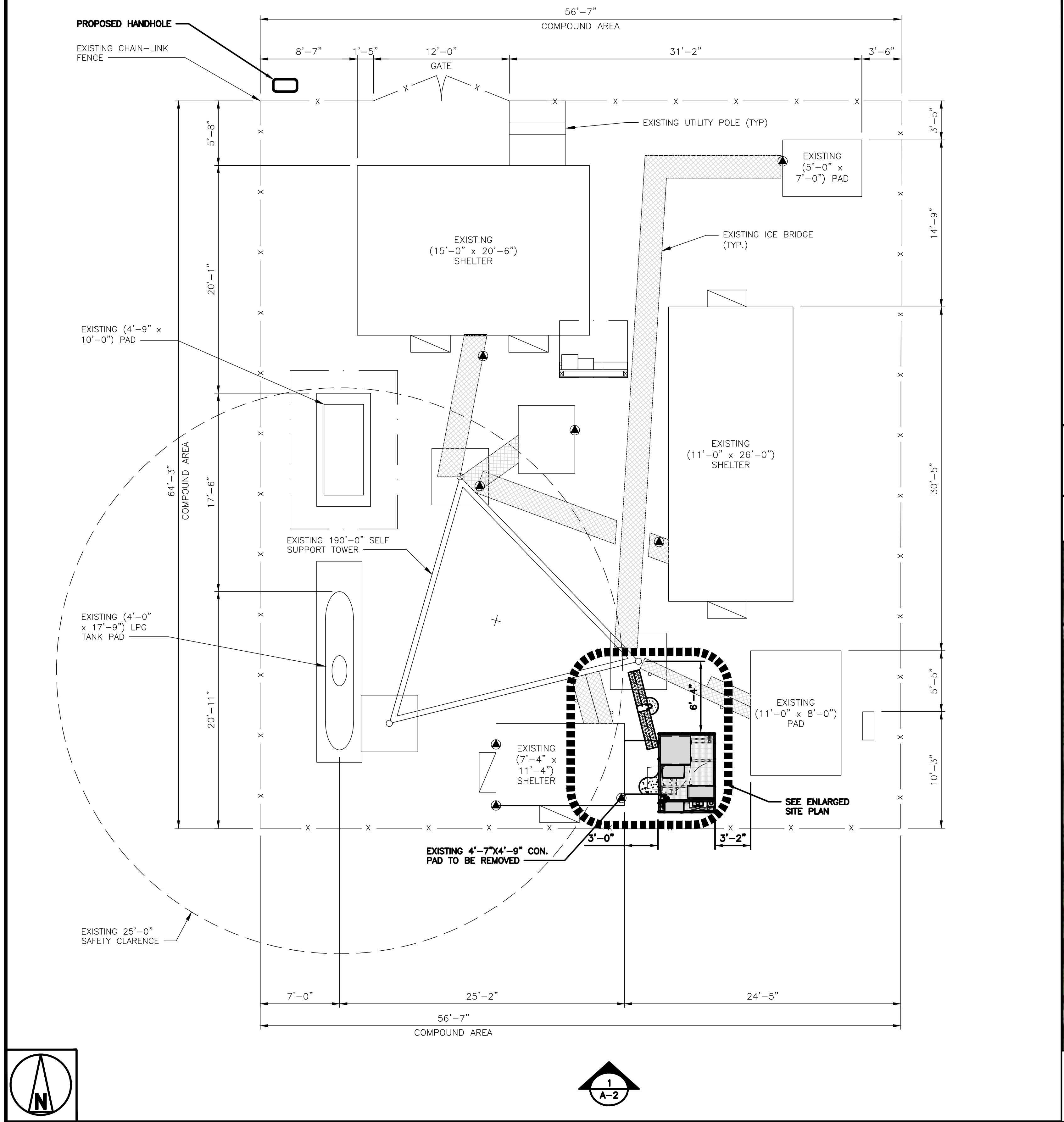
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

NOTES

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

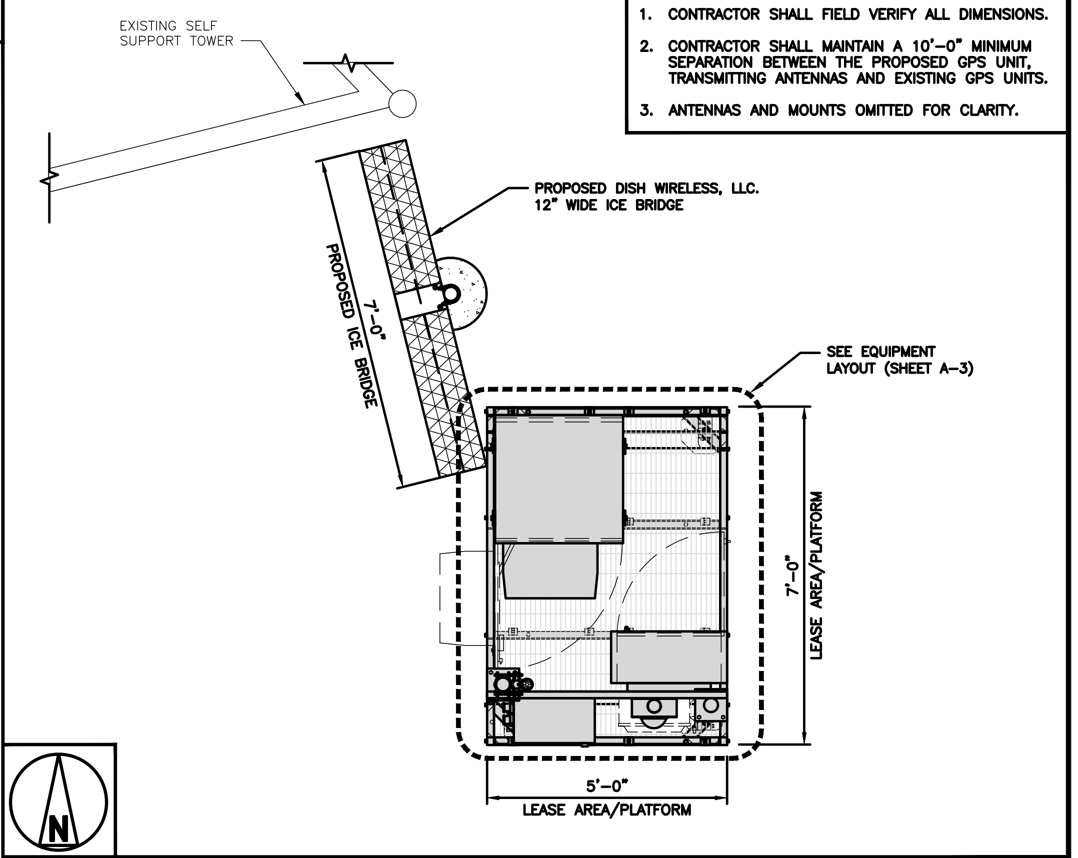


COMPOUND PLAN

6' 4' 2' 0 5' 10'
3/16"=1'-0"
1

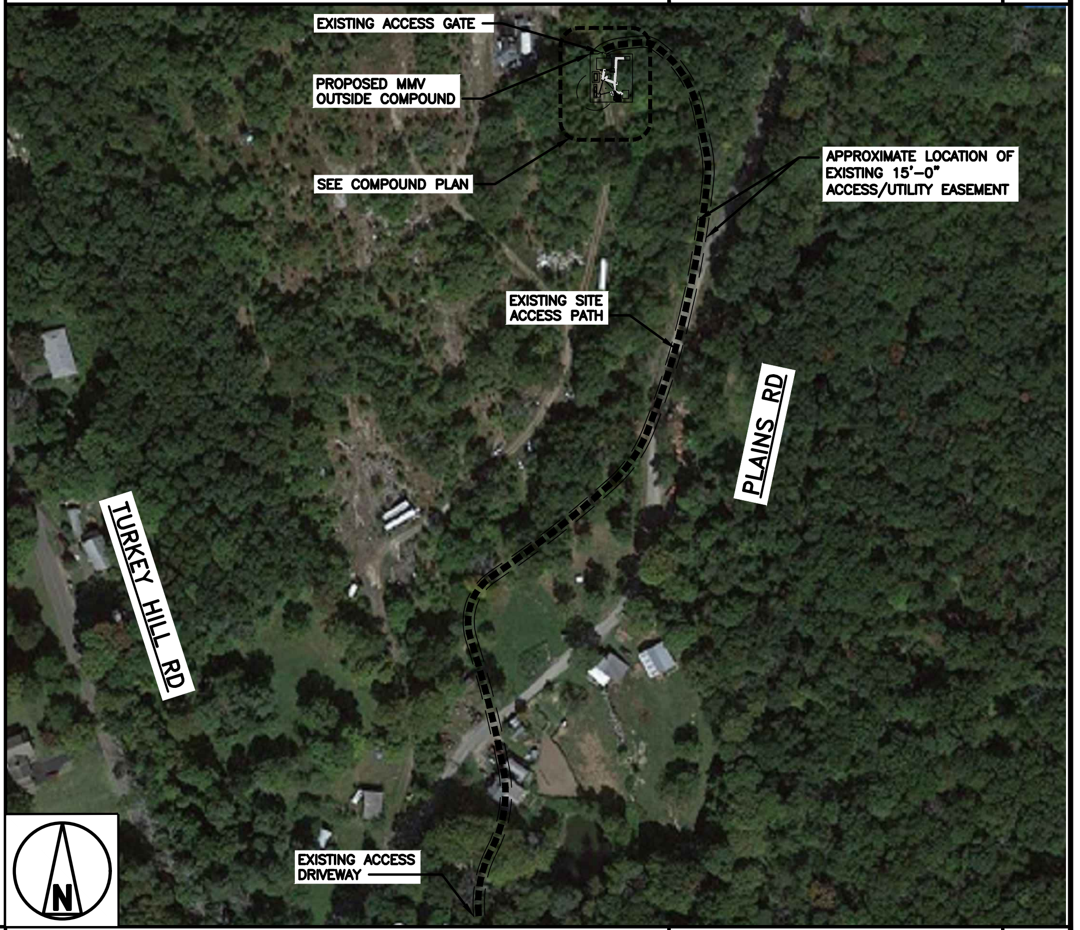
NOTES

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

12" 6" 0 1' 2' 3' 4' 5'
1/2"=1'-0"
2



SITE PLAN

128' 64' 0 128' 256'
1/128"=1'-0"
3

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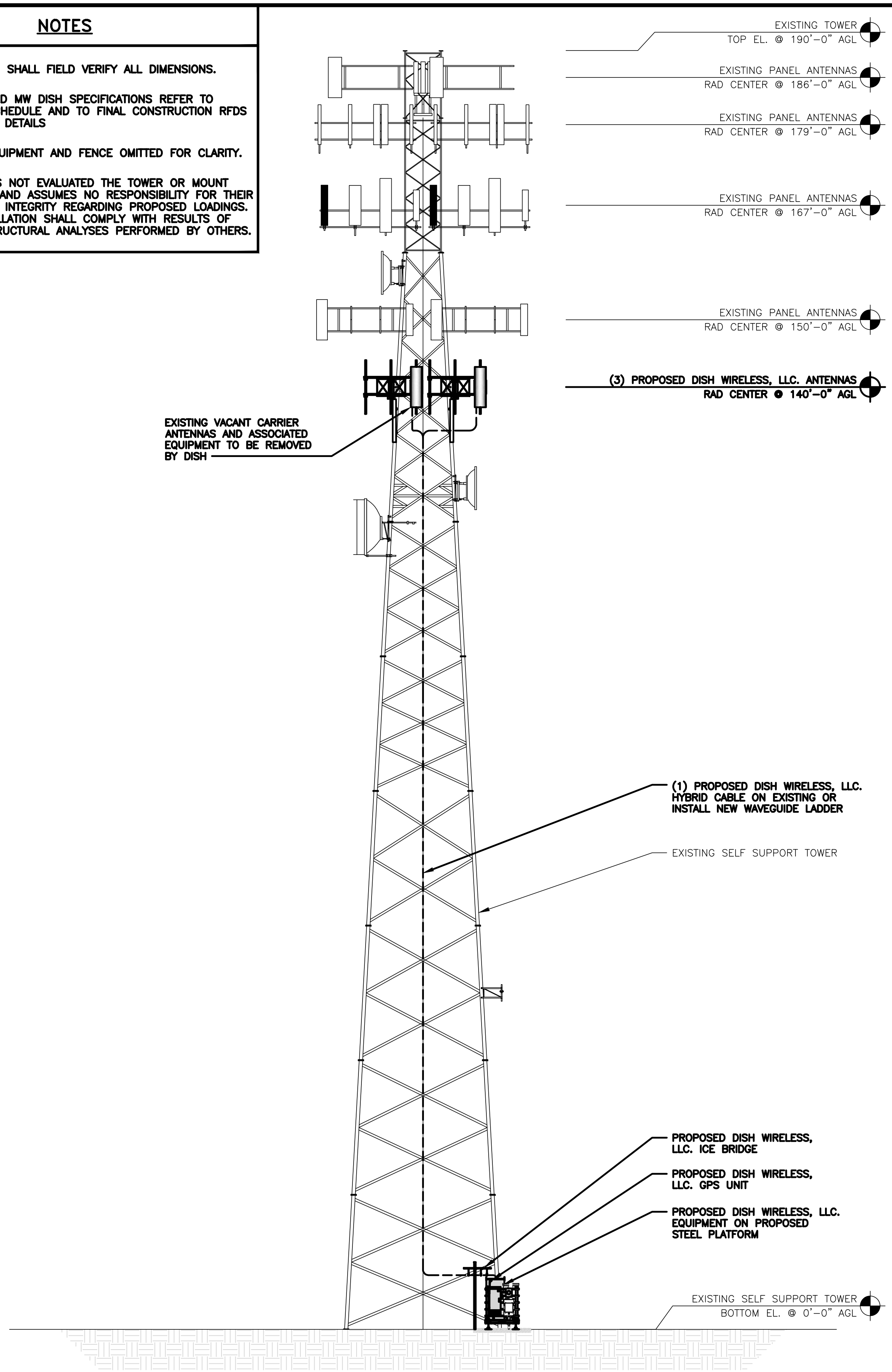
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
OVERALL AND ENLARGED SITE PLAN

SHEET NUMBER
A-1

NOTES

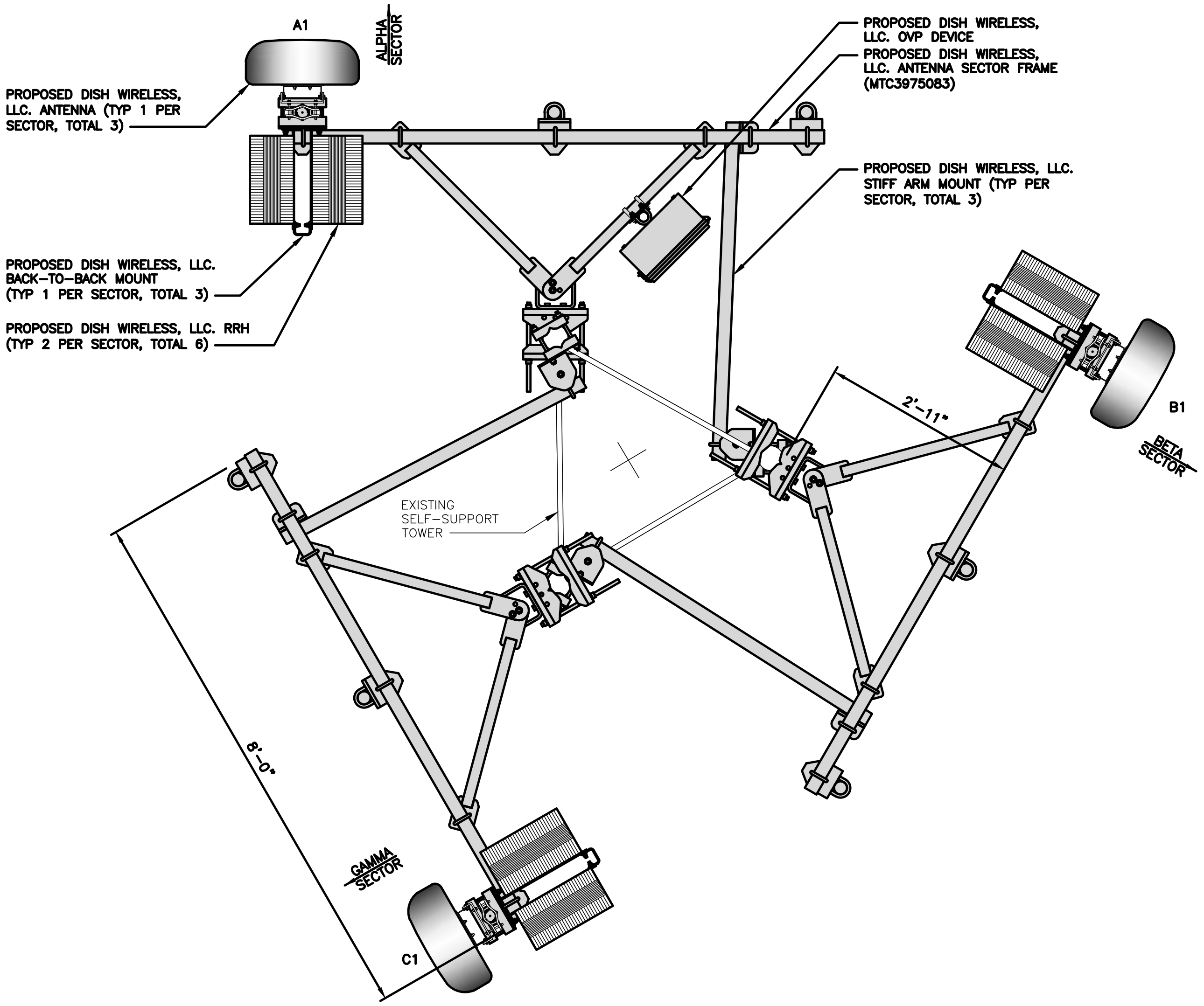
1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. ANTENNA AND MW DISH SPECIFICATIONS REFER TO ANTENNA SCHEDULE AND TO FINAL CONSTRUCTION RFDS FOR ALL RF DETAILS
3. EXISTING EQUIPMENT AND FENCE OMITTED FOR CLARITY.
4. INFINIGY HAS NOT EVALUATED THE TOWER OR MOUNT STRUCTURE AND ASSUMES NO RESPONSIBILITY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



PROPOSED SOUTH ELEVATION

12' 8' 4' 0 10' 20'
3/32"=1'–0"

1



ANTENNA LAYOUT

12" 6" 0 1' 2' 3'
3/4"=1'–0"

2

SECTOR	POSITION	ANTENNA						TRANSMISSION CABLE
		EXISTING OR PROPOSED	MANUFACTURER – MODEL NUMBER	TECHNOLOGY	SIZE (HxW)	AZMUITH	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	
		MANUFACTURER – MODEL NUMBER	TECHNOLOGY
ALPHA	A1	FUJITSU – TA08025–B604	5G
	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

NOTES

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.

ANTENNA SCHEDULE

NO SCALE

3

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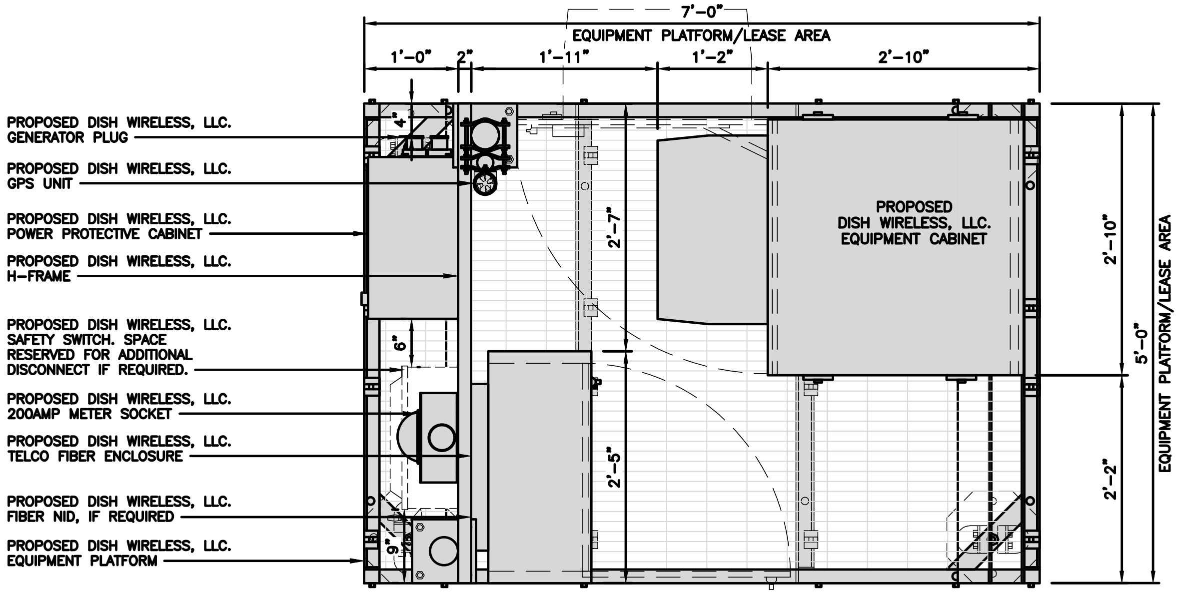
A&E PROJECT NUMBER
2039–Z5555C

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

SHEET TITLE
ELEVATION, ANTENNA LAYOUT AND SCHEDULE

SHEET NUMBER
A-2



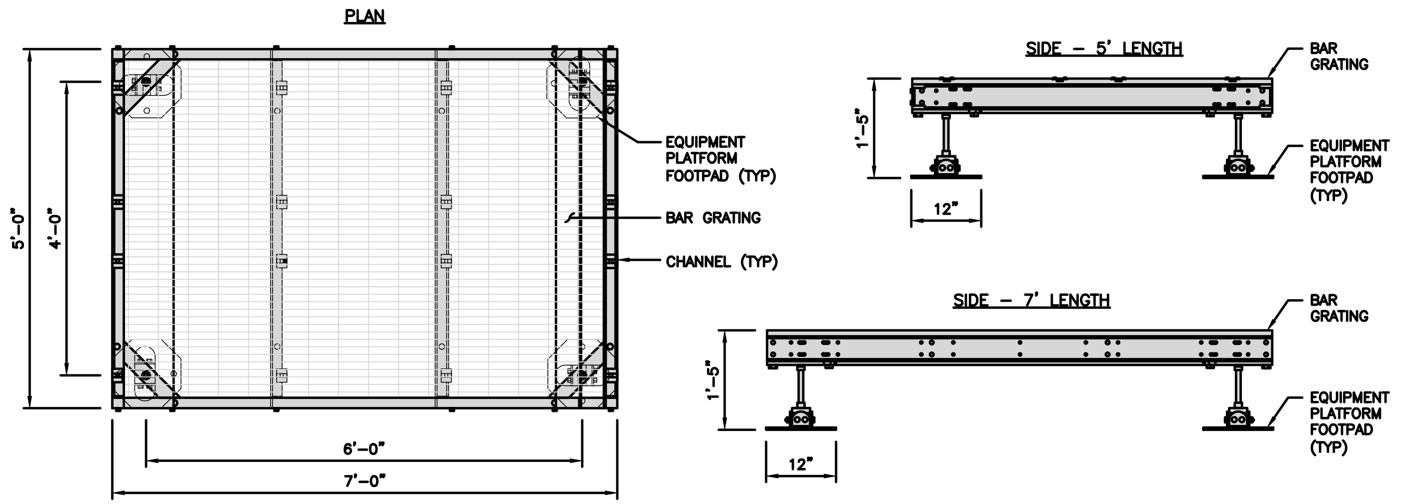
PLATFORM EQUIPMENT PLAN

12" 9" 6" 3" 0 1' 2'
1"=1'-0"

1

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"

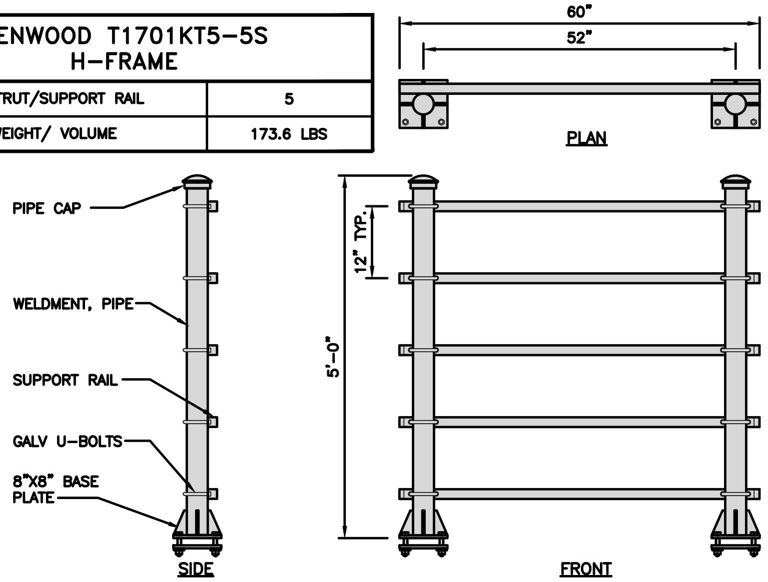


PLATFORM DETAIL

NO SCALE

2

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



H-FRAME DETAIL

NO SCALE

3

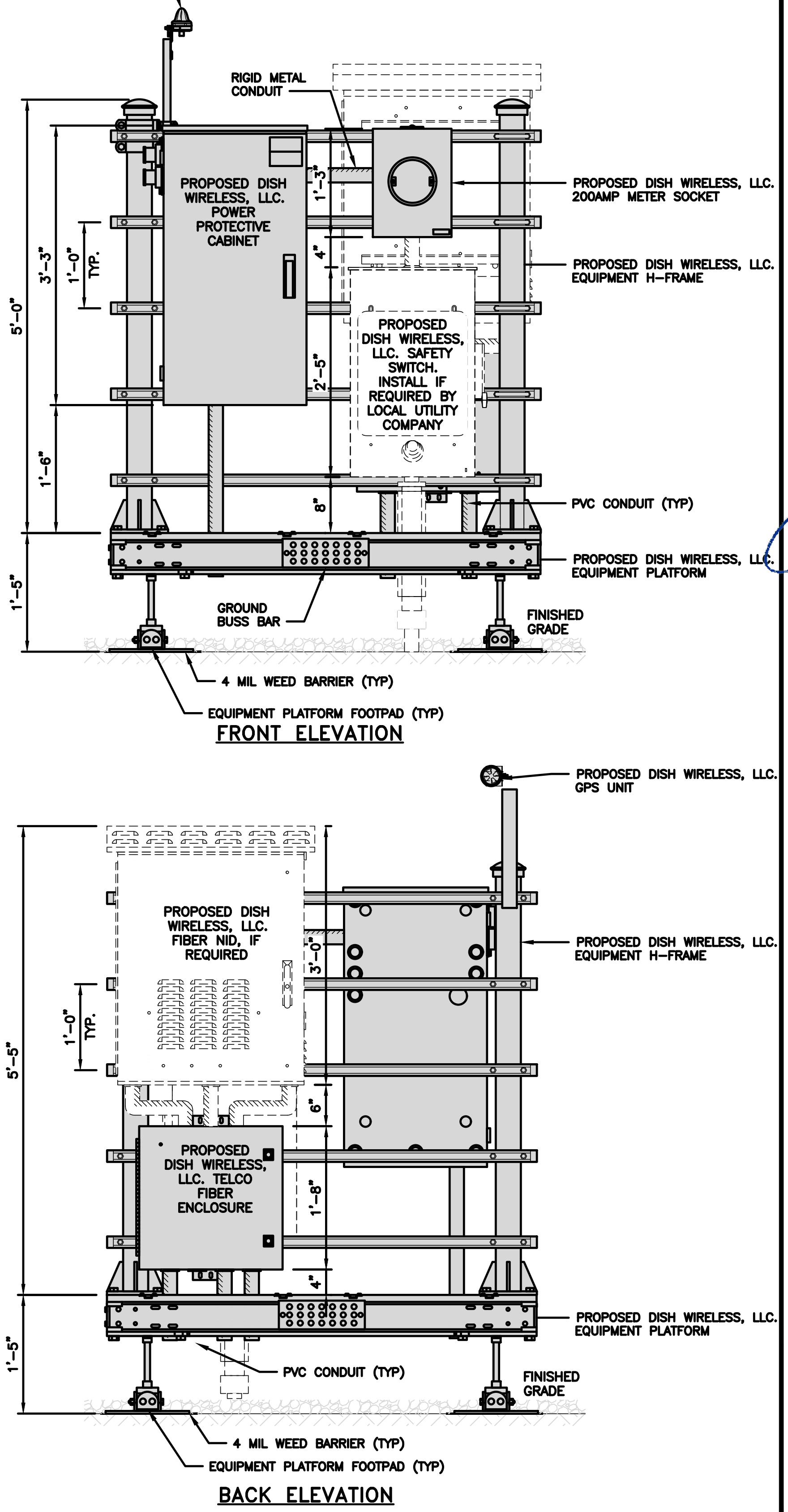
NOT USED

NO SCALE

4

NOTES

1. CONTRACTOR TO BURY PLATFORM FEET WITH A MINIMUM OF 2" OF FILL PER EXISTING SITE SURFACE
2. 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)
3. EQUIPMENT CABINET OMITTED FOR CLARITY



H-FRAME EQUIPMENT ELEVATION

12" 9" 6" 3" 0 1' 2'
1"=1'-0"

5

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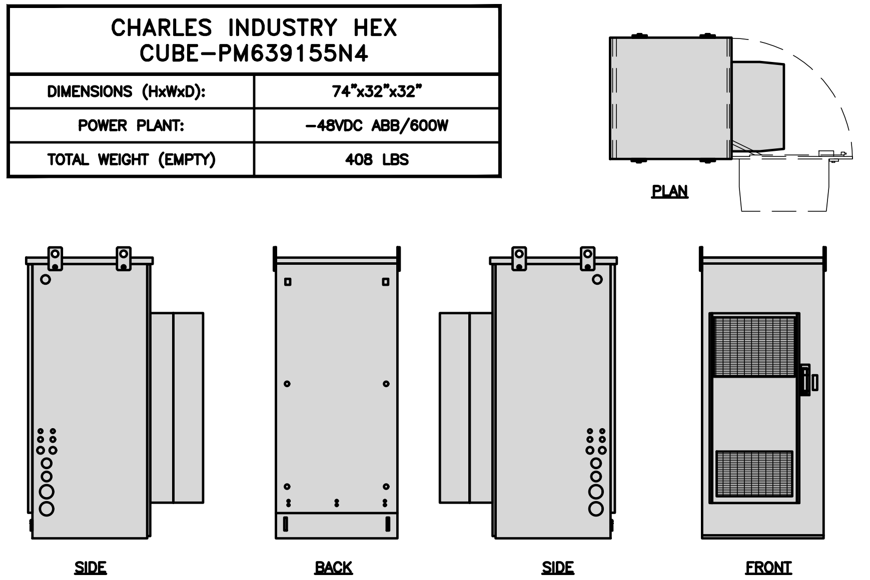
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT PLATFORM AND H-FRAME DETAILS

SHEET NUMBER
A-3

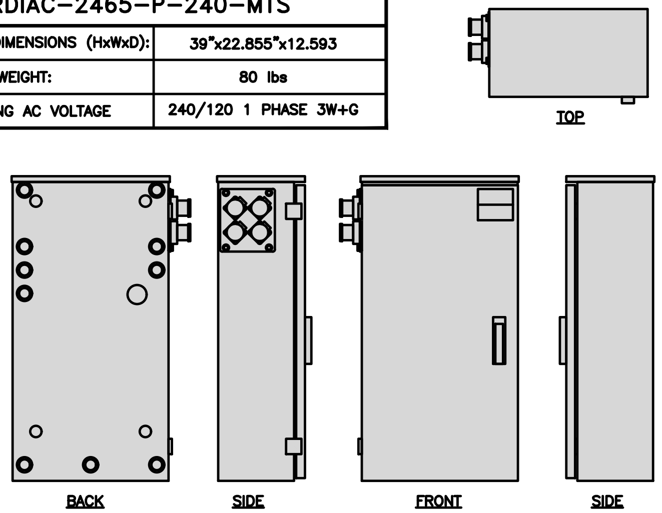
CHARLES INDUSTRY HEX CUBE–PM639155N4	
DIMENSIONS (HxWxD):	74"x32"x32"
POWER PLANT:	–48VDC ABB/600W
TOTAL WEIGHT (EMPTY)	408 LBS



CABINET DETAIL

NO SCALE 1

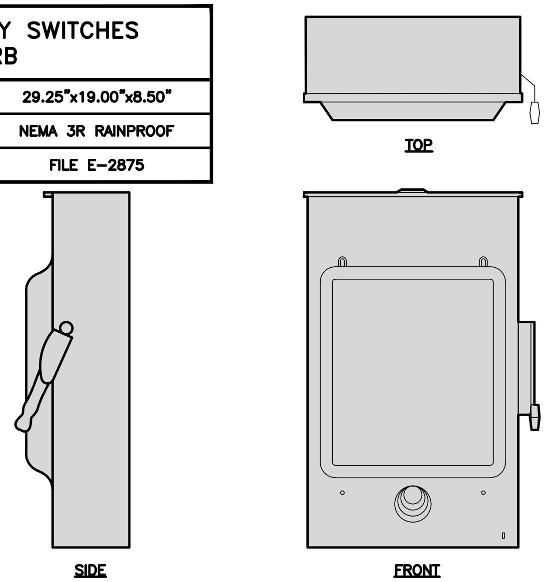
RAYCAP PPC RDIAC–2465–P–240–MTS	
ENCLOSURE DIMENSIONS (HxWxD):	39"x22.855"x12.593
WEIGHT:	80 lbs
OPERATING AC VOLTAGE	240/120 1 PHASE 3W+G



POWER PROTECTION CABINET (PPC) DETAIL

NO SCALE 2

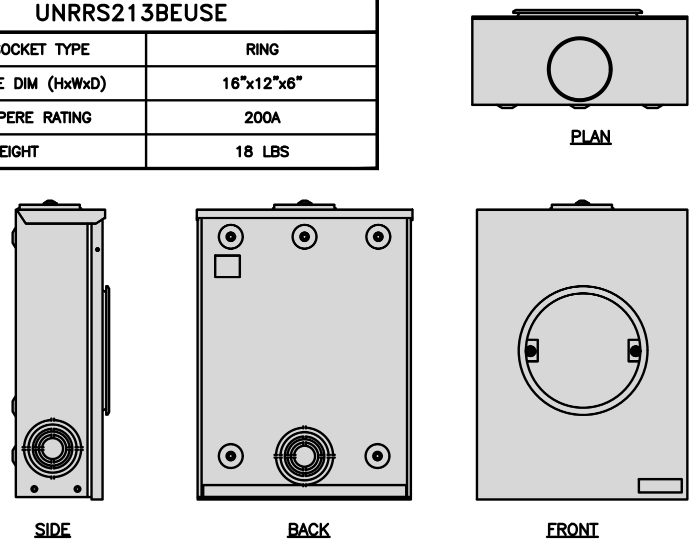
SQUARE D SAFETY SWITCHES D224NRB	
ENCLOSURE DIM (HxWxD)	29.25"x19.00"x8.50"
ENCLOSURE TYPE	NEMA 3R RAINPROOF
UL LISTED	FILE E–2875



SAFETY SWITCH DETAIL

NO SCALE 3

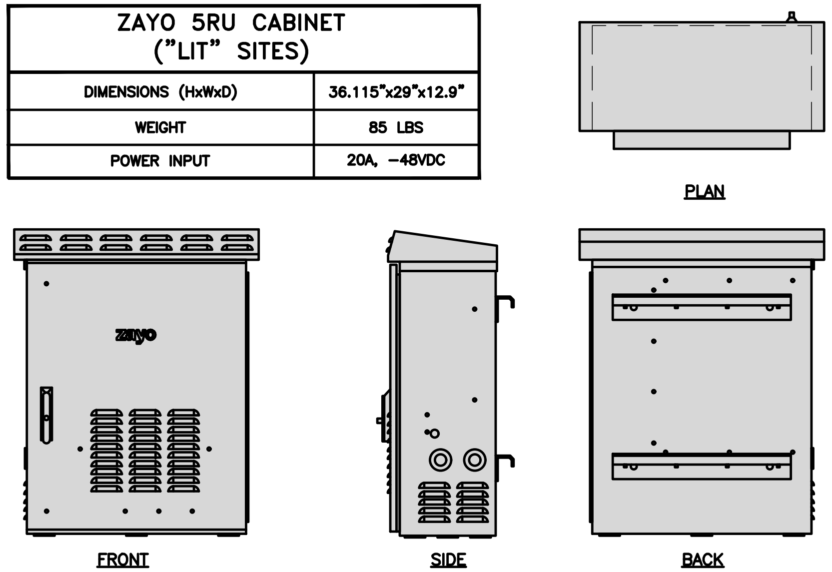
EATON METER SOCKET UNRRS213BEUSE	
METER SOCKET TYPE	RING
ENCLOSURE DIM (HxWxD)	16"x12"x6"
MAIN AMPERE RATING	200A
WEIGHT	18 LBS



METER SOCKET DETAIL

NO SCALE 4

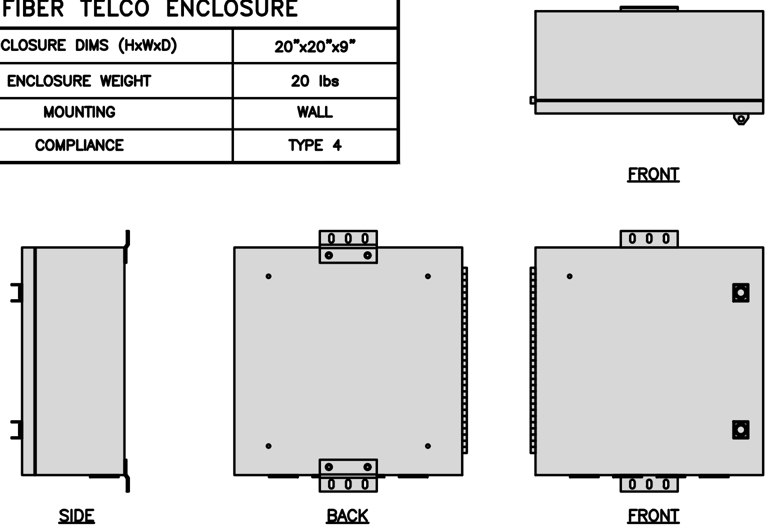
ZAYO 5RU CABINET ("LIT" SITES)	
DIMENSIONS (HxWxD)	36.115"x29"x12.9"
WEIGHT	85 LBS
POWER INPUT	20A, –48VDC



NETWORK INTERFACE UNIT DETAIL

NO SCALE 5

CHARLES CFIT–PF2020DSH1 FIBER TELCO ENCLOSURE	
ENCLOSURE DIMS (HxWxD)	20"x20"x9"
ENCLOSURE WEIGHT	20 lbs
MOUNTING	WALL
COMPLIANCE	TYPE 4

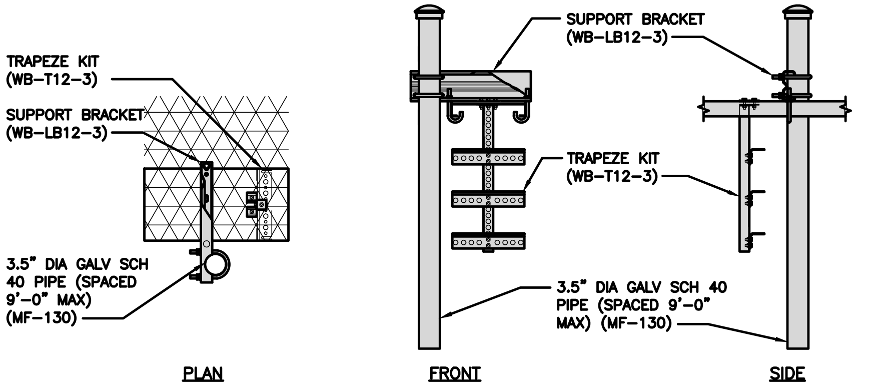


FIBER TELCO ENCLOSURE DETAIL

NO SCALE 6

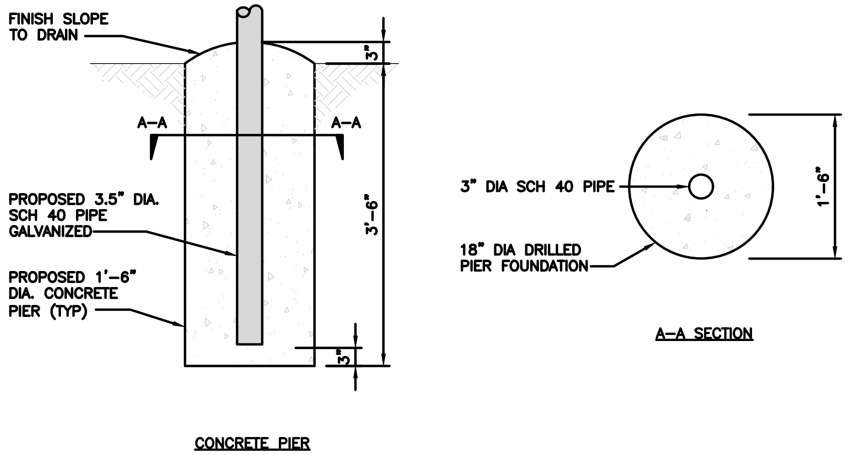
COMMSCOPE WB–K110–B WAVEGUIDE BRIDGE KIT	
DIMENSIONS (HxL)	160"x10'
WEIGHT/ VOLUME	325.0 LBS
CABLE RUN (QTY)	12

INCLUDED PRODUCTS:	WB–T12–3 TRAPEZE KIT, 3 RUNGS WB–LB12–3 SUPPORT BRACKET MF–130 DIRECT BURIAL PIPE COLUMN, 13'–4"



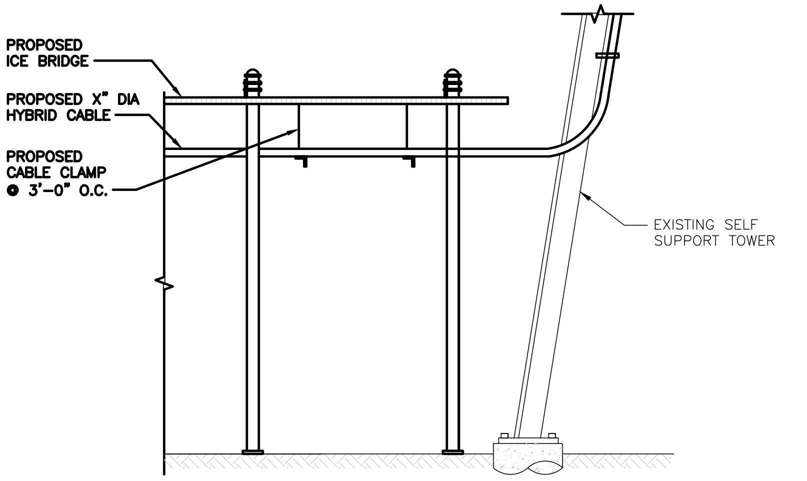
ICE BRIDGE DETAIL

NO SCALE 7



TYPICAL ICE BRIDGE CONCRETE PIER DETAIL

NO SCALE 8



HYBRID CABLE RUN

NO SCALE 9

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2039–Z5555C

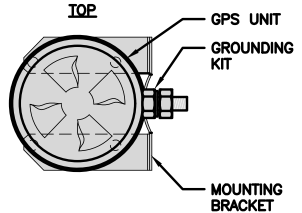
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT DETAILS

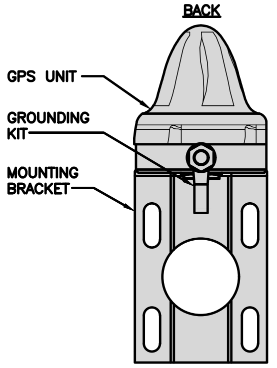
SHEET NUMBER
A-4

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

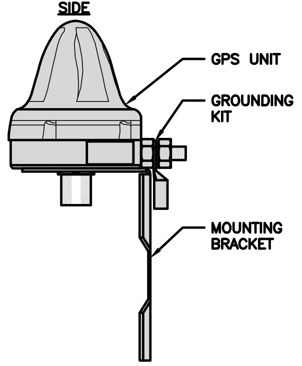
TOP



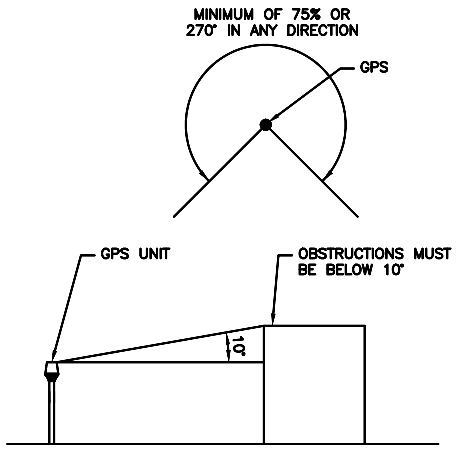
BACK



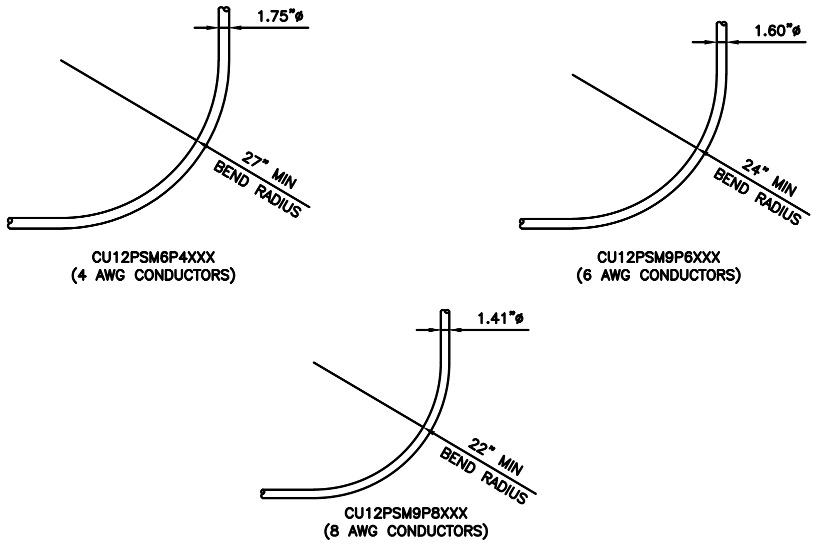
SIDE



GPS ANTENNA DETAIL | NO SCALE | 1



GPS MINIMUM SKY VIEW REQUIREMENTS | NO SCALE | 2



CABLES UNLIMITED HYBRID CABLE
MINIMUM BEND RADIUSES | 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

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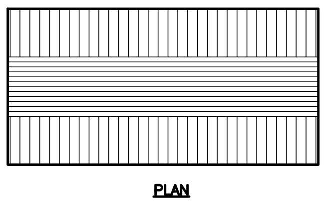
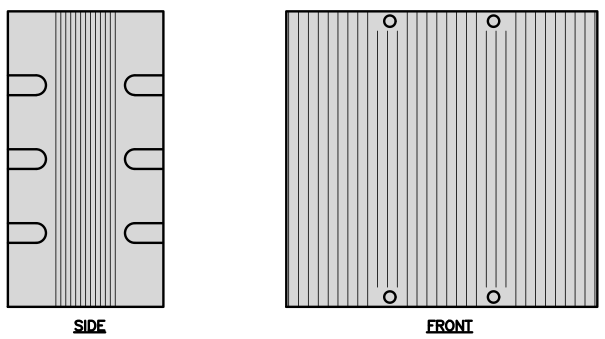
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
EQUIPMENT DETAILS

SHEET NUMBER
A-5

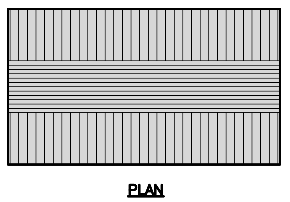
FUJITSU TA08025–B604 RRH	
DIMENSIONS (HxWxD) (KG/IN)	380x400x200/14.9"x15.7"x7.8"
WEIGHT(KG,LB)/ VOLUME	29kg,63.9lb/ 30L
POWER SUPPLY	DC–58~–36V

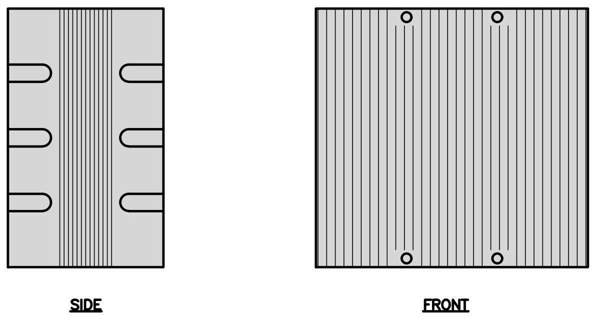




REMOTE RADIO HEAD DETAIL
NO SCALE 1

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

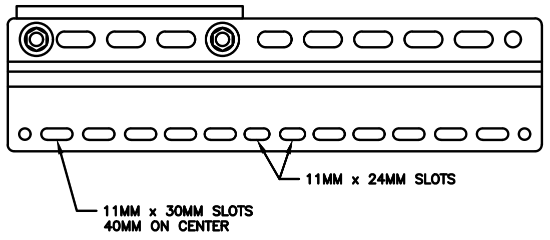


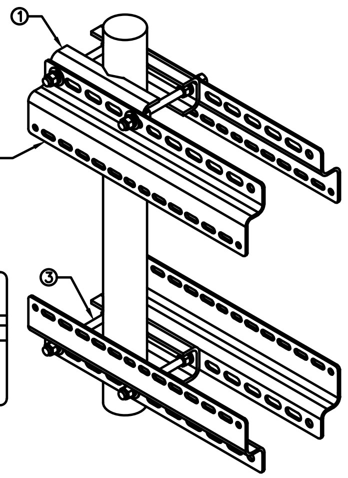


REMOTE RADIO HEAD DETAIL
NO SCALE 2

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

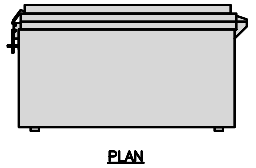
ITEM#	DESCRIPTION
1	PLATE, CHANNEL BRACKET
2	RRH Z BRACKET, 3/16"
3	THREADED ROD ASSEMBLY 1/2"x12"

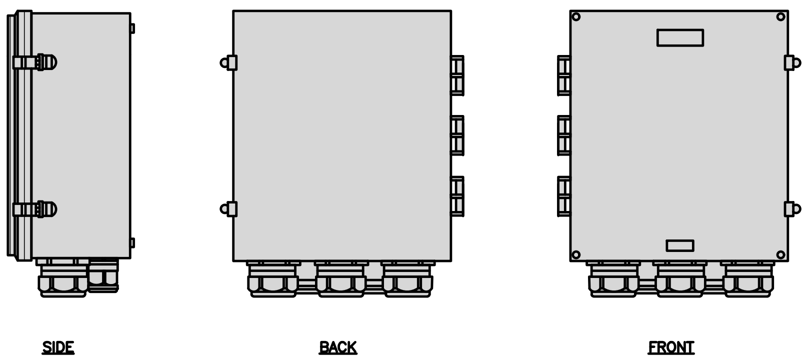




REMOTE RADIO MOUNT DETAIL
NO SCALE 3

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

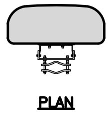


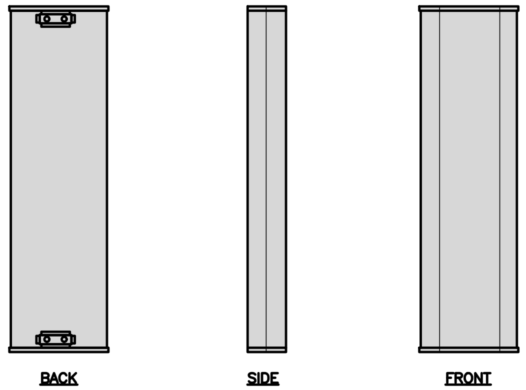


SURGE SUPPRESSION DETAIL
NO SCALE 4

JMA WIRELESS MX08FRO665–20 ANTENNA	
DIMENSIONS (HxWxD)	72.0"x20.0"x8.0"
TOTAL WEIGHT	54 LB
RF PORTS, CONNECTOR TYPE	8 x 4.3–10 FEMALE

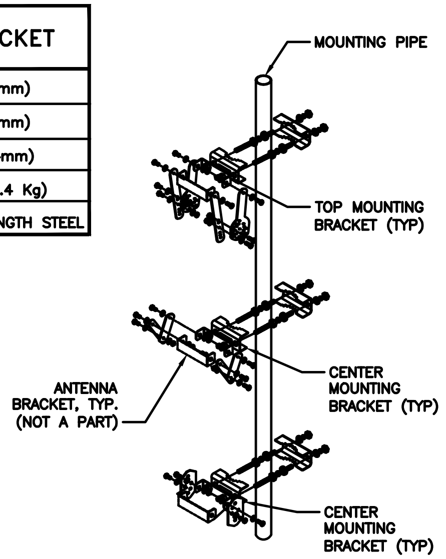
NOTES
FINAL ANTENNA SPECIFICATIONS TO BE CONFIRMED BY GC





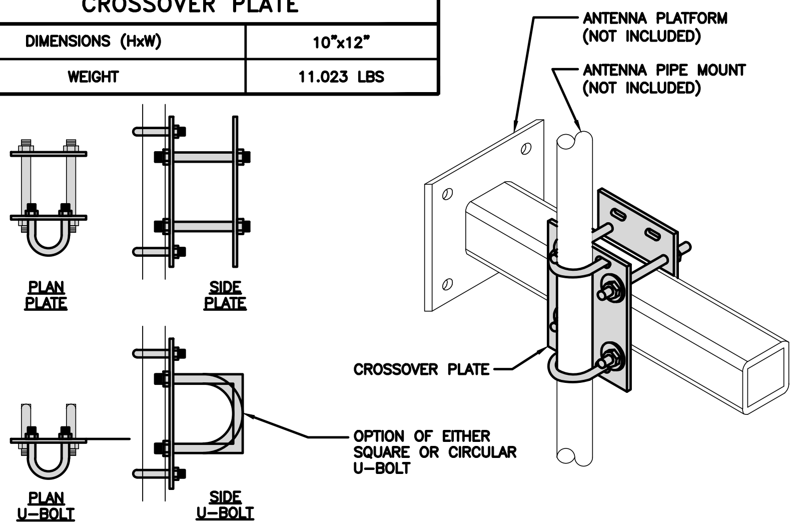
ANTENNA DETAIL
NO SCALE 5

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



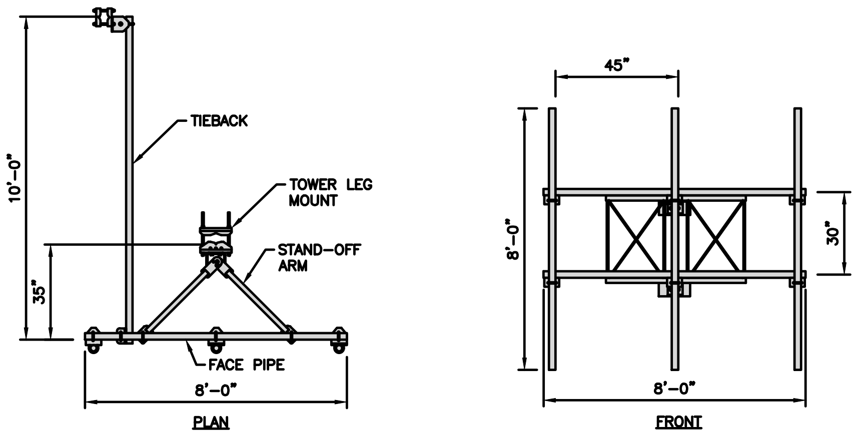
ANTENNA MOUNTING DETAIL
NO SCALE 6

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

wireless.

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CONSTRUCTION DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039–Z5555C

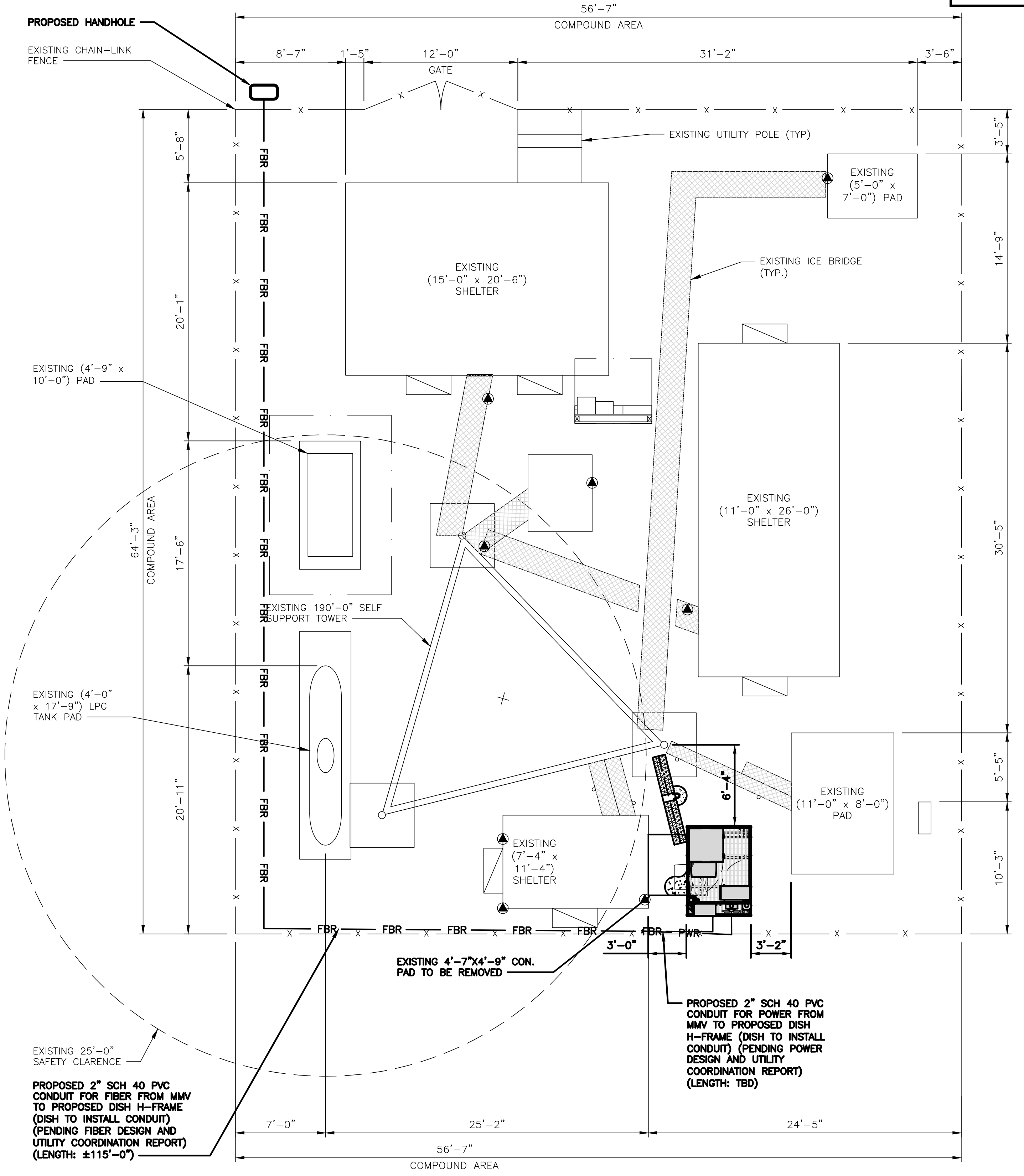
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
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.



UTILITY ROUTE PLAN

6' 4' 2' 0 5' 10'

3/16"=1'-0"

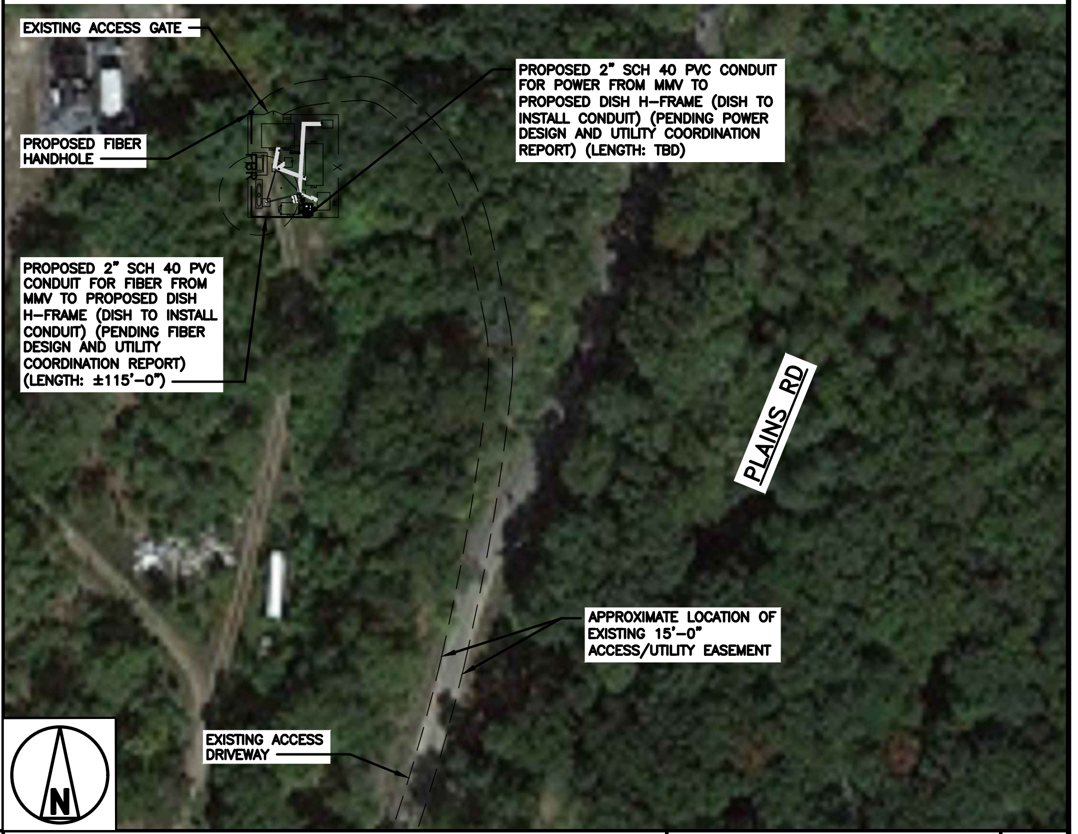
1

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

60' 30' 0 60' 120'

1"=60'

3

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CONSTRUCTION DOCUMENTS

SUBMITTALS

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A&E PROJECT NUMBER
2039-Z5555C

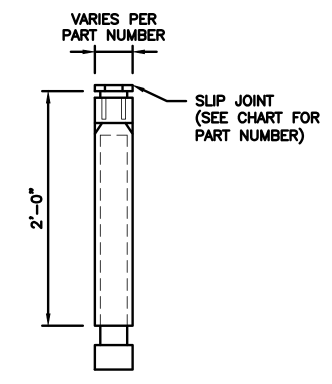
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
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"

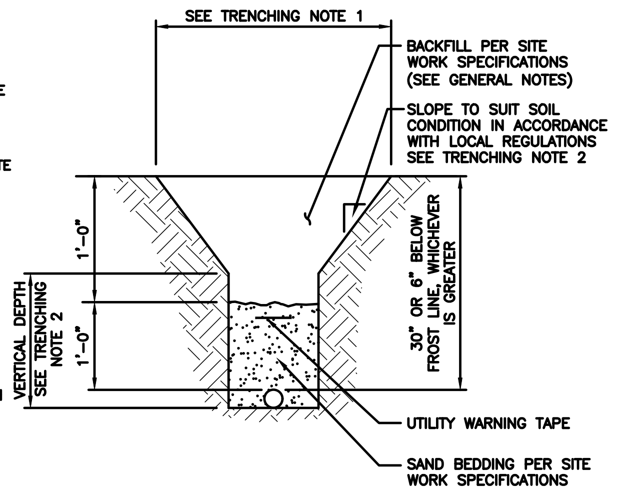


NOTE:
CONTRACTOR TO INSTALL EXPANSION FITTING SLIP JOINT AT METER CENTER CONDUIT TERMINATION, AS PER LOCAL UTILITY POLICY, ORDINANCE AND/OR SPECIFIED REQUIREMENT.

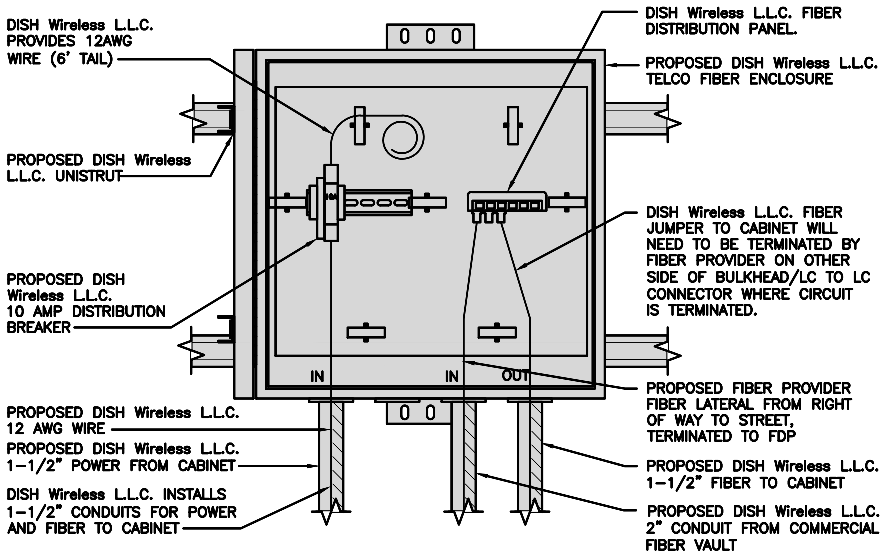
EXPANSION JOINT DETAIL | NO SCALE | 1

TRENCHING NOTES

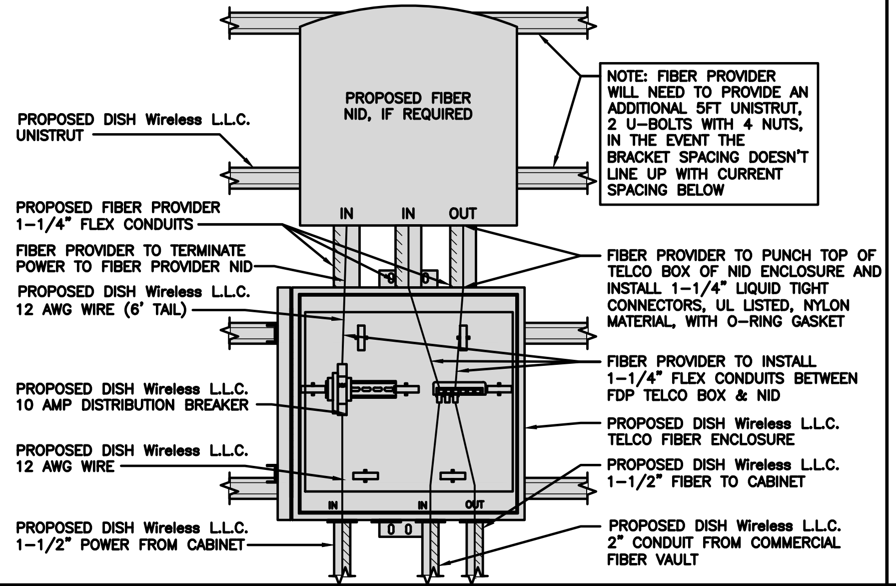
1. CONTRACTOR SHALL RESTORE THE TRENCH TO ITS ORIGINAL CONDITIONS BY EITHER SEEDING OR SODDING GRASS AREAS, OR REPLACING ASPHALT OR CONCRETE AREAS TO ITS ORIGINAL CROSS SECTION.
2. TRENCHING SAFETY; INCLUDING, BUT NOT LIMITED TO SOIL CLASSIFICATION, SLOPING, AND SHORING, SHALL BE GOVERNED BY THE CURRENT OSHA TRENCHING AND EXCAVATION SAFETY STANDARDS.
3. 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.



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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CONSTRUCTION DOCUMENTS

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REV	DATE	DESCRIPTION
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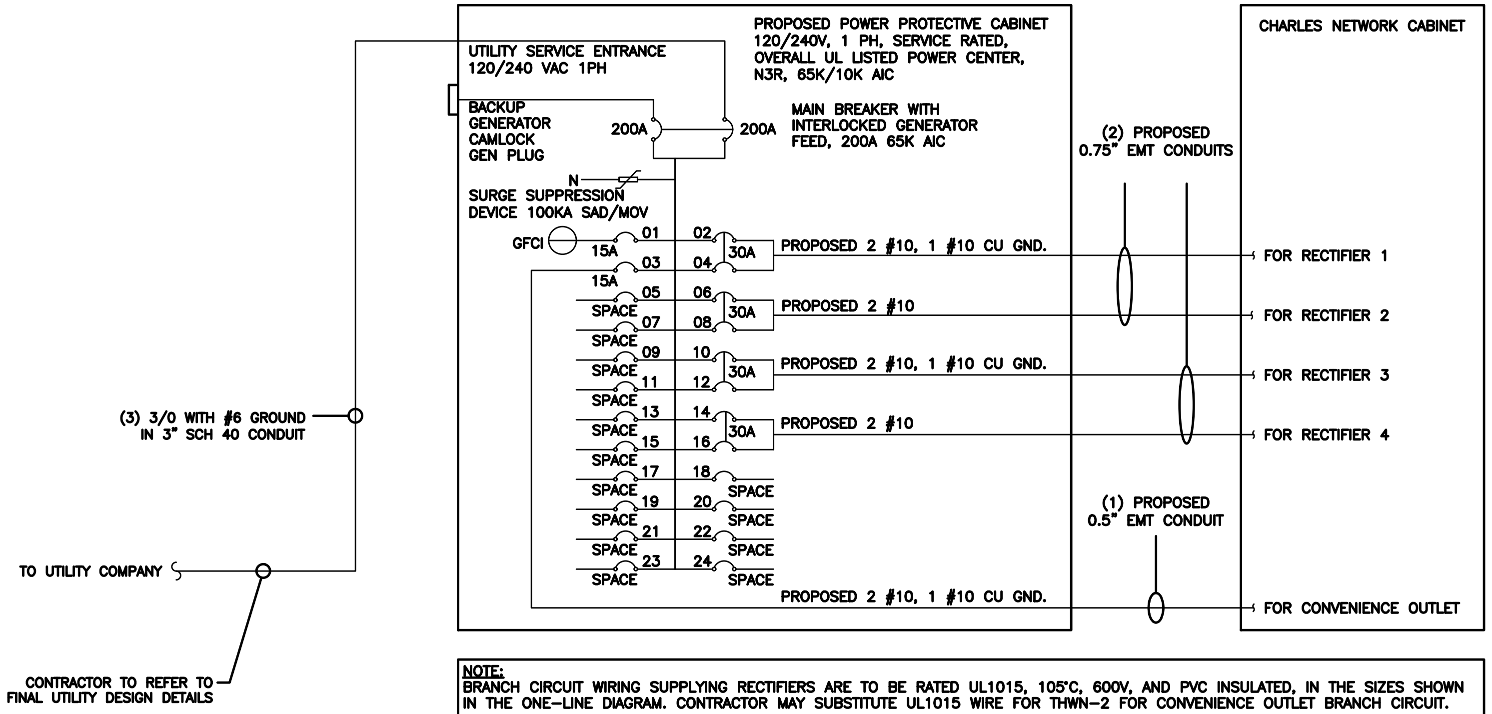
A&E PROJECT NUMBER
2039-Z5555C

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

SHEET TITLE
ELECTRICAL DETAILS

SHEET NUMBER
E-2



NOTE:
BRANCH CIRCUIT WIRING SUPPLYING RECTIFIERS ARE TO BE RATED UL1015, 105°C, 600V, AND PVC INSULATED, IN THE SIZES SHOWN IN THE ONE-LINE DIAGRAM. CONTRACTOR MAY SUBSTITUTE UL1015 WIRE FOR THWN-2 FOR CONVENIENCE OUTLET BRANCH CIRCUIT.

BREAKERS REQUIRED:
(4) 30A, 2P BREAKER – SQUARE D P/N:Q0230
(1) 15A, 1P BREAKER – SQUARE D P/N:Q0115

PPC ONE-LINE DIAGRAM

NO SCALE

1

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.

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	■	15A	1	A	2	30A	2880	■	ABB/GE INFINITY RECTIFIER 1
CHARLES GFCI OUTLET	■	180	15A	3	B	4		■	2880	
–SPACE–		■		5	A	6	30A	2880	■	ABB/GE INFINITY RECTIFIER 2
–SPACE–	■			7	B	8		■	2880	
–SPACE–		■		9	A	10	30A	2880	■	ABB/GE INFINITY RECTIFIER 3
–SPACE–	■			11	B	12		■	2880	
–SPACE–		■		13	A	14	30A	2880	■	ABB/GE INFINITY RECTIFIER 4
–SPACE–	■			15	B	16		■	2880	
–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	VOLTAGE AMPS				
			98		98	AMPS				
			98			MAX AMPS				
			123			MAX 125%				

PANEL SCHEDULE

NO SCALE

2

NOT USED

NO SCALE

3

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STATE OF CONNECTICUT
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LICENSED PROFESSIONAL ENGINEER
5/12/21

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RCD	SS	CJW

RFDS REV #: N/A

CONSTRUCTION DOCUMENTS

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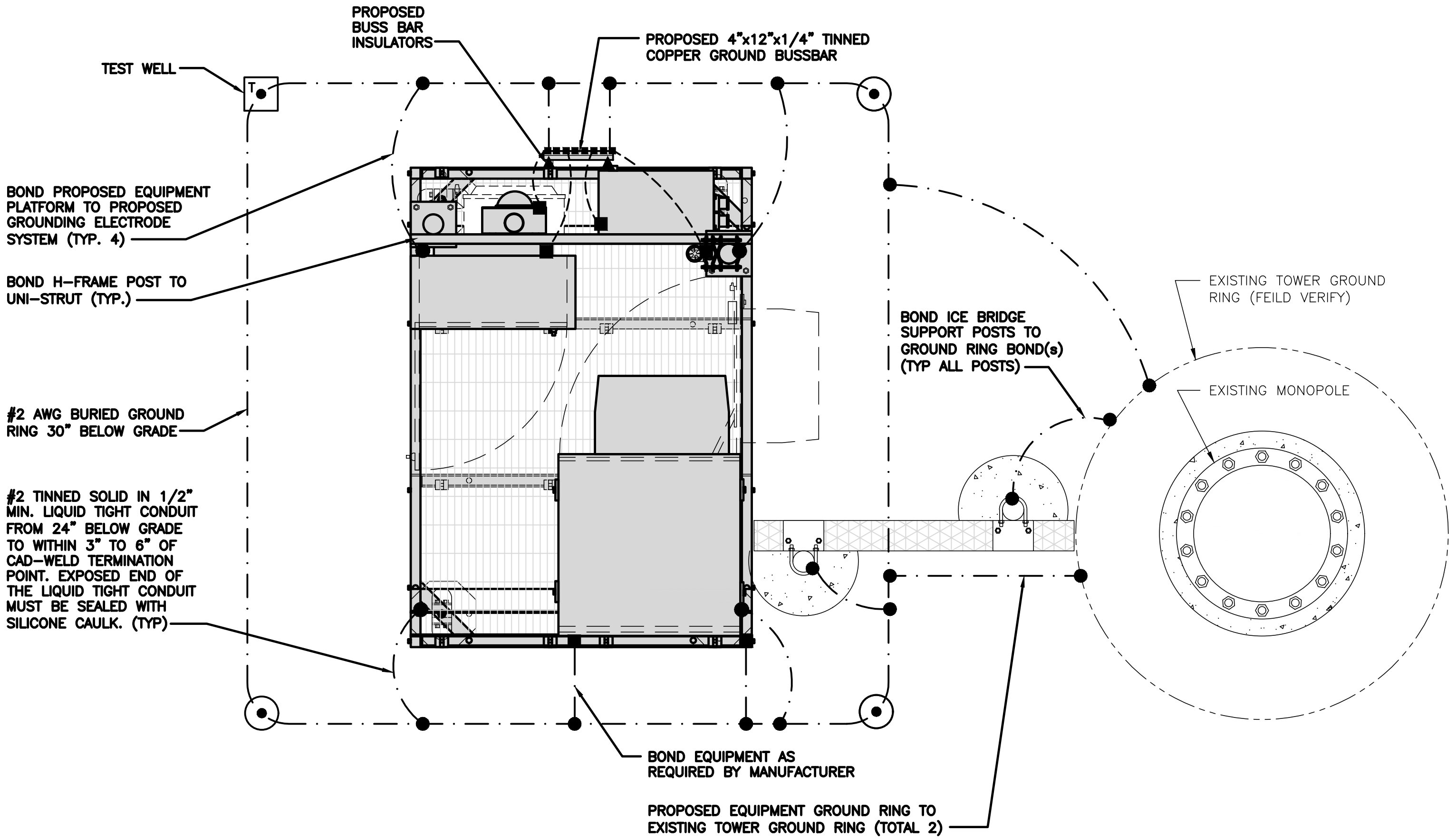
A&E PROJECT NUMBER
2039–Z5555C

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

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

SHEET NUMBER
E-3

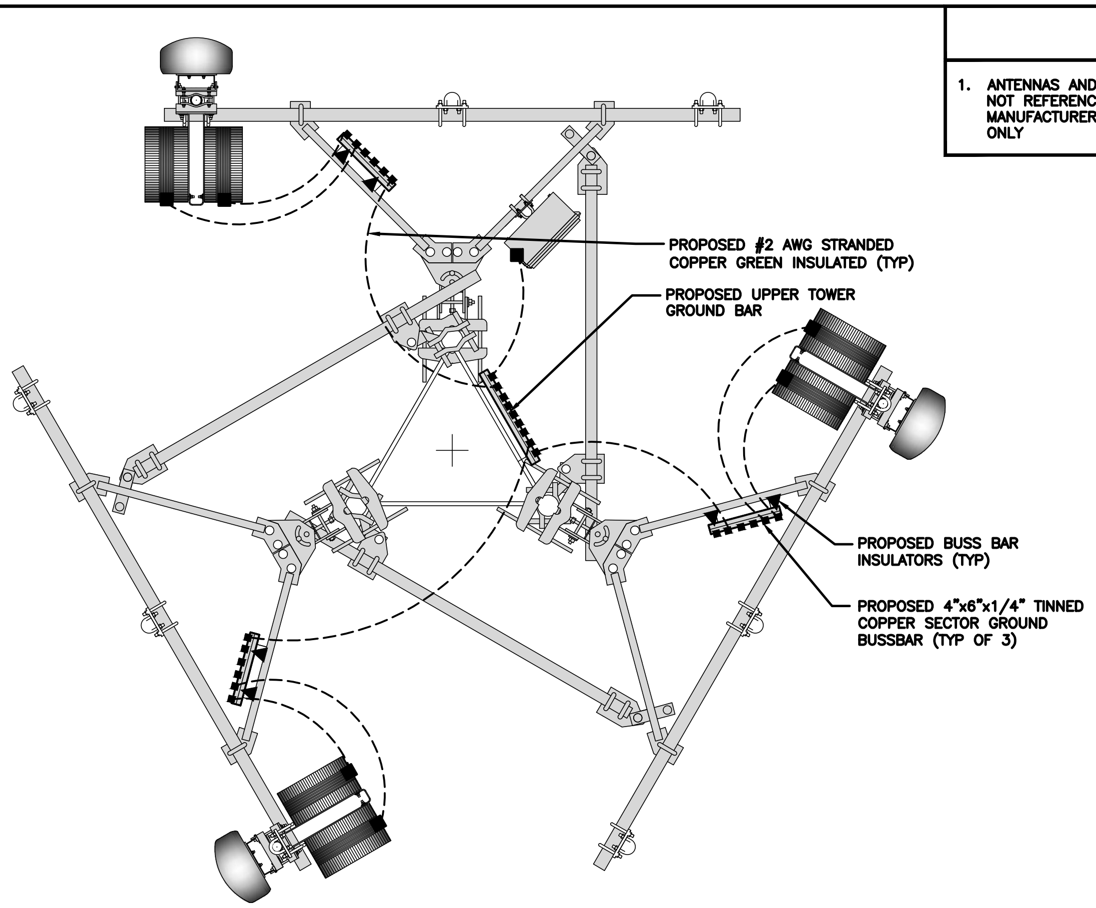


TYPICAL EQUIPMENT GROUNDING PLAN

NO SCALE 1

NOTES

1. ANTENNAS AND OVP SHOWN ARE GENERIC AND NOT REFERENCING TO A SPECIFIC MANUFACTURER. THIS LAYOUT IS FOR REFERENCE ONLY



TYPICAL ANTENNA GROUNDING PLAN

NO SCALE 2

● EXOTHERMIC CONNECTION

■ MECHANICAL CONNECTION

▭ GROUND BUS BAR

⊙ GROUND ROD

⊡T TEST GROUND ROD WITH INSPECTION SLEEVE

– – – – – #2 AWG STRANDED & INSULATED

– · – · – #2 AWG SOLID COPPER TINNED

GROUNDING LEGEND

1. GROUNDING IS SHOWN DIAGRAMMATICALLY ONLY.
2. 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.
3. ALL GROUND CONDUCTORS SHALL BE COPPER; NO ALUMINUM CONDUCTORS SHALL BE USED.

GROUNDING KEY NOTES

Ⓐ **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.

Ⓑ **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.

Ⓒ **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.

Ⓓ **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.

Ⓔ **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.

Ⓕ **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.

Ⓖ **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.

Ⓗ **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.

Ⓙ **TELCO GROUND BAR:** BOND TO BOTH CELL REFERENCE GROUND BAR OR EXTERIOR GROUND RING.

Ⓚ **FRAME BONDING:** THE BONDING POINT FOR TELECOM EQUIPMENT FRAMES SHALL BE THE GROUND BUS THAT IS NOT ISOLATED FROM THE EQUIPMENTS METAL FRAMEWORK.

Ⓛ **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.

Ⓜ **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.

Ⓝ **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

Ⓟ **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.

Ⓠ 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

Ⓡ 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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RCD	SS	CJW

RFDS REV #: N/A

CONSTRUCTION
DOCUMENTS

SUBMITTALS		
REV	DATE	DESCRIPTION
0	05/12/2021	FINAL

A&E PROJECT NUMBER
2039-Z5555C

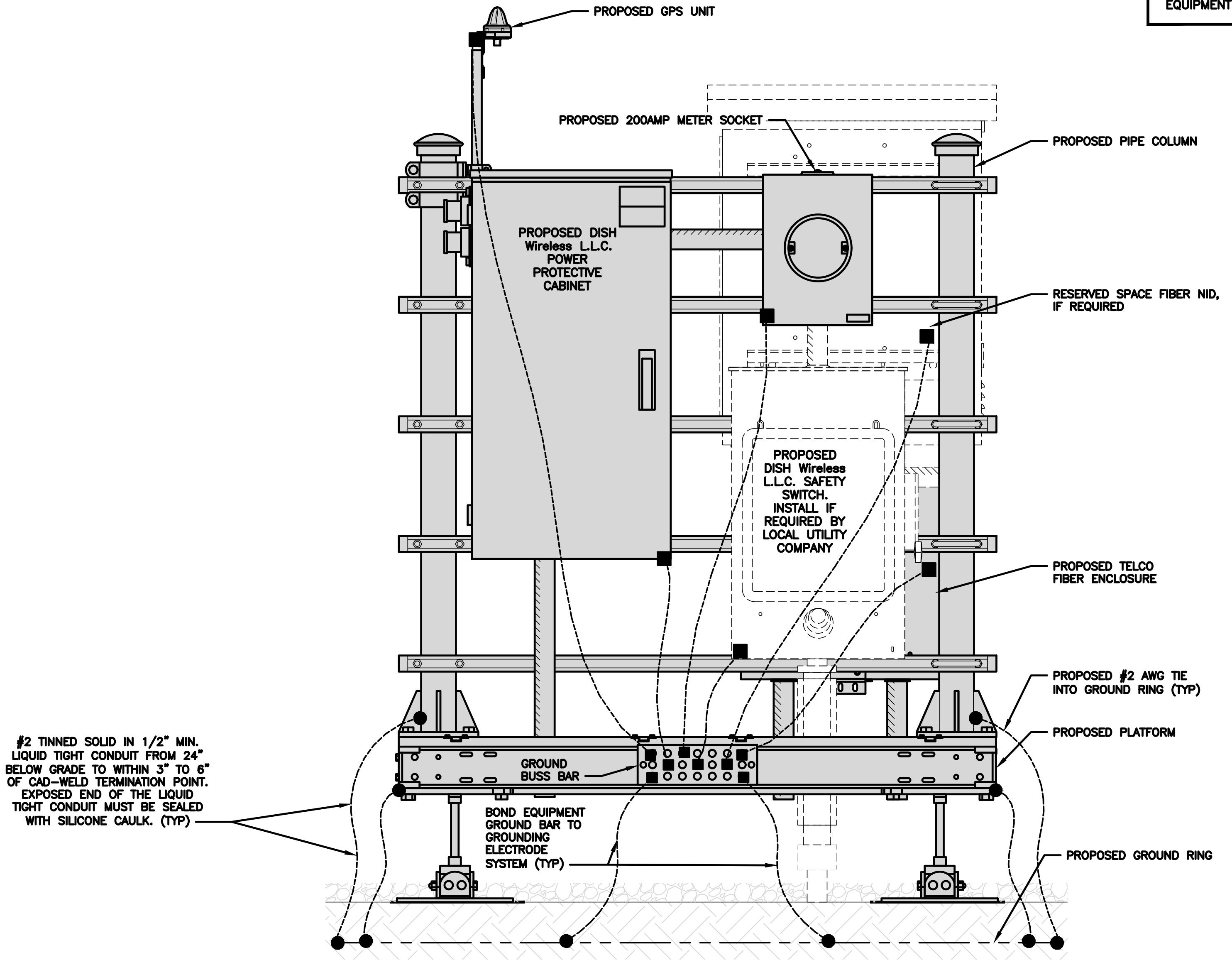
DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GROUNDING PLANS
AND NOTES

SHEET NUMBER
G-1

NOTES

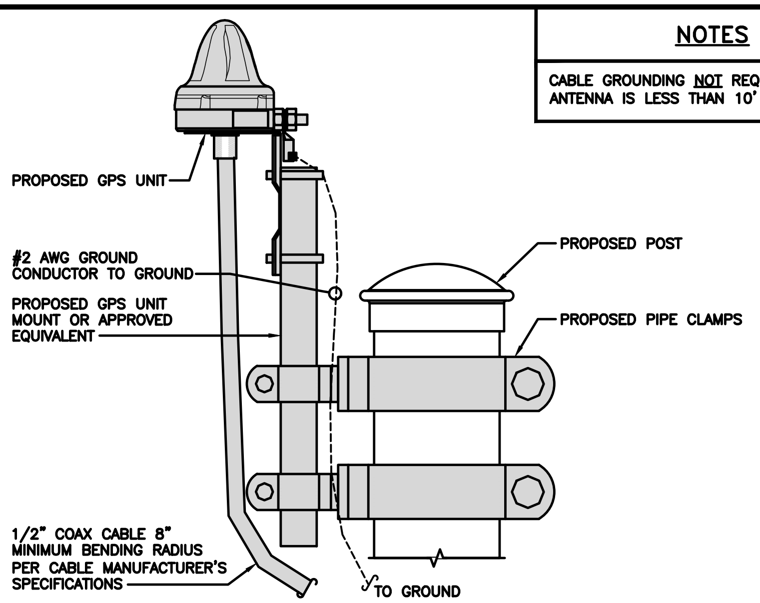
EQUIPMENT CABINET OMITTED FOR CLARITY



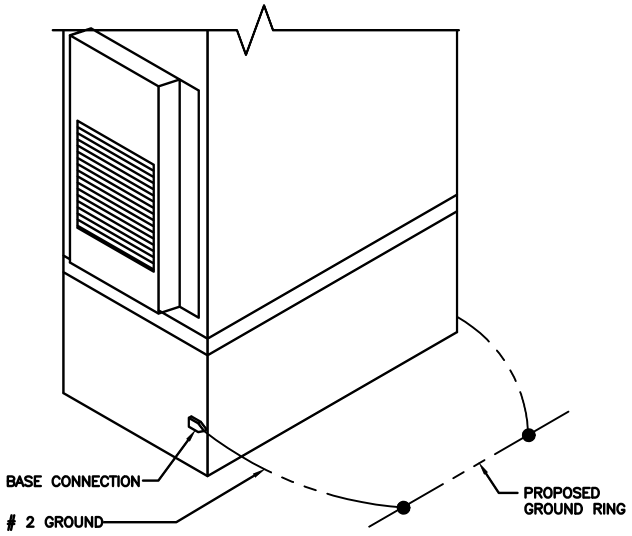
H-FRAME GROUNDING DETAIL NO SCALE 1

NOTES

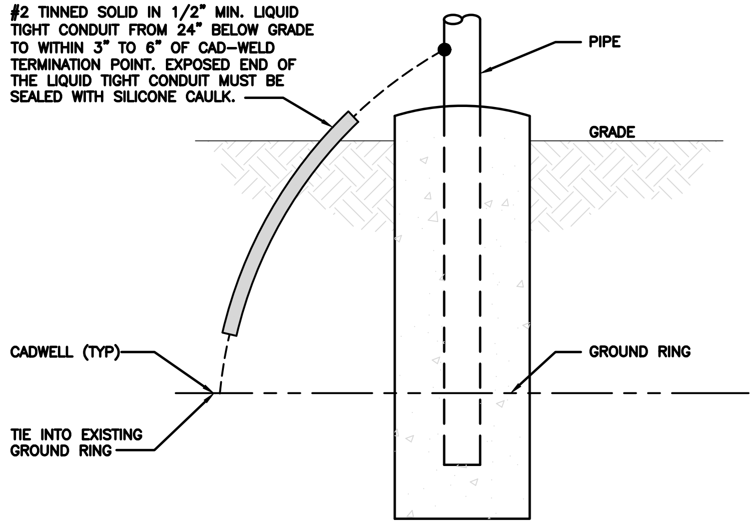
CABLE GROUNDING NOT REQUIRED WHEN ANTENNA IS LESS THAN 10' FROM CABINET



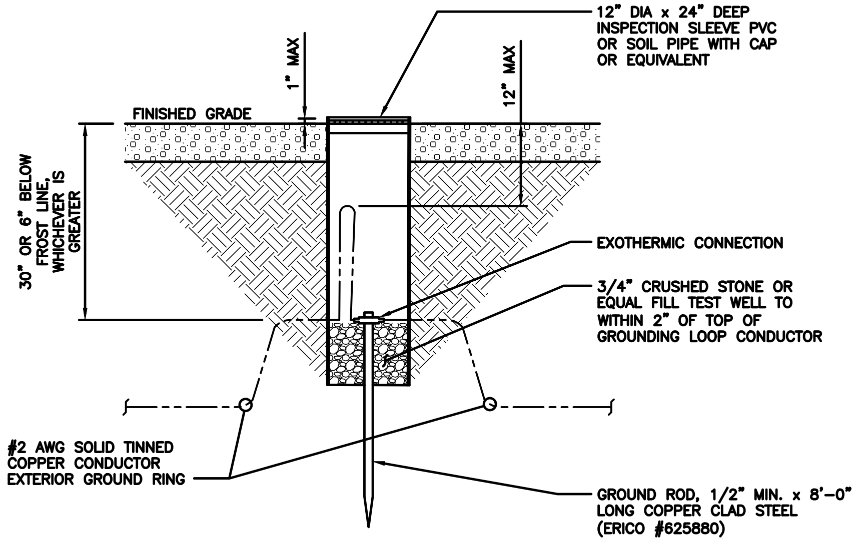
TYPICAL GPS UNIT GROUNDING NO SCALE 2



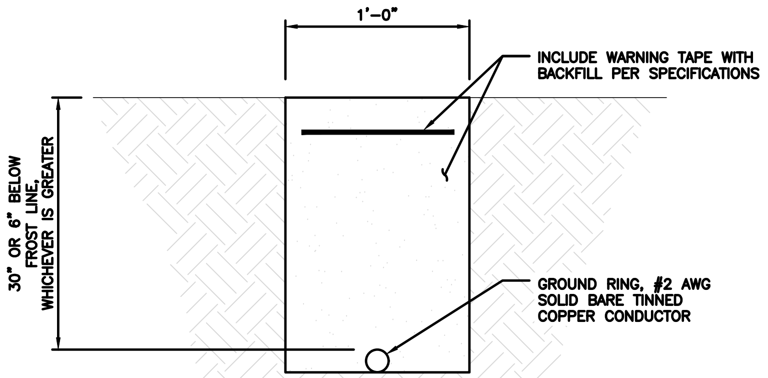
OUTDOOR CABINET GROUNDING NO SCALE 3



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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2039-Z5555C

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

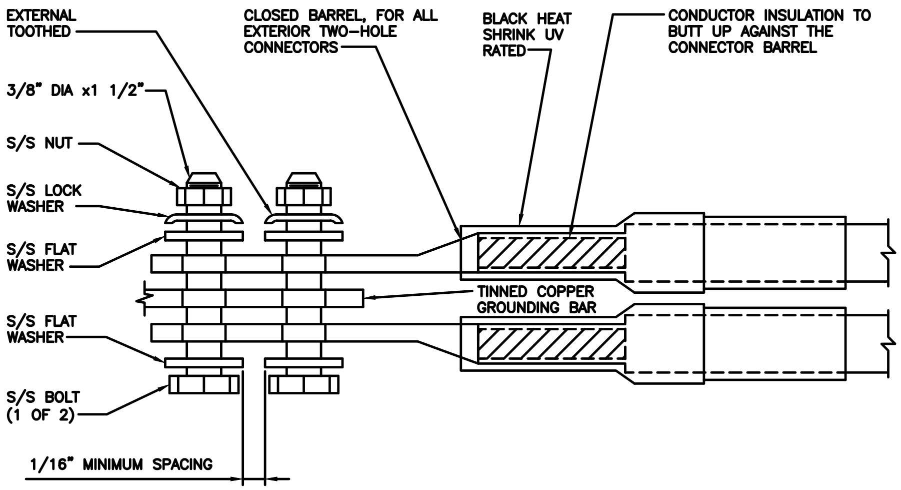
SHEET TITLE
GROUNDING DETAILS

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).

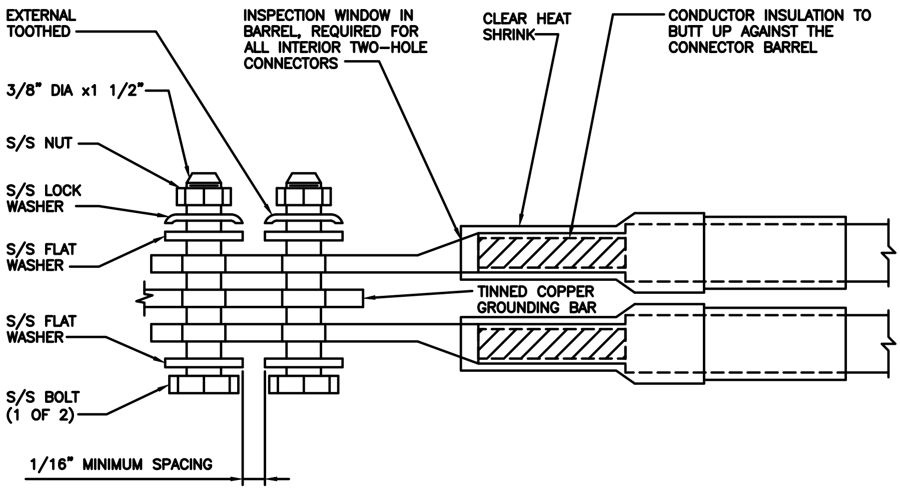
TYPICAL GROUNDING NOTES

NO SCALE 1



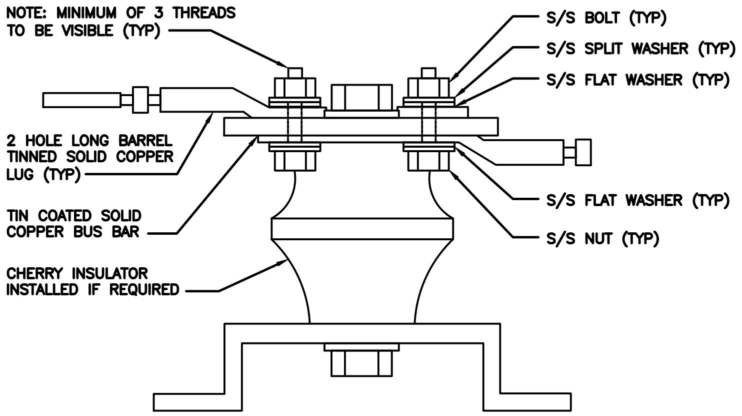
TYPICAL EXTERIOR TWO HOLE LUG

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

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BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

SHEET TITLE
GROUNDING DETAILS

SHEET NUMBER
G-3

RF JUMPER COLOR CODING

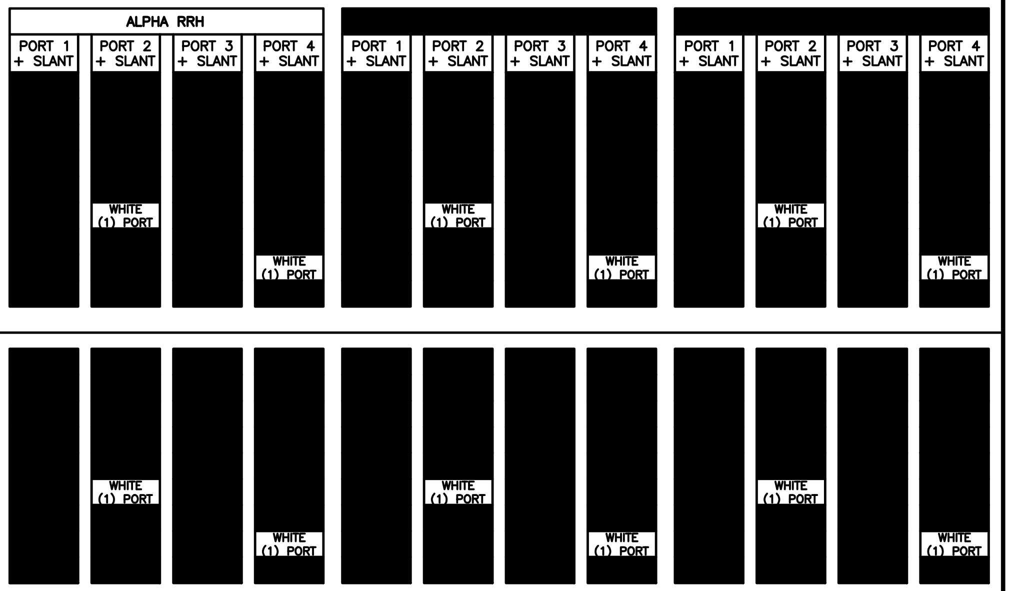
3/4" TAPE WIDTHS WITH 3/4" SPACING

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)

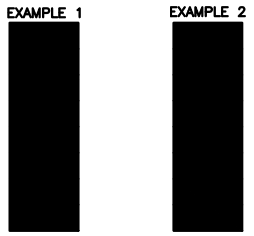


HYBRID/DISCREET CABLES

INCLUDE SECTOR BANDS BEING SUPPORTED AM LONG WITH FREQUENCY BANDS

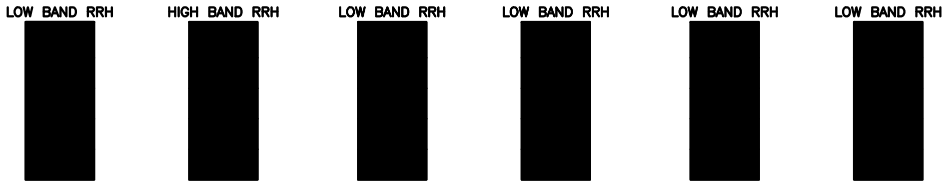
EXAMPLE 1 – HYBRID, OR DISCREET, SUPPORTS ALL SECTORS, BOTH LOW-BANDS AND MID-BANDS

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



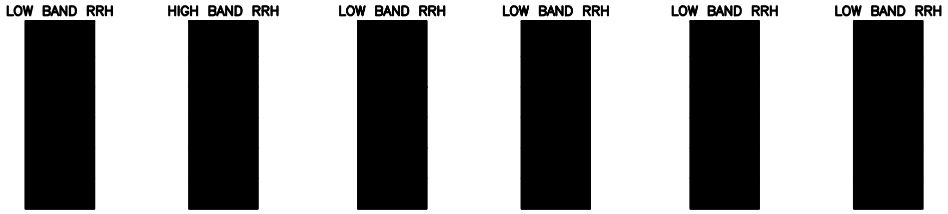
HYBRID/DISCREET CABLES

LOW-BAND RRH FIBER CABLES HAVE SECTOR STRIPE ONLY

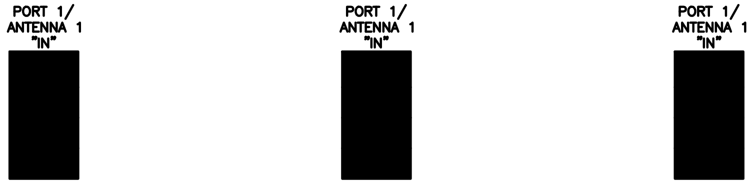


POWER CABLES TO RRHs

LOW-BAND RRH POWER CABLES HAVE SECTOR STRIPE ONLY



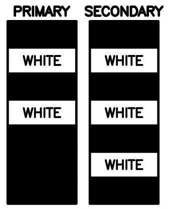
RET MOTORS AT ANTENNAS



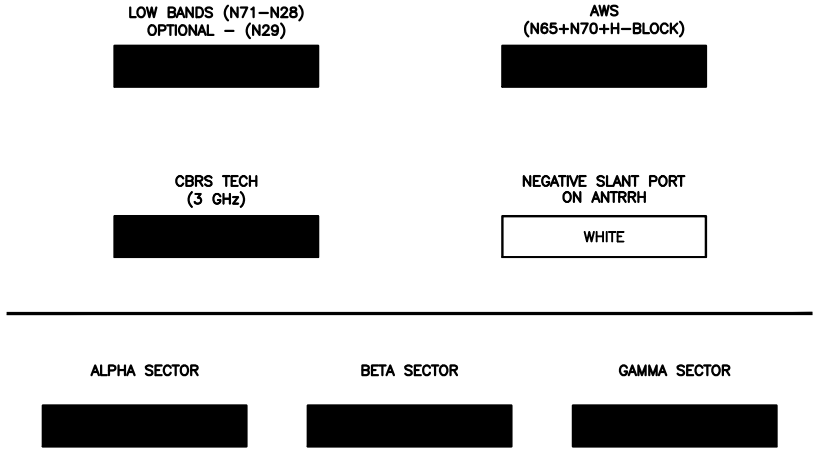
MICROWAVE RADIO LINKS

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



COLOR IDENTIFIER NO SCALE 2

NOT USED NO SCALE 3

NOT USED NO SCALE 4

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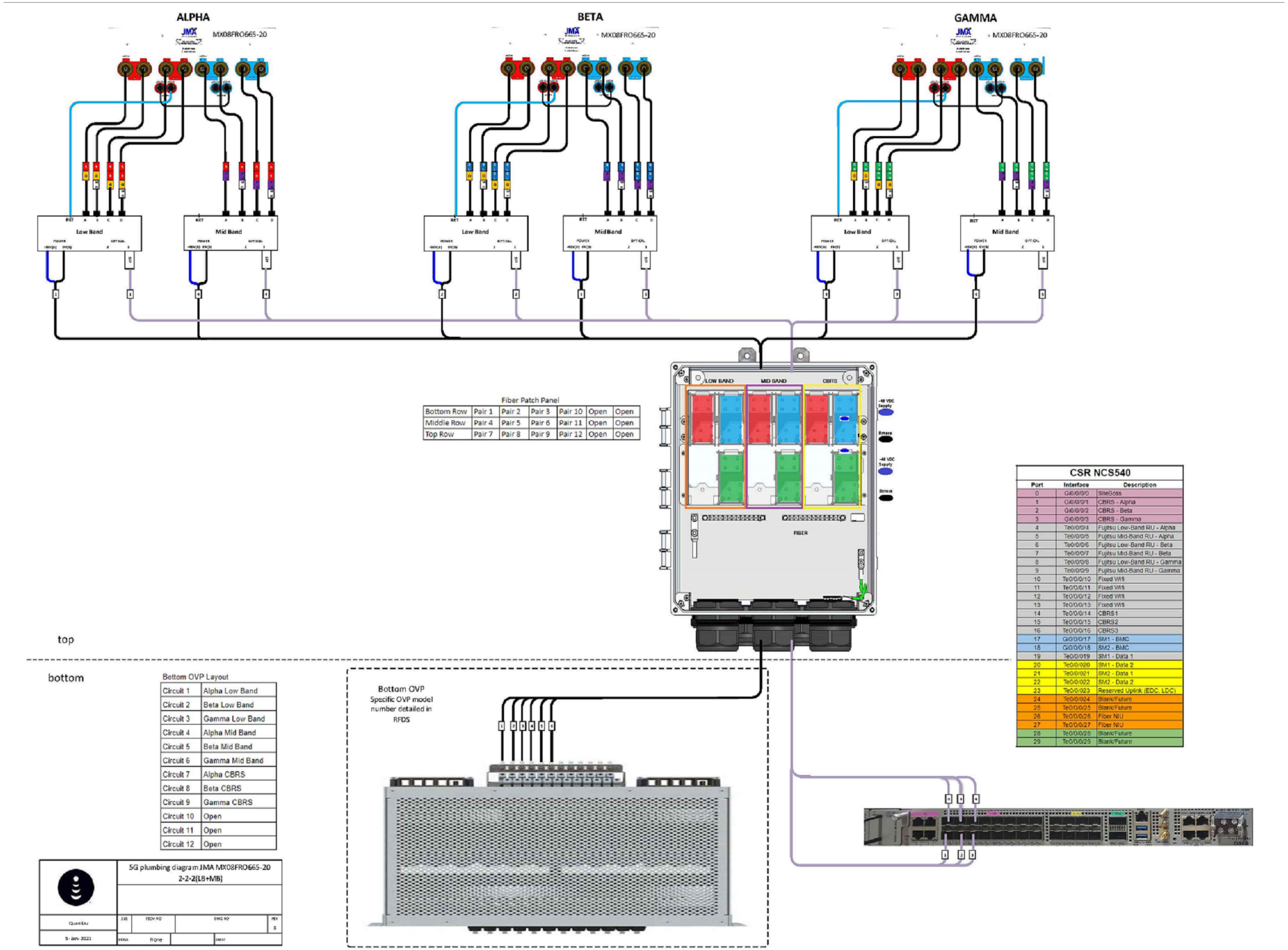
BOBDL00053A
539 PLAINS RD
HADDAM, CT 06438

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	Gi0/0/0/0	SiteBoss
1	Gi0/0/0/1	CBRS - Alpha
2	Gi0/0/0/2	CBRS - Beta
3	Gi0/0/0/3	CBRS - Gamma
4	Te0/0/0/4	Fujitsu Low-Band RU - Alpha
5	Te0/0/0/5	Fujitsu Mid-Band RU - Alpha
6	Te0/0/0/6	Fujitsu Low-Band RU - Beta
7	Te0/0/0/7	Fujitsu Mid-Band RU - Beta
8	Te0/0/0/8	Fujitsu Low-Band RU - Gamma
9	Te0/0/0/9	Fujitsu Mid-Band RU - Gamma
10	Te0/0/0/10	Fixed Wifi
11	Te0/0/0/11	Fixed Wifi
12	Te0/0/0/12	Fixed Wifi
13	Te0/0/0/13	Fixed Wifi
14	Te0/0/0/14	CBRS1
15	Te0/0/0/15	CBRS2
16	Te0/0/0/16	CBRS3
17	Gi0/0/0/17	SM1 - BMC
18	Gi0/0/0/18	SM2 - BMC
19	Te0/0/019	SM1 - Data 1
20	Te0/0/020	SM1 - Data 2
21	Te0/0/021	SM2 - Data 1
22	Te0/0/022	SM2 - Data 2
23	Te0/0/023	Reserved Uplink (EDC, LDC)
24	Te0/0/024	Blank/Future
25	Te0/0/0/25	Blank/Future
26	Te0/0/0/26	Fiber NIU
27	Te0/0/0/27	Fiber NIU
28	Te0/0/0/28	Blank/Future
29	Te0/0/0/29	Blank/Future

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

Bottom OVP
Specific OVP model
number detailed in
RFDS

5G plumbing diagram JMA MX08FRO665-20
2-2-2(LB+MB)

Quantity	SIZE	FSCM NO	DWG NO	REV 3
5-Jan-2021	SCALE None		SHEET	

PLUMBING DIAGRAM

NO SCALE

1

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DISH WIRELESS, LLC.
PROJECT INFORMATION
BOBDL00053A
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	⊗ T
EXOTHERMIC WITH INSPECTION SLEEVE	▣
GROUNDING BAR	▬
GROUND ROD	⊣●
TEST GROUND ROD WITH INSPECTION SLEEVE	⊣▣ T
SINGLE POLE SWITCH	$
DUPLEX RECEPTACLE	⦶
DUPLEX GFCI RECEPTACLE	GFI
FLUORESCENT LIGHTING FIXTURE (2) TWO LAMPS 48–T8	F
SMOKE DETECTION (DC)	SD
EMERGENCY LIGHTING (DC)	
SECURITY LIGHT W/PHOTOCELL LITHONIA ALXW LED–1–25A400/51K–SR4–120–PE–DDBTXD	▭
CHAIN LINK FENCE	—— x —— x —— x —— x ——
WOOD/WROUGHT IRON FENCE	—□—□—□—□—□—□—
WALL STRUCTURE	▨
LEASE AREA	— — — — — — — — — — —
PROPERTY LINE (PL)	——— – – ——— – – ———
SETBACKS	- - - - - - - - - - - - - -
ICE BRIDGE	▩
CABLE TRAY	▨
WATER LINE	— W — W — W — W — W —
UNDERGROUND POWER	— UGP — UGP — UGP — UGP — UGP —
UNDERGROUND TELCO	— UGT — UGT — UGT — UGT — UGT —
OVERHEAD POWER	— OHP — OHP — OHP — OHP —
OVERHEAD TELCO	— OHT — OHT — OHT — OHT —
UNDERGROUND TELCO/POWER	— UGT/P — UGT/P — UGT/P — UGT/P —
ABOVE GROUND POWER	— AGP — AGP — AGP — AGP — AGP —
ABOVE GROUND TELCO	— AGT — AGT — AGT — AGT — AGT —
ABOVE GROUND TELCO/POWER	— AGT/P — AGT/P — AGT/P — AGT/P —
WORKPOINT	W.P.
SECTION REFERENCE	XX X–X
DETAIL REFERENCE	XX X–X

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

dish wireless.

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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
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.

dish wireless.

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STATE OF CONNECTICUT
SHUHEI SAKANOUE
34916
LICENSED PROFESSIONAL ENGINEER
5/12/21

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:	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-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.

dish wireless.

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LITTLETON, CO 80120

CROWN CASTLE
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SHUHEI SAKANOUE
34916
5/12/21

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.

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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

CROWN CASTLE
2000 CORPORATE DRIVE
CANONSBURG, PA 15317

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SHUHEI SAKANO
34916
5/12/21

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:	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

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:

STATE OF CONNECTICUT
MAHAM BARIMANI
30501
LICENSED
PROFESSIONAL ENGINEER

Maham Barimani, P.E.
Senior Project Engineer

TABLE OF CONTENTS

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	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 2 2 4 12	Conduit 3/8 7/16 3/4 1-1/4
		3	cci antennas	OPA65R-BU6D w/ Mount Pipe		
		3	ericsson	RRUS 32 B2		
		3	ericsson	RRUS 32 B30		
		3	ericsson	RRUS 4449 B5/B12		

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.

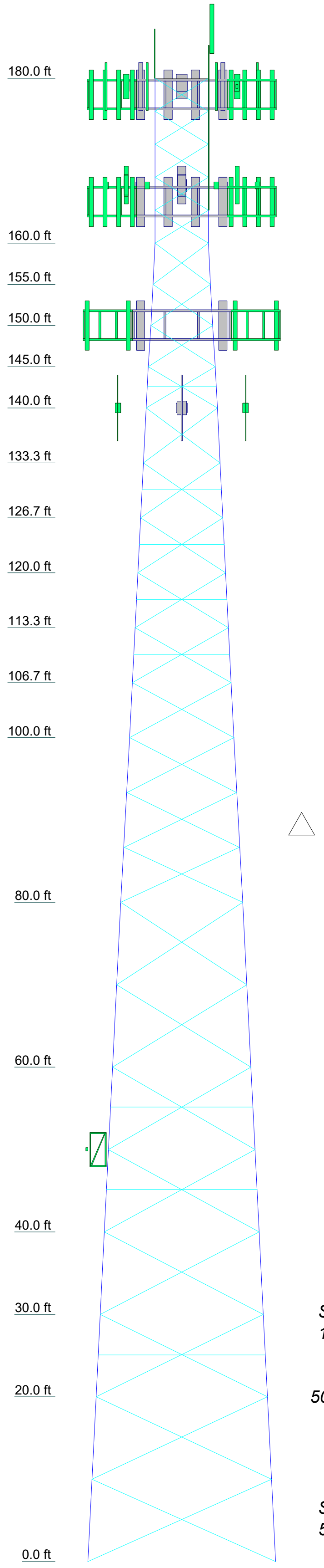
4.1) Recommendations

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	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Sec. Horizontals	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	ROHN 2 STD	A572-50	L2x2x1/4	A572-50	L2x2x1/8	N.A.	6.52083	5 @ 4	1.0
T2	ROHN 2.5 EH		H	A36	N.A.		6.5625	4 @ 5	0.2
T3							7.06771		0.2
T4			I	K			7.58073		0.3
T5			J	A36		I	8.09115		0.5
T6	ROHN 3 EH		2L2x2x3/16x1/2			N.A.	8.60417	9 @ 6.66667	0.6
T7						I	9.28125		0.7
T8						L2 1/2x2 1/2x1/4	9.95833		0.8
T9	ROHN 3.5 EH		2L2 1/2x2 1/2x3/16x1/2				10.6354		0.9
T10							11.3151		0.9
T11	A					N.A.	11.9974		1.0
T12	B		2L3x3x3/16x1/2				12.6771	8 @ 10	3.8
T13	C		2L3x3x3/16x1/4				14.7708		3.7
T14	D		2L3x3x1/4x1/4	A572-50		L3x3x1/4	16.7708		5.1
T15	E		2L3 1/2x3 1/2x1/4x1/4			N.A.	18.8542		2.6
T16	F					L	19.8594		3.1
T17	G		L4x4x1/4			N.A.	20.8646		4.5
							22.8646		29.9



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

AXIAL
164 K
SHEAR
13 K
MOMENT
1496 kip-ft
TORQUE 19 kip-ft
50 mph WIND - 1.500 in ICE

AXIAL
71 K
SHEAR
52 K
MOMENT
5542 kip-ft
TORQUE 66 kip-ft
REACTIONS - 130 mph WIND

Crown Castle
The Pathway to Possible
2000 Corporate Drive
Canonsburg, PA
Phone: (724) 416-2000
FAX:

Job: **806478**		
Project:		
Client: Crown Castle	Drawn by: Mishka Stueber	App'd:
Code: TIA-222-H	Date: 04/21/21	Scale: NTS
Path: C:\Users\MStueber\OneDrive - Crown Castle USA Inc\Desktop\Working\806478\WO 1945873 - SA\Prod\806478.eri		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.

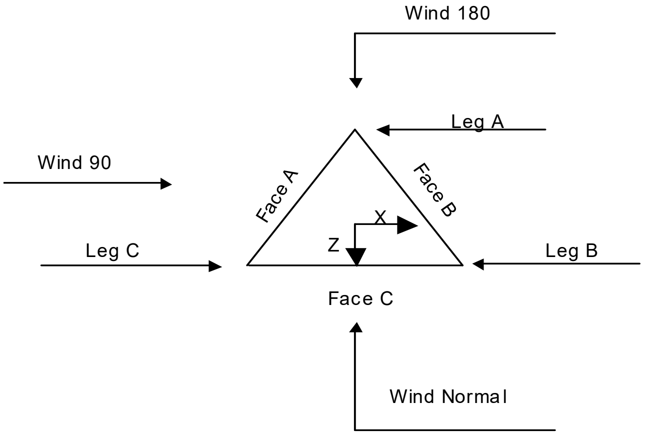
Autocalc Torque Arm Areas

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

Poles

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

Tower Section	*Tower Elevation*	*Assembly Database*	*Description*	*Section Width*	*Number of Sections*	*Section Length*
	ft			*ft*		*ft*
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)	Equal Angle	L2x2x1/4	1
		Diagonal (1)	Equal Angle	L2x2x1/4	1

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Gusset Area (per face)* *ft^2*	*Gusset Thickness* *in*	*Gusset Grade*	*Adjust. Factor A_f*	*Adjust. Factor A_r*	*Weight Mult.*	*Double Angle Stitch Bolt Spacing Diagonals* *in*	*Double Angle Stitch Bolt Spacing Horizontals* *in*	*Double Angle Stitch Bolt Spacing Redundants* *in*
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)*

			K Factors[1]							
Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*Legs*	*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*
T1 180.000-160.000	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 160.000-155.000	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 155.000-150.000	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 150.000-145.000	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 145.000-140.000	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 140.000-133.333	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 133.333-126.667	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 126.667-120.000	No	No	0.5	1 1	1 1	1 1	1 1	1 1	1 1	1 1

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

[1] *Note: 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
*													
CU12PSM9P6XXX(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	C_AA_A ft²/ft	Weight klf
*********								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight 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 ft*	*Face*	*A_R ft^2*	*A_F ft^2*	*C_AA_A In Face ft^2*	*C_AA_A Out Face ft^2*	*Weight K*
		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 ft*	*Face or Leg*	*Ice Thickness in*	*A_R ft^2*	*A_F ft^2*	*C_AA_A In Face ft^2*	*C_AA_A Out Face ft^2*	*Weight K*
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_AA_A *In Face* ft^2	C_AA_A *Out Face* ft^2	*Weight* K
		B		0.000	0.000	56.299	0.000	0.805
		C		0.000	0.000	60.010	0.000	0.981
T16	30.000-20.000	A	1.240	0.000	0.000	61.516	0.000	0.874
		B		0.000	0.000	55.533	0.000	0.784
		C		0.000	0.000	59.407	0.000	0.959
T17	20.000-0.000	A	1.132	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 -	0.6000	0.6000

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

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			80.00		
T13	23	2" SR	60.00 - 80.00	0.6000	0.6000
T13	25	CU12PSM9P6XXX(1-1/2)	60.00 - 80.00	0.6000	0.6000
T14	1	FLC 158-50J(1-5/8")	40.00 - 60.00	0.6000	0.6000
T14	2	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T14	4	LDF6-50A(1-1/4")	40.00 - 60.00	0.6000	0.6000
T14	5	2-1/2" Rigid Conduit	40.00 - 60.00	0.6000	0.6000
T14	6	WR-VG122ST-BRDA(7/16)	40.00 - 60.00	0.6000	0.6000
T14	7	FB-L98B-002-75000(3/8)	40.00 - 60.00	0.6000	0.6000
T14	8	WR-VG86ST-BRD(3/4)	40.00 - 60.00	0.6000	0.6000
T14	9	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T14	11	HB114-1-0813U4-M5J(1-1/4)	40.00 - 60.00	0.6000	0.6000
T14	12	LDF4-50A(1/2")	40.00 - 50.00	0.6000	0.6000
T14	13	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T14	15	HCS 6X12 4AWG(1-5/8)	40.00 - 60.00	0.6000	0.6000
T14	18	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T14	19	Thin Flat Bar Climbing Ladder	40.00 - 60.00	0.6000	0.6000
T14	21	2" SR	40.00 - 60.00	0.6000	0.6000
T14	22	2" SR	40.00 - 60.00	0.6000	0.6000
T14	23	2" SR	40.00 - 60.00	0.6000	0.6000
T14	25	CU12PSM9P6XXX(1-1/2)	40.00 - 60.00	0.6000	0.6000
T15	1	FLC 158-50J(1-5/8")	30.00 - 40.00	0.6000	0.6000
T15	2	Feedline Ladder (Af)	30.00 - 40.00	0.6000	0.6000
T15	4	LDF6-50A(1-1/4")	30.00 - 40.00	0.6000	0.6000
T15	5	2-1/2" Rigid Conduit	30.00 - 40.00	0.6000	0.6000
T15	6	WR-VG122ST-BRDA(7/16)	30.00 - 40.00	0.6000	0.6000
T15	7	FB-L98B-002-75000(3/8)	30.00 - 40.00	0.6000	0.6000
T15	8	WR-VG86ST-BRD(3/4)	30.00 - 40.00	0.6000	0.6000
T15	9	Feedline Ladder (Af)	30.00 - 40.00	0.6000	0.6000
T15	11	HB114-1-0813U4-M5J(1-1/4)	30.00 - 40.00	0.6000	0.6000
T15	12	LDF4-50A(1/2")	30.00 - 40.00	0.6000	0.6000
T15	13	Feedline Ladder (Af)	30.00 - 40.00	0.6000	0.6000
T15	15	HCS 6X12 4AWG(1-5/8)	30.00 - 40.00	0.6000	0.6000
T15	18	Safety Line 3/8	30.00 - 40.00	0.6000	0.6000
T15	19	Thin Flat Bar Climbing Ladder	30.00 - 40.00	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 Adjustment °*	*Placement ft*		*C_AA_A Front ft^2*	*C_AA_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*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
						2" Ice			
Sub6 Antenna - VZS01 w/ Mount Pipe	B	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.915 5.264 5.623 6.371	2.687 3.151 3.631 4.639	0.101 0.141 0.186 0.294
Sub6 Antenna - VZS01 w/ Mount Pipe	C	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.915 5.264 5.623 6.371	2.687 3.151 3.631 4.639	0.101 0.141 0.186 0.294
RFV01U-D1A	A	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	1.875 2.045 2.223 2.601	1.250 1.393 1.543 1.865	0.084 0.103 0.124 0.175
RFV01U-D1A	B	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	1.875 2.045 2.223 2.601	1.250 1.393 1.543 1.865	0.084 0.103 0.124 0.175
RFV01U-D1A	C	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	1.875 2.045 2.223 2.601	1.250 1.393 1.543 1.865	0.084 0.103 0.124 0.175
RFV01U-D2A	A	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	1.875 2.045 2.223 2.601	1.013 1.145 1.284 1.585	0.070 0.087 0.106 0.153
RFV01U-D2A	B	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	1.875 2.045 2.223 2.601	1.013 1.145 1.284 1.585	0.070 0.087 0.106 0.153
RFV01U-D2A	C	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	1.875 2.045 2.223 2.601	1.013 1.145 1.284 1.585	0.070 0.087 0.106 0.153
DB-B1-6C-8AB-0Z	A	From Leg	4.000 0.000 0.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	5.600 5.915 6.240 6.914	2.333 2.558 2.791 3.284	0.044 0.080 0.120 0.213
CBC78T-DS-43-2X	A	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.368 0.446 0.531 0.723	0.512 0.605 0.705 0.927	0.021 0.027 0.035 0.057
CBC78T-DS-43-2X	B	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.368 0.446 0.531 0.723	0.512 0.605 0.705 0.927	0.021 0.027 0.035 0.057
CBC78T-DS-43-2X	C	From Leg	4.000 0.000 1.000	0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	0.368 0.446 0.531 0.723	0.512 0.605 0.705 0.927	0.021 0.027 0.035 0.057
DB-T1-6Z-8AB-0Z	B	From Leg	4.000 0.000 0.000	0.000	178.000	No Ice 1/2" Ice 1" Ice	5.600 5.915 6.240 6.914	2.333 2.558 2.791 3.284	0.044 0.080 0.120 0.213

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
						2" Ice			
Sector Mount [SM 510-3]	C	None		0.000	178.000	No Ice 1/2" Ice 1" Ice 2" Ice	39.970 56.450 72.590 104.060	39.970 56.450 72.590 104.060	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	4.254 5.014 5.711 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	4.254 5.014 5.711 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	4.254 5.014 5.711 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	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	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	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	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	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	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	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	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: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	5.630	5.790	0.482
						2" Ice			
(2) LGP21401	A	From Leg	4.000	0.000	165.000	No Ice	1.104	0.207	0.014
			0.000			1/2"	1.239	0.274	0.021
			2.000			Ice	1.381	0.348	0.030
						1" Ice	1.688	0.521	0.055
						2" Ice			
(2) LGP21401	B	From Leg	4.000	0.000	165.000	No Ice	1.104	0.207	0.014
			0.000			1/2"	1.239	0.274	0.021
			2.000			Ice	1.381	0.348	0.030
						1" Ice	1.688	0.521	0.055
						2" Ice			
(2) LGP21401	C	From Leg	4.000	0.000	165.000	No Ice	1.104	0.207	0.014
			0.000			1/2"	1.239	0.274	0.021
			2.000			Ice	1.381	0.348	0.030
						1" Ice	1.688	0.521	0.055
						2" Ice			
RRUS 4449 B5/B12	A	From Leg	4.000	0.000	165.000	No Ice	1.968	1.408	0.071
			0.000			1/2"	2.144	1.564	0.090
			2.000			Ice	2.328	1.727	0.111
						1" Ice	2.718	2.075	0.163
						2" Ice			
RRUS 4449 B5/B12	B	From Leg	4.000	0.000	165.000	No Ice	1.968	1.408	0.071
			0.000			1/2"	2.144	1.564	0.090
			2.000			Ice	2.328	1.727	0.111
						1" Ice	2.718	2.075	0.163
						2" Ice			
RRUS 4449 B5/B12	C	From Leg	4.000	0.000	165.000	No Ice	1.968	1.408	0.071
			0.000			1/2"	2.144	1.564	0.090
			2.000			Ice	2.328	1.727	0.111
						1" Ice	2.718	2.075	0.163
						2" Ice			
RRUS 4478 B14	A	From Leg	4.000	0.000	165.000	No Ice	1.843	1.059	0.060
			0.000			1/2"	2.012	1.197	0.076
			2.000			Ice	2.190	1.342	0.094
						1" Ice	2.566	1.656	0.140
						2" Ice			
RRUS 4478 B14	B	From Leg	4.000	0.000	165.000	No Ice	1.843	1.059	0.060
			0.000			1/2"	2.012	1.197	0.076
			2.000			Ice	2.190	1.342	0.094
						1" Ice	2.566	1.656	0.140
						2" Ice			
RRUS 4478 B14	C	From Leg	4.000	0.000	165.000	No Ice	1.843	1.059	0.060
			0.000			1/2"	2.012	1.197	0.076
			2.000			Ice	2.190	1.342	0.094
						1" Ice	2.566	1.656	0.140
						2" Ice			
DC6-48-60-18-8F	A	From Leg	4.000	0.000	165.000	No Ice	1.212	1.212	0.020
			0.000			1/2"	1.892	1.892	0.042
			2.000			Ice	2.105	2.105	0.067
						1" Ice	2.570	2.570	0.126
						2" Ice			
DC6-48-60-18-8F	B	From Leg	4.000	0.000	165.000	No Ice	1.212	1.212	0.020
			0.000			1/2"	1.892	1.892	0.042
			2.000			Ice	2.105	2.105	0.067
						1" Ice	2.570	2.570	0.126
						2" Ice			
DC6-48-60-18-8F	C	From Leg	4.000	0.000	165.000	No Ice	1.212	1.212	0.020
			0.000			1/2"	1.892	1.892	0.042
			2.000			Ice	2.105	2.105	0.067
						1" Ice	2.570	2.570	0.126
						2" Ice			
RRUS 32 B30	A	From Leg	4.000	0.000	165.000	No Ice	2.692	1.573	0.060
			0.000			1/2"	2.912	1.756	0.080
			2.000			Ice	3.138	1.945	0.104

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice 2" Ice	3.614	2.346	0.161
RRUS 32 B30	B	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	2.692 2.912 3.138 3.614	1.573 1.756 1.945 2.346	0.060 0.080 0.104 0.161
RRUS 32 B30	C	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	2.692 2.912 3.138 3.614	1.573 1.756 1.945 2.346	0.060 0.080 0.104 0.161
RRUS 32 B2	A	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	2.731 2.953 3.182 3.663	1.668 1.855 2.049 2.458	0.053 0.074 0.098 0.157
RRUS 32 B2	B	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	2.731 2.953 3.182 3.663	1.668 1.855 2.049 2.458	0.053 0.074 0.098 0.157
RRUS 32 B2	C	From Leg	4.000 0.000 2.000	0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	2.731 2.953 3.182 3.663	1.668 1.855 2.049 2.458	0.053 0.074 0.098 0.157
Sector Mount [SM 510-3]	C	None		0.000	165.000	No Ice 1/2" Ice 1" Ice 2" Ice	39.970 56.450 72.590 104.060	39.970 56.450 72.590 104.060	2.396 3.077 3.960 6.296
*									
APXVTM14-ALU-I20 w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.090 4.480 4.880 5.710	2.860 3.230 3.610 4.400	0.077 0.127 0.185 0.331
APXVTM14-ALU-I20 w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.090 4.480 4.880 5.710	2.860 3.230 3.610 4.400	0.077 0.127 0.185 0.331
APXVTM14-ALU-I20 w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice 1" Ice 2" Ice	4.090 4.480 4.880 5.710	2.860 3.230 3.610 4.400	0.077 0.127 0.185 0.331
NNVV-65B-R4 w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice 1" Ice 2" Ice	7.550 8.040 8.530 9.560	4.230 4.670 5.120 6.050	0.110 0.197 0.296 0.529
NNVV-65B-R4 w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice 1" Ice 2" Ice	7.550 8.040 8.530 9.560	4.230 4.670 5.120 6.050	0.110 0.197 0.296 0.529
NNVV-65B-R4 w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice 1" Ice 2" Ice	7.550 8.040 8.530 9.560	4.230 4.670 5.120 6.050	0.110 0.197 0.296 0.529
TD-RRH8X20-25	A	From Leg	4.000 0.000	0.000	150.000	No Ice 1/2"	4.045 4.298	1.535 1.714	0.070 0.097

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert ft ft ft*	*Azimuth Adjustment °*	*Placement ft*		*C_AA_A Front ft^2*	*C_AA_A Side ft^2*	*Weight K*
			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 °	Placement ft		C_AA_A Front ft²	C_AA_A 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/	A	From Leg	4.000	0.000	140.000	No Ice	8.010	4.230	0.098
Mount Pipe			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/	B	From Leg	4.000	0.000	140.000	No Ice	8.010	4.230	0.098
Mount Pipe			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/	C	From Leg	4.000	0.000	140.000	No Ice	8.010	4.230	0.098
Mount Pipe			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_A Front* *ft²*	*C_AA_A Side* *ft²*	*Weight* *K*
			0.000			1/2"	2.728	2.728	0.044
			0.000			Ice	3.401	3.401	0.063
						1" Ice	4.396	4.396	0.119
						2" Ice			
(2) 8' x 2" Mount Pipe	B	From Leg	4.000	0.000	140.000	No Ice	1.900	1.900	0.029
			0.000			1/2"	2.728	2.728	0.044
			0.000			Ice	3.401	3.401	0.063
						1" Ice	4.396	4.396	0.119
						2" Ice			
(2) 8' x 2" Mount Pipe	C	From Leg	4.000	0.000	140.000	No Ice	1.900	1.900	0.029
			0.000			1/2"	2.728	2.728	0.044
			0.000			Ice	3.401	3.401	0.063
						1" Ice	4.396	4.396	0.119
						2" Ice			
Commscope MTC3975083 (3)	C	None		0.000	140.000	No Ice	23.850	23.850	1.260
						1/2"	34.120	34.120	1.803
						Ice	44.390	44.390	2.345
						1" Ice	64.930	64.930	3.431
						2" Ice			
****** *									
GPS_A	C	From Leg	3.000	0.000	50.000	No Ice	0.255	0.255	0.001
			0.000			1/2"	0.320	0.320	0.005
			0.000			Ice	0.393	0.393	0.010
						1" Ice	0.561	0.561	0.025
						2" Ice			
Side Arm Mount [SO 305-1]	C	From Leg	1.500	0.000	50.000	No Ice	0.530	1.520	0.030
			0.000			1/2"	0.780	2.070	0.044
			0.000			Ice	1.060	2.660	0.064
						1" Ice	1.730	3.910	0.125
						2" Ice			
*									
(4) L2x2x1/4 (RD)	A	From Leg	0.500	0.000	126.667 -	No Ice	0.944	0.005	0.016
			0.000		120.000	1/2"	1.273	0.021	0.022
			0.000			Ice	1.610	0.044	0.032
						1" Ice	2.305	0.113	0.065
						2" Ice			
(4) L2x2x1/4 (RD)	B	From Leg	0.500	0.000	126.667 -	No Ice	0.944	0.005	0.016
			0.000		120.000	1/2"	1.273	0.021	0.022
			0.000			Ice	1.610	0.044	0.032
						1" Ice	2.305	0.113	0.065
						2" Ice			
(4) L2x2x1/4 (RD)	C	From Leg	0.500	0.000	126.667 -	No Ice	0.944	0.005	0.016
			0.000		120.000	1/2"	1.273	0.021	0.022
			0.000			Ice	1.610	0.044	0.032
						1" Ice	2.305	0.113	0.065
						2" Ice			
(4) L2x2x1/4 (RH)	A	From Leg	0.500	0.000	126.667 -	No Ice	0.825	0.005	0.014
			0.000		120.000	1/2"	1.115	0.021	0.019
			0.000			Ice	1.412	0.044	0.028
						1" Ice	2.029	0.113	0.057
						2" Ice			
(4) L2x2x1/4 (RH)	B	From Leg	0.500	0.000	126.667 -	No Ice	0.825	0.005	0.014
			0.000		120.000	1/2"	1.115	0.021	0.019
			0.000			Ice	1.412	0.044	0.028
						1" Ice	2.029	0.113	0.057
						2" Ice			
(4) L2x2x1/4 (RH)	C	From Leg	0.500	0.000	126.667 -	No Ice	0.825	0.005	0.014
			0.000		120.000	1/2"	1.115	0.021	0.019
			0.000			Ice	1.412	0.044	0.028
						1" Ice	2.029	0.113	0.057
						2" Ice			
****** ***									

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*
			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
		Diagonal	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
		Top Girt	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
T2	160 - 155	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
T3	155 - 150	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
T4	150 - 145	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
T5	145 - 140	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

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
			Max. Vx	6	-0.002	0.000	0.000
T6	140 - 133.333	Leg	Max Tension	7	59.490	0.015	0.031
			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
		Diagonal	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
T7	133.333 - 126.667	Leg	Max Tension	7	71.706	-0.664	0.002
			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
			Max. Vx	8	0.219	-0.040	0.384
		Diagonal	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
		Secondary Horizontal	Max Tension	8	0.627	0.012	-0.008
			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
			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
		Diagonal	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
			Max. Vy	26	-0.015	0.000	0.000
			Max. Vx	26	-0.000	0.000	0.000
		Redund Diag 1 Bracing	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*
			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
		Diagonal	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
		Secondary Horizontal	Max Tension	8	0.991	0.015	-0.011
			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
T10	113.333 - 106.667	Leg	Max Tension	7	104.374	-0.900	-0.001
			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
		Diagonal	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
		Secondary Horizontal	Max Tension	8	0.774	0.024	-0.010
			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
T11	106.667 - 100	Leg	Max Tension	7	115.076	0.319	0.023
			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
		Diagonal	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
T12	100 - 80	Leg	Max Tension	7	144.095	-3.007	0.026
			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
		Diagonal	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
T13	80 - 60	Leg	Max Tension	7	170.020	-3.339	0.067
			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

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
		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
T14	60 - 40	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
T15	40 - 30	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
T16	30 - 20	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
T17	20 - 0	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 - No Ice	70.969	-49.517	-0.055	-35.359	5295.861	65.543
0.9 Dead+1.0 Wind 270 deg - No Ice	53.226	-49.517	-0.055	-28.664	5306.870	65.543
1.2 Dead+1.0 Wind 300 deg - No Ice	70.969	-42.287	-24.483	-2683.501	4539.709	55.813
0.9 Dead+1.0 Wind 300 deg - No Ice	53.226	-42.287	-24.483	-2676.807	4550.718	55.813
1.2 Dead+1.0 Wind 330 deg - No Ice	70.969	-24.891	-43.120	-4698.085	2652.556	45.089
0.9 Dead+1.0 Wind 330 deg - No Ice	53.226	-24.891	-43.120	-4691.391	2663.565	45.089
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

	Sum of Applied Forces			*Sum of Reactions*			
Load Comb.	*PX* *K*	*PY* *K*	*PZ* *K*	*PX* *K*	*PY* *K*	*PZ* *K*	*% Error*
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%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
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
		Redund Diag 1 Bracing	A325N	0.625	1	1.064	9.108	0.117	1.05	Member Block Shear
T9	120	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* *in²*	*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 K=1.00	1.075	-26.206	36.842	0.711 [1]
T2	160 - 155	ROHN 2.5 EH	5.009	5.009	65.0 K=1.00	2.254	-35.350	74.429	0.475 [1]
T3	155 - 150	ROHN 2.5 EH	5.009	5.009	65.0 K=1.00	2.254	-43.741	74.427	0.588 [1]
T4	150 - 145	ROHN 2.5 EH	5.009	5.009	65.0 K=1.00	2.254	-53.793	74.427	0.723 [1]
T5	145 - 140	ROHN 2.5 EH	5.009	2.581	33.5 K=1.00	2.254	-63.708	93.410	0.682 [1]
T6	140 - 133.333	ROHN 3 EH	6.678	6.678	70.5 K=1.00	3.016	-75.455	94.342	0.800 [1]
T7	133.333 - 126.667	ROHN 3 EH	6.678	3.457	36.5 K=1.00	3.016	-89.011	123.118	0.723 [1]
T8	126.667 - 120	ROHN 3 EH	6.678	1.670	8.8 K=0.50	3.016	-100.685	134.948	0.746 [1]
T9	120 - 113.333	ROHN 3.5 EH	6.678	3.443	31.6 K=1.00	3.678	-114.070	153.863	0.741 [1]
T10	113.333 - 106.667	ROHN 3.5 EH	6.678	3.437	31.6 K=1.00	3.678	-125.783	153.899	0.817 [1]
T11	106.667 - 100	BT100140- Rohn 3.5EH w/ 2" SR	6.678	6.678	61.4 K=0.78	6.820	-138.334	232.935	0.594 [1]
T12	100 - 80	BT100140- Rohn 4EH w/ 2" SR	20.037	6.679	54.6 K=0.80	7.549	-172.302	273.092	0.631 [1]
T13	80 - 60	BT100140- Rohn 5EH w/ 2" SR (60-80)	20.033	10.017	65.5 K=0.83	9.253	-202.914	304.198	0.667 [1]
T14	60 - 40	BT100140- Rohn 5EH w/ 2" SR (40-60)	20.036	5.151	34.5 K=0.85	9.253	-233.537	381.660	0.612 [1]
T15	40 - 30	BT100140- Rohn 6EHS w/ 2" SR (30-40)	10.017	10.017	55.0 K=0.85	9.855	-250.927	355.524	0.706 [1]
T16	30 - 20	BT100140- Rohn 6EHS w/ 2" SR (20-30)	10.017	5.132	28.2 K=0.85	9.855	-265.219	418.472	0.634 [1]
T17	20 - 0	BT100140- Rohn 6EH w/ 2" SR	20.033	10.017	55.0 K=0.87	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* *in²*	*P_u* *K*	*ϕP_n* *K*	*Ratio* $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/4	7.682	3.623	113.4 K=1.02	0.938	-5.294	20.877	0.254 [1]
T2	160 - 155	L1 3/4x1 3/4x3/16	8.454	4.131	144.3 K=1.00	0.621	-4.592	8.534	0.538 [1]
T3	155 - 150	L1 3/4x1 3/4x3/16	8.869	4.341	151.7 K=1.00	0.621	-4.502	7.728	0.582 [1]
T4	150 - 145	L2x2x1/4	9.296	4.553	139.7 K=1.00	0.938	-5.640	13.748	0.410 [1]
T5	145 - 140	2L1 3/4x1 3/4x3/16x3/16	9.732	4.876	185.2 K=1.00	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	105.8 K=1.00	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	114.3 K=1.00	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 2L 'a' > 36.772 in - 145	12.843	6.425	100.2 K=1.00	1.805	-7.370	41.764	0.176 [1]
T10	113.333 - 106.667	2L2 1/2x2 1/2x3/16x1/2 2L 'a' > 38.454 in - 157	13.430	6.719	104.8 K=1.00	1.805	-7.624	39.969	0.191 [1]
T11	106.667 - 100	2L2 1/2x2 1/2x3/16x1/2 2L 'a' > 39.199 in - 169	14.025	6.849	106.8 K=1.00	1.805	-7.043	39.141	0.180 [1]
T12	100 - 80	2L3x3x3/16x1/2 2L 'a' > 44.357 in - 178	15.889	7.764	101.9 K=1.00	2.180	-7.813	46.595	0.168 [1]
T13	80 - 60	2L3x3x3/16x1/4 2L 'a' > 54.001 in - 199	19.100	9.452	127.6 K=1.00	2.180	-9.370	34.378	0.273 [1]
T14	60 - 40	2L3x3x1/4x1/4 2L 'a' > 60.029 in - 213	20.885	10.475	141.5 K=1.00	2.875	-10.539	39.600	0.266 [1]
T15	40 - 30	2L3 1/2x3 1/2x1/4x1/4 2L 'a' > 61.473 in - 234	21.789	10.747	125.0 K=1.00	3.375	-10.168	57.513	0.177 [1]
T16	30 - 20	2L3 1/2x3 1/2x1/4x1/4 2L 'a' > 64.727 in - 243	22.687	11.316	131.6 K=1.00	3.375	-11.889	52.338	0.227 [1]
T17	20 - 0	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 / ϕP_n controls

Top Girt 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	L2x2x1/8	6.521	6.115	184.6 K=1.00	0.484	-0.100	4.070	0.025 [1]

[1] P_u / ϕP_n controls

Redundant Horizontal (1) 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	L2x2x1/4	2.574	2.428	74.5 K=1.00	0.938	-1.746	27.870	0.063 [1]

[1] P_u / ϕP_n controls

Redundant Diagonal (1) 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	L2x2x1/4	3.138	2.963	90.9 K=1.00	0.938	-1.158	24.988	0.046 [1]

[1] P_u / ϕP_n controls

Tension Checks

Leg 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 $\frac{P_u}{\phi P_n}$*
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	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
		w/ 2" SR							
T12	100 - 80	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	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
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	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
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	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$

[1] P_u / ϕP_n controls

Secondary 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 $\frac{P_u}{\phi P_n}$
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	Kl/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	Kl/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	Kl/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

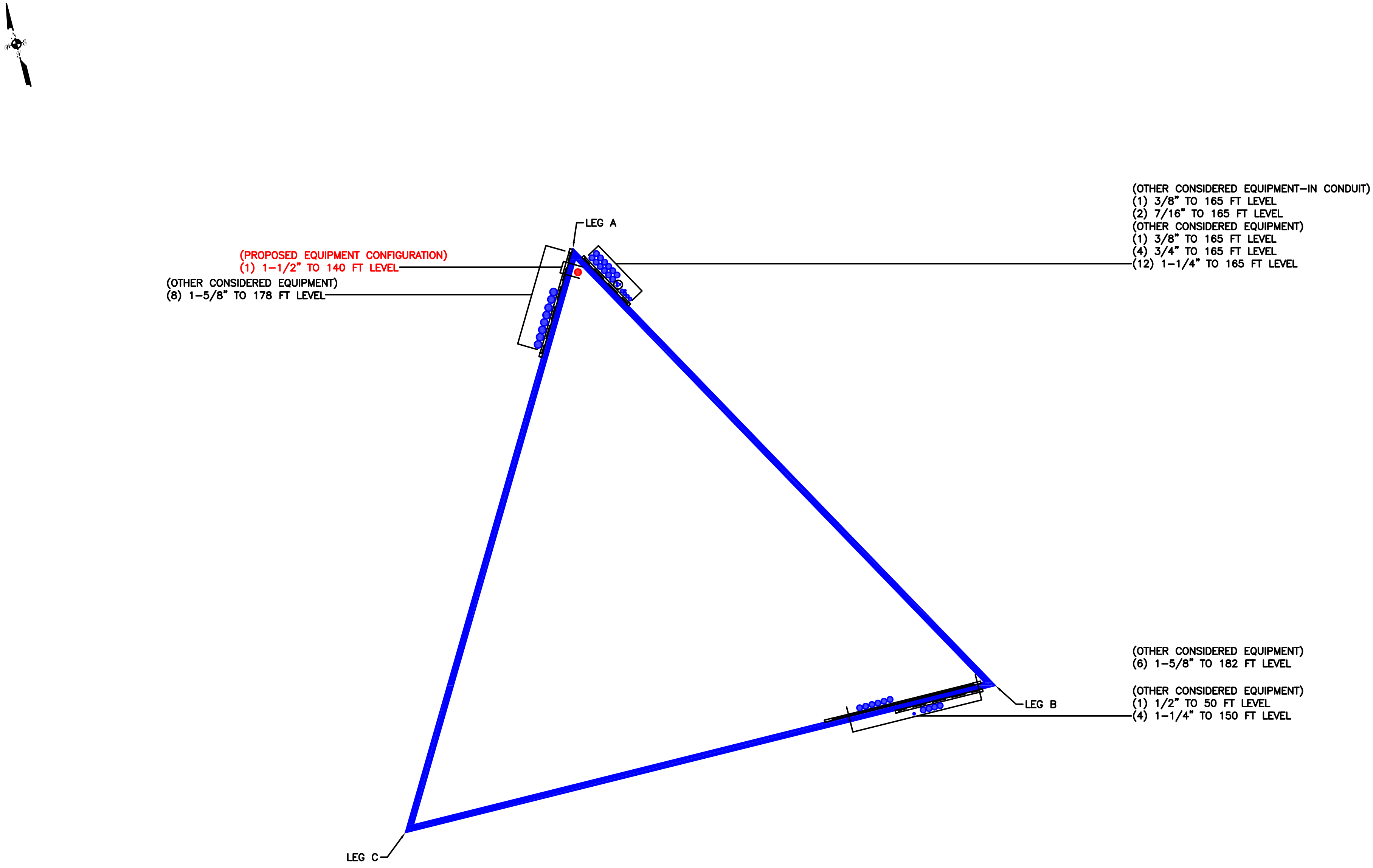
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 2 STD	2	-26.206	38.684	67.7	Pass
T2	160 - 155	Leg	ROHN 2.5 EH	38	-35.350	78.151	45.2	Pass
T3	155 - 150	Leg	ROHN 2.5 EH	47	-43.741	78.148	56.0	Pass
T4	150 - 145	Leg	ROHN 2.5 EH	56	-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	øP$_{allow}$ 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


LEG A
(PROPOSED EQUIPMENT CONFIGURATION)
(1) 1-1/2" TO 140 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(8) 1-5/8" TO 178 FT LEVEL
(OTHER CONSIDERED EQUIPMENT-IN CONDUIT)
(1) 3/8" TO 165 FT LEVEL
(2) 7/16" TO 165 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(1) 3/8" TO 165 FT LEVEL
(4) 3/4" TO 165 FT LEVEL
(12) 1-1/4" TO 165 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(6) 1-5/8" TO 182 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(1) 1/2" TO 50 FT LEVEL
(4) 1-1/4" TO 150 FT LEVEL
LEG B
LEG C

APPENDIX C

ADDITIONAL CALCULATIONS

Pipe with SR on Heel 100' to 110'

LOADS

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

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

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 3.36 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}^{\ 2} - D_{L\_in}^{\ 2}\right) = 3.68 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}^{\ 4} - D_{L\_in}^{\ 4}\right) = 6.28 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}^{\ 2} + D_{L\_in}^{\ 2}}}{4} = 1.31 \cdot in$

Centroid Coordinates: $x_L := 0.5 D_{L\_out} = 2 \cdot in$

$y_L := 0.5 D_{L\_out} = 2 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

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

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

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

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

$g = 7 \cdot in$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

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

Centroid: $x_{bar1} := x_{bar\_L} + D_R = 4 \cdot in$

$x_{bar2} := x_{bar\_R} + g = 8 \cdot in$

$A_L \cdot x_{bar1} = 14.71 \cdot in^3$

$A_R \cdot x_{bar2} = 25.13 \cdot in^3$

$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 39.85 \cdot in^3$

$x_0 := \frac{Ax_{total}}{A_T} = 5.84 \cdot in$

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

$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 18.77 \cdot in^4$

$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 15.41 \cdot in^4$

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

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

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

PROPERTIES SUMMARY

EXISTING LEG

Area: $A_L = 3.68 \cdot in^2$

Moment of Inertias: $I_{xL} := I_{xx} = 6.28 \cdot in^4$

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

Radii of Gyration: $r_{xL} = 1.307 \cdot in$

$r_{yL} = 1.31 \cdot in$

SOLID ROD RIENFORCEMENT

Area: $A_R = 3.14 \cdot in^2$

Moment of Inertias: $I_{xR} := I_R = 0.79 \cdot in^4$

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

Radii of Gyration: $r_{xR} := r_R = 0.5 \cdot in$

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

COMPOSITE SECTION

Area: $A_T = 6.82 \cdot in^2$

Moment of Inertias: $I_x = 7.07 \cdot in^4$

$I_y = 34.18 \cdot in^4$

Radii of Gyration: $r_x = 1.018 \cdot in$

$r_y = 2.239 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 3.53 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 3.53 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5D_{L\_out} + g + D_R - x_{bar\_L}} = 3.8 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 5.85 \cdot in^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

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

Diameter to Thickness Ratio: $\dfrac{D_{L\_out}}{T_L} = 12.58$

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

$$F'y\_L := \left| \begin{array}{l} F_{y\_L} \ \text{ if } \dfrac{D_{L\_out}}{T_L} \le 0.114\dfrac{E}{F_{y\_L}} \\ \left(\dfrac{0.0379E}{\dfrac{D_{L\_out}}{T_L}\cdot F_{y\_L}} + \dfrac{2}{3}\right)\cdot F_{y\_L} \ \text{ if } 0.114\dfrac{E}{F_{y\_L}} < \dfrac{D_{L\_out}}{T_L} \le 0.448\dfrac{E}{F_{y\_L}} \\ \dfrac{0.337E}{\dfrac{D_{L\_out}}{T_L}} \ \text{ if } 0.448\dfrac{E}{F_{y\_L}} < \dfrac{D_{L\_out}}{T_L} \le 300 \\ \text{"REDESIGN"} \ \text{ otherwise} \end{array} \right. = 50\cdot\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \dfrac{K_L\cdot L_{u\_L}}{r_L} = 61.3$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} \text{ if } \dfrac{D_R}{0.5 \cdot D_R} \le 0.114 \dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5 \cdot D_R} \cdot F_{y\_R}} + \dfrac{2}{3}\right) \cdot F_{y\_L} \text{ if } 0.114 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 0.448 \dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5 \cdot D_R}} \text{ if } 0.448 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 300 \\ \text{"REDESIGN" otherwise} \end{cases} = 105 \cdot \text{ksi}$$

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:

$$KL\_r_R := \frac{K_R \cdot L_{u\_R}}{\min(r_{xR}, r_{yR})} = 72$$

<u>BUILT-UP MEMBER (TIA-222-H Section 4.5.3):</u>

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 Indivdual 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:

$$KL\_r_o := \frac{1.0 \cdot \max(L_{u\_L}, L_{u\_R})}{\min(r_x, r_y)} = 78.7$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \left| \begin{array}{ll} KL\_r_o & \text{if } \dfrac{a_i}{r_i} \le 40 \\ \sqrt{KL\_r_o{}^2 + \left(\dfrac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \dfrac{a_i}{r_i} > 40 \end{array} \right. = 100.14$$

$$KL\_r_m := \left| \begin{array}{ll} \sqrt{KL\_r_o{}^2 + \left(\dfrac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{array} \right. = 106.66$$

Spacing Requirement Verification:

$$KL\_r_m := \left| \begin{array}{ll} KL\_r_m & \text{if } \dfrac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \dfrac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} & \text{otherwise} \end{array} \right. = 160.2$$

$$KL\_r_m := \left| \begin{array}{ll} KL\_r_m & \text{if } \dfrac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{array} \right. = 160.2$$

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

$$F'y := \min(F'y\_R) = 105 \cdot ksi$$

$$F_e := \frac{\pi^2 \cdot E}{KL\_r_R{}^2} = 55.21 \cdot ksi$$

$$F_{cr} := \left| \begin{array}{ll} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y & \text{if } \dfrac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{array} \right. = 47.37 \cdot ksi$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength (Reinforcement):

$$\phi C_{n\_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot kip$$

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

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{KL\_r_L^{\ 2}} = 76.16 \cdot ksi$$

$$F_{cr\_L} := \left| \begin{array}{l} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L \quad \text{if } KL\_r_L \le 4.71\sqrt{\frac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} \quad \text{otherwise} \end{array} \right. = 37.99 \cdot ksi$$

$$A_L = 3.68 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 125.76 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 39.58 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 49.35 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 49.35 \cdot \%$$

$$Compressive_{Strength} := \left| \begin{array}{l} Compressive_{Strength} \quad \text{if } S15Allowable = \text{"No"} \\ \frac{Compressive_{Strength}}{1.05} \quad \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 47.0 \cdot \%$$

Crushing Strength:

$$\phi C_{u\_Crushing} := \left| \begin{array}{l} \phi_c \cdot F_{y\_L} \cdot A_L \quad \text{if } Crushing = \text{"Yes"} \\ \text{"N/A"} \quad \text{otherwise} \end{array} \right. = \text{"N/A"} \cdot kip$$

$$Crushing_{Strength} := \left| \begin{array}{l} \frac{C_u}{\phi C_{u\_Crushing}} \quad \text{if } Crushing = \text{"Yes"} \\ 0\% \quad \text{otherwise} \end{array} \right. = 0 \cdot \%$$

$$Crushing_{Strength} := \left| \begin{array}{l} Crushing_{Strength} \quad \text{if } S15Allowable = \text{"No"} \\ \frac{Crushing_{Strength}}{1.05} \quad \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \left| \begin{array}{l} \text{"Redesign"} \quad \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% \quad \text{otherwise} \end{array} \right. = 0 \cdot \%$$

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

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

Design Strengths:

$$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 165.53 \cdot kip$$

$$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$$

$$Tension_{Yielding} := \begin{cases} \dfrac{T_u}{\phi T_{yn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}} \right) & \text{otherwise} \end{cases} = 46.95 \cdot \%$$

$$Tension_{Yielding} := \begin{cases} Tension_{Yielding} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{Tension_{Yielding}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{cases} = 44.7 \cdot \%$$

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

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

Net Areas:

$$U := 1.0$$

$$A_{n\_L} := A_L \cdot U = 3.68 \cdot in^2$$

$$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$$

Design Strengths:

$$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 179.32 \cdot kip$$

$$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$$

$$Tension_{Rupture} := \begin{cases} \dfrac{T_u}{\phi T_{rn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}} \right) & \text{otherwise} \end{cases} = 43.34 \cdot \%$$

$$Tension_{Rupture} := \begin{cases} Tension_{Rupture} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{Tension_{Rupture}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{cases} = 41.3 \cdot \%$$

ANALYSIS / DESIGN SUMMARY

$$\text{Compressive}_{\text{Strength}} = 47\cdot\%$$

$$\text{Crushing}_{\text{Strength}} = 0\cdot\%$$

$$\text{Tension}_{\text{Yielding}} = 44.72\cdot\%$$

$$\text{Tension}_{\text{Rupture}} = 41.28\cdot\%$$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$$\boxed{\text{RATING} = 47\cdot\%}$$

Pipe with SR on Heel 80' to 100'

LOADS

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

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

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: $L_{u\_R} := 36\text{in}$ (0.001in 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: $\frac{D_{L\_out}}{T_L} = 13.35$

Inside Diameter: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 3.83 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}^{\ 2} - D_{L\_in}^{\ 2}\right) = 4.41 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}^{\ 4} - D_{L\_in}^{\ 4}\right) = 9.61 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}^{\ 2} + D_{L\_in}^{\ 2}}}{4} = 1.48 \cdot in$

Centroid Coordinates: $x_L := 0.5D_{L\_out} = 2.25 \cdot in$

$y_L := 0.5D_{L\_out} = 2.25 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

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

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

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

Gap: $g := 10in - \left(\dfrac{D_R}{2}\right) - \left(\dfrac{D_{L\_out}}{2}\right)$

$g = 6.75 \cdot in$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

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

Centroid: $x_{bar1} := x_{bar\_L} + D_R = 4.25 \cdot in$

$x_{bar2} := x_{bar\_R} + g = 7.75 \cdot in$

$A_L \cdot x_{bar1} = 18.73 \cdot in^3$

$A_R \cdot x_{bar2} = 24.35 \cdot in^3$

$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 43.08 \cdot in^3$

$x_0 := \dfrac{Ax_{total}}{A_T} = 5.71 \cdot in$

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

$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 18.96 \cdot in^4$

$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 13.9 \cdot in^4$

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

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

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

PROPERTIES SUMMARY

EXISTING LEG

Area: $A_L = 4.41 \cdot in^2$

Moment of Inertias: $I_{xL} := I_{xx} = 9.61 \cdot in^4$

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

Radii of Gyration: $r_{xL} = 1.477 \cdot in$

$r_{yL} = 1.48 \cdot in$

SOLID ROD RIENFORCEMENT

Area: $A_R = 3.14 \cdot in^2$

Moment of Inertias: $I_{xR} := I_R = 0.79 \cdot in^4$

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

Radii of Gyration: $r_{xR} := r_R = 0.5 \cdot in$

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

COMPOSITE SECTION

Area: $A_T = 7.55 \cdot in^2$

Moment of Inertias: $I_x = 10.4 \cdot in^4$

$I_y = 32.86 \cdot in^4$

Radii of Gyration: $r_x = 1.174 \cdot in$

$r_y = 2.087 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max(0.5 D_{L\_out}, 0.5 \cdot D_R)} = 4.62 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max(0.5 D_{L\_out}, 0.5 \cdot D_R)} = 4.62 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5 D_{L\_out} + g + D_R - x_{bar\_L}} = 3.76 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 5.76 \cdot in^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

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

Diameter to Thickness Ratio: $\dfrac{D_{L\_out}}{T_L} = 13.35$

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

$$F'y\_L := \left| \begin{array}{ll} F_{y\_L} \text{ if } \dfrac{D_{L\_out}}{T_L} \le 0.114 \dfrac{E}{F_{y\_L}} \\ \left(\dfrac{0.0379E}{\dfrac{D_{L\_out}}{T_L} \cdot F_{y\_L}} + \dfrac{2}{3} \right) \cdot F_{y\_L} \text{ if } 0.114 \dfrac{E}{F_{y\_L}} < \dfrac{D_{L\_out}}{T_L} \le 0.448 \dfrac{E}{F_{y\_L}} \\ \dfrac{0.337E}{\dfrac{D_{L\_out}}{T_L}} \text{ if } 0.448 \dfrac{E}{F_{y\_L}} < \dfrac{D_{L\_out}}{T_L} \le 300 \\ \text{"REDESIGN" otherwise} \end{array} \right. = 50 \cdot \text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \dfrac{K_L \cdot L_{u\_L}}{r_L} = 54.31$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} & \text{if } \dfrac{D_R}{0.5\cdot D_R} \le 0.114\dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5\cdot D_R}\cdot F_{y\_R}} + \dfrac{2}{3}\right)\cdot F_{y\_L} & \text{if } 0.114\dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5\cdot D_R} \le 0.448\dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5\cdot D_R}} & \text{if } 0.448\dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5\cdot D_R} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105\cdot ksi$$

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:

$$KL\_r_R := \frac{K_R\cdot L_{u\_R}}{\min(r_{xR}, r_{yR})} = 72$$

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

Minimum Radius of Gyration of Individual Component:

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

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

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

Distance between Connectors: $a_i := L_{u\_R} = 36\cdot in$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

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

$$KL\_r_o := \frac{1.0\cdot\max(L_{u\_L}, L_{u\_R})}{\min(r_x, r_y)} = 68.34$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \left| \begin{array}{ll} KL\_r_o \quad \text{if } \dfrac{a_i}{r_i} \le 40 \\ \sqrt{KL\_r_o^{2} + \left(\dfrac{K_i \cdot a_i}{r_{ib}}\right)^{2}} \quad \text{if } \dfrac{a_i}{r_i} > 40 \end{array} \right. = 92.22$$

$$KL\_r_m := \left| \begin{array}{ll} \sqrt{KL\_r_o^{2} + \left(\dfrac{a_i}{r_i}\right)^{2}} \quad \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} \quad \text{if Intermediate} = \text{"Welded"} \end{array} \right. = 99.27$$

Spacing Requirement Verification:

$$KL\_r_m := \left| \begin{array}{ll} KL\_r_m \quad \text{if } \dfrac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \dfrac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} \quad \text{otherwise} \end{array} \right. = 160.4$$

$$KL\_r_m := \left| \begin{array}{ll} KL\_r_m \quad \text{if } \dfrac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} \quad \text{otherwise} \end{array} \right. = 160.4$$

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

$$F'y := \min(F'y\_R) = 105 \cdot ksi$$

$$F_e := \frac{\pi^{2} \cdot E}{KL\_r_R^{2}} = 55.21 \cdot ksi$$

$$F_{cr} := \left| \begin{array}{ll} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y \quad \text{if } \dfrac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e \quad \text{otherwise} \end{array} \right. = 47.37 \cdot ksi$$

$$A := A_R$$

Reduction Factor: $\phi_c := 0.9$

Design Compressive Strength (Reinforcement): $\phi C_{n\_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot kip$

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

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{KL\_r_L{}^2} = 97.03 \cdot ksi$$

$$F_{cr\_L} := \begin{cases} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L & \text{if } KL\_r_L \le 4.71\sqrt{\dfrac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} & \text{otherwise} \end{cases} = 40.3 \cdot ksi$$

$$A_L = 4.41 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 159.86 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 53.54 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 62.93 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 62.93 \cdot \%$$

$$Compressive_{Strength} := \begin{cases} Compressive_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \dfrac{Compressive_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 59.9 \cdot \%$$

Crushing Strength:

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

$$Crushing_{Strength} := \begin{cases} \dfrac{C_u}{\phi C_{u\_Crushing}} & \text{if } Crushing = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0 \cdot \%$$

$$Crushing_{Strength} := \begin{cases} Crushing_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \dfrac{Crushing_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \begin{cases} \text{"Redesign"} & \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% & \text{otherwise} \end{cases} = 0 \cdot \%$$

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

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

Design Strengths:

$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 198.33 \cdot kip$

$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$

$$Tension_{Yielding} := \begin{cases} \dfrac{T_u}{\phi T_{yn\_L}} & \text{if } Tension = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}}\right) & \text{otherwise} \end{cases} = 42.42 \cdot \%$$

$$Tension_{Yielding} := \begin{cases} Tension_{Yielding} & \text{if } S15Allowable = \text{"No"} \\ \dfrac{Tension_{Yielding}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 40.4 \cdot \%$$

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

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

Net Areas:

$U := 1.0$

$A_{n\_L} := A_L \cdot U = 4.41 \cdot in^2$

$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$

Design Strengths:

$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 214.86 \cdot kip$

$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$

$$Tension_{Rupture} := \begin{cases} \dfrac{T_u}{\phi T_{rn\_L}} & \text{if } Tension = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}}\right) & \text{otherwise} \end{cases} = 39.15 \cdot \%$$

$$Tension_{Rupture} := \begin{cases} Tension_{Rupture} & \text{if } S15Allowable = \text{"No"} \\ \dfrac{Tension_{Rupture}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 37.3 \cdot \%$$

ANALYSIS / DESIGN SUMMARY

$\text{Compressive}_{\text{Strength}} = 59.93 \cdot \%$

$\text{Crushing}_{\text{Strength}} = 0 \cdot \%$

$\text{Tension}_{\text{Yielding}} = 40.4 \cdot \%$

$\text{Tension}_{\text{Rupture}} = 37.29 \cdot \%$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$\boxed{\text{RATING} = 59.93 \cdot \%}$

Pipe with SR on Heel 60' to 80'

LOADS

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

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

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: $L_{u\_R} := 36\text{in}$ (0.001in 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: $\frac{D_{L\_out}}{T_L} = 14.83$

Inside Diameter: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 4.81 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}^{\ 2} - D_{L\_in}^{\ 2}\right) = 6.11 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}^{\ 4} - D_{L\_in}^{\ 4}\right) = 20.67 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}^{\ 2} + D_{L\_in}^{\ 2}}}{4} = 1.84 \cdot in$

Centroid Coordinates: $x_L := 0.5 D_{L\_out} = 2.78 \cdot in$

$y_L := 0.5 D_{L\_out} = 2.78 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

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

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

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

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

$g = 6.22 \cdot in$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

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

Centroid: $x_{bar1} := x_{bar\_L} + D_R = 4.78 \cdot in$

$x_{bar2} := x_{bar\_R} + g = 7.22 \cdot in$

$A_L \cdot x_{bar1} = 29.22 \cdot in^3$

$A_R \cdot x_{bar2} = 22.68 \cdot in^3$

$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 51.9 \cdot in^3$

$x_0 := \frac{Ax_{total}}{A_T} = 5.61 \cdot in$

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

$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 24.85 \cdot in^4$

$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 8.93 \cdot in^4$

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

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

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

PROPERTIES SUMMARY

EXISTING LEG

Area: $A_L = 6.11 \cdot in^2$

Moment of Inertias: $I_{xL} := I_{xx} = 20.67 \cdot in^4$

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

Radii of Gyration: $r_{xL} = 1.839 \cdot in$

$r_{yL} = 1.84 \cdot in$

SOLID ROD RIENFORCEMENT

Area: $A_R = 3.14 \cdot in^2$

Moment of Inertias: $I_{xR} := I_R = 0.79 \cdot in^4$

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

Radii of Gyration: $r_{xR} := r_R = 0.5 \cdot in$

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

COMPOSITE SECTION

Area: $A_T = 9.25 \cdot in^2$

Moment of Inertias: $I_x = 21.46 \cdot in^4$

$I_y = 33.78 \cdot in^4$

Radii of Gyration: $r_x = 1.523 \cdot in$

$r_y = 1.911 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 7.71 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 7.71 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5D_{L\_out} + g + D_R - x_{bar\_L}} = 4.11 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 6.02 \cdot in^3$$

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):

$$F'y\_L := \left|\begin{array}{ll} F_{y\_L} & \text{if } \frac{D_{L\_out}}{T_L} \le 0.114\,\frac{E}{F_{y\_L}} \\ \left(\dfrac{0.0379E}{\frac{D_{L\_out}}{T_L}\cdot F_{y\_L}} + \dfrac{2}{3}\right)\cdot F_{y\_L} & \text{if } 0.114\,\frac{E}{F_{y\_L}} < \frac{D_{L\_out}}{T_L} \le 0.448\,\frac{E}{F_{y\_L}} \\ \dfrac{0.337E}{\frac{D_{L\_out}}{T_L}} & \text{if } 0.448\,\frac{E}{F_{y\_L}} < \frac{D_{L\_out}}{T_L} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{array}\right. = 50\cdot\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \frac{K_L\cdot L_{u\_L}}{r_L} = 65.36$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} & \text{if } \dfrac{D_R}{0.5 \cdot D_R} \le 0.114 \dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5 \cdot D_R} \cdot F_{y\_R}} + \dfrac{2}{3} \right) \cdot F_{y\_L} & \text{if } 0.114 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 0.448 \dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot ksi$$

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:

$$KL\_r_R := \frac{K_R \cdot L_{u\_R}}{\min(r_{xR}, r_{yR})} = 72$$

<u>BUILT-UP MEMBER (TIA-222-H Section 4.5.3):</u>

Minimum Radius of Gyration of Individual Component:

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

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

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

Distance between Connectors: $a_i := L_{u\_R} = 36 \cdot in$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

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

$$KL\_r_o := \frac{1.0 \cdot \max(L_{u\_L}, L_{u\_R})}{\min(r_x, r_y)} = 78.94$$

Modified Effective Slenderness Ratio:

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

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

Spacing Requirement Verification:

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \frac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \frac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} & \text{otherwise} \end{cases} = 240.4$$

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \frac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 240.4$$

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

$$F'y := \min(F'y\_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL\_r_R^{\,2}} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y & \text{if } \frac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

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]

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{KL\_r_L{}^2} = 67 \cdot ksi$$

$$F_{cr\_L} := \left| \begin{array}{ll} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L & \text{if } KL\_r_L \le 4.71 \sqrt{\frac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} & \text{otherwise} \end{array} \right. = 36.59 \cdot ksi$$

$$A_L = 6.11 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 201.25 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 51.44 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 66.6 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 66.6 \cdot \%$$

$$Compressive_{Strength} := \left| \begin{array}{ll} Compressive_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Compressive_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 63.4 \cdot \%$$

Crushing Strength:

$$\phi C_{u\_Crushing} := \left| \begin{array}{ll} \phi_c \cdot F_{y\_L} \cdot A_L & \text{if } Crushing = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{array} \right. = \text{"N/A"} \cdot kip$$

$$Crushing_{Strength} := \left| \begin{array}{ll} \frac{C_u}{\phi C_{u\_Crushing}} & \text{if } Crushing = \text{"Yes"} \\ 0\% & \text{otherwise} \end{array} \right. = 0 \cdot \%$$

$$Crushing_{Strength} := \left| \begin{array}{ll} Crushing_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Crushing_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \left| \begin{array}{ll} \text{"Redesign"} & \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% & \text{otherwise} \end{array} \right. = 0 \cdot \%$$

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

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

Design Strengths:

$$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 275.04 \cdot kip$$

$$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$$

$$\text{Tension}_{\text{Yielding}} := \left| \begin{array}{ll} \dfrac{T_u}{\phi T_{yn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}} \right) & \text{otherwise} \end{array} \right. = 40.83 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} := \left| \begin{array}{ll} \text{Tension}_{\text{Yielding}} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{\text{Tension}_{\text{Yielding}}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{array} \right. = 38.9 \cdot \%$$

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

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

Net Areas:

$$U := 1.0$$

$$A_{n\_L} := A_L \cdot U = 6.11 \cdot in^2$$

$$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$$

Design Strengths:

$$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 297.96 \cdot kip$$

$$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$$

$$\text{Tension}_{\text{Rupture}} := \left| \begin{array}{ll} \dfrac{T_u}{\phi T_{rn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}} \right) & \text{otherwise} \end{array} \right. = 37.69 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} := \left| \begin{array}{ll} \text{Tension}_{\text{Rupture}} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{\text{Tension}_{\text{Rupture}}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{array} \right. = 35.9 \cdot \%$$

BU: 806478
WO: 1945873
Leg: 60-80'

Done By: MAS
Checked By:
Date: 4/21/2021

ANALYSIS / DESIGN SUMMARY

$$\text{Compressive}_{\text{Strength}} = 63.42 \cdot \%$$

$$\text{Crushing}_{\text{Strength}} = 0 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} = 38.89 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} = 35.89 \cdot \%$$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$$\boxed{\text{RATING} = 63.42 \cdot \%}$$

BU: 806478
WO: 1945873
Leg: 40-60'

Done By: MAS
Checked By:
Date: 4/21/2021

CROWN CASTLE

Pipe with SR on Heel 40' to 60'

LOADS

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

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

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: [✓ 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: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 4.81 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}{}^2 - D_{L\_in}{}^2\right) = 6.11 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}{}^4 - D_{L\_in}{}^4\right) = 20.67 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}{}^2 + D_{L\_in}{}^2}}{4} = 1.84 \cdot in$

Centroid Coordinates: $x_L := 0.5 D_{L\_out} = 2.78 \cdot in$

$y_L := 0.5 D_{L\_out} = 2.78 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

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

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

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

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

$g = 6.22 \cdot in$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

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

Centroid: $x_{bar1} := x_{bar\_L} + D_R = 4.78 \cdot in$

$x_{bar2} := x_{bar\_R} + g = 7.22 \cdot in$

$A_L \cdot x_{bar1} = 29.22 \cdot in^3$

$A_R \cdot x_{bar2} = 22.68 \cdot in^3$

$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 51.9 \cdot in^3$

$x_0 := \frac{Ax_{total}}{A_T} = 5.61 \cdot in$

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

$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 24.85 \cdot in^4$

$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 8.93 \cdot in^4$

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

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

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

PROPERTIES SUMMARY

EXISTING LEG

Area: $A_L = 6.11 \cdot in^2$

Moment of Inertias: $I_{xL} := I_{xx} = 20.67 \cdot in^4$

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

Radii of Gyration: $r_{xL} = 1.839 \cdot in$

$r_{yL} = 1.84 \cdot in$

SOLID ROD RIENFORCEMENT

Area: $A_R = 3.14 \cdot in^2$

Moment of Inertias: $I_{xR} := I_R = 0.79 \cdot in^4$

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

Radii of Gyration: $r_{xR} := r_R = 0.5 \cdot in$

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

COMPOSITE SECTION

Area: $A_T = 9.25 \cdot in^2$

Moment of Inertias: $I_x = 21.46 \cdot in^4$

$I_y = 33.78 \cdot in^4$

Radii of Gyration: $r_x = 1.523 \cdot in$

$r_y = 1.911 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 7.71 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 7.71 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5D_{L\_out} + g + D_R - x_{bar\_L}} = 4.11 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 6.02 \cdot in^3$$

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):

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

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \frac{K_L\cdot L_{u\_L}}{r_L} = 33.6$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} & \text{if } \dfrac{D_R}{0.5 \cdot D_R} \le 0.114 \dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5 \cdot D_R} \cdot F_{y\_R}} + \dfrac{2}{3} \right) \cdot F_{y\_L} & \text{if } 0.114 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 0.448 \dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

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:

$$KL\_r_R := \frac{K_R \cdot L_{u\_R}}{\min(r_{xR}, r_{yR})} = 72$$

<u>BUILT-UP MEMBER (TIA-222-H Section 4.5.3):</u>

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 Indivdual 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:

$$KL\_r_o := \frac{1.0 \cdot \max(L_{u\_L}, L_{u\_R})}{\min(r_x, r_y)} = 40.59$$

Modified Effective Slenderness Ratio:

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

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

Spacing Requirement Verification:

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \frac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \frac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} & \text{otherwise} \end{cases} = 123.6$$

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \frac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 123.6$$

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

$$F'y := \min(F'y\_R) = 105 \cdot ksi$$

$$F_e := \frac{\pi^2 \cdot E}{KL\_r_R^{\,2}} = 55.21 \cdot ksi$$

$$F_{cr} := \begin{cases} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y & \text{if } \frac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot ksi$$

$$A := A_R$$

Reduction Factor:

$$\phi_c := 0.9$$

Design Compressive Strength
(Reinforcement):

$$\phi C_{n\_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot kip$$

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

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{KL\_r_L{}^2} = 253.45 \cdot ksi$$

$$F_{cr\_L} := \left| \begin{array}{ll} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L & \text{if } KL\_r_L \le 4.71 \sqrt{\frac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} & \text{otherwise} \end{array} \right. = 46.04 \cdot ksi$$

$$A_L = 6.11 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 253.24 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 59.2 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 60.91 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 60.91 \cdot \%$$

$$Compressive_{Strength} := \left| \begin{array}{ll} Compressive_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Compressive_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 58.0 \cdot \%$$

Crushing Strength:

$$\phi C_{u\_Crushing} := \left| \begin{array}{ll} \phi_c \cdot F_{y\_L} \cdot A_L & \text{if } Crushing = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{array} \right. = \text{"N/A"} \cdot kip$$

$$Crushing_{Strength} := \left| \begin{array}{ll} \frac{C_u}{\phi C_{u\_Crushing}} & \text{if } Crushing = \text{"Yes"} \\ 0\% & \text{otherwise} \end{array} \right. = 0 \cdot \%$$

$$Crushing_{Strength} := \left| \begin{array}{ll} Crushing_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Crushing_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \left| \begin{array}{ll} \text{"Redesign"} & \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% & \text{otherwise} \end{array} \right. = 0 \cdot \%$$

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

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

Design Strengths:

$$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 275.04 \cdot kip$$

$$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$$

$$\text{Tension}_{\text{Yielding}} := \begin{cases} \dfrac{T_u}{\phi T_{yn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}} \right) & \text{otherwise} \end{cases} = 46.92 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} := \begin{cases} \text{Tension}_{\text{Yielding}} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{\text{Tension}_{\text{Yielding}}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{cases} = 44.7 \cdot \%$$

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

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

Net Areas:

$$U := 1.0$$

$$A_{n\_L} := A_L \cdot U = 6.11 \cdot in^2$$

$$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$$

Design Strengths:

$$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 297.96 \cdot kip$$

$$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$$

$$\text{Tension}_{\text{Rupture}} := \begin{cases} \dfrac{T_u}{\phi T_{rn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}} \right) & \text{otherwise} \end{cases} = 43.31 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} := \begin{cases} \text{Tension}_{\text{Rupture}} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{\text{Tension}_{\text{Rupture}}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{cases} = 41.2 \cdot \%$$

BU: 806478
WO: 1945873
Leg: 40-60'

Done By: MAS
Checked By:
Date: 4/21/2021

CROWN CASTLE

ANALYSIS / DESIGN SUMMARY

$$\text{Compressive}_{\text{Strength}} = 58.01 \cdot \%$$

$$\text{Crushing}_{\text{Strength}} = 0 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} = 44.69 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} = 41.25 \cdot \%$$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$$\boxed{\text{RATING} = 58.01 \cdot \%}$$

Pipe with SR on Heel 30' to 40'

LOADS

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

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

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: [✓ 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: $\frac{D_{L\_out}}{T_L} = 15.34$

Inside Diameter: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 5.76 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}{}^2 - D_{L\_in}{}^2\right) = 8.4 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}{}^4 - D_{L\_in}{}^4\right) = 40.49 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}{}^2 + D_{L\_in}{}^2}}{4} = 2.19 \cdot in$

Centroid Coordinates: $x_L := 0.5 D_{L\_out} = 3.31 \cdot in$

$y_L := 0.5 D_{L\_out} = 3.31 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

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

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

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

Gap: $g := 10in - \left(\dfrac{D_R}{2}\right) - \left(\dfrac{D_{L\_out}}{2}\right)$

$g = 5.69 \cdot in$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area: $A_T := A_L + A_R = 11.55 \cdot in^2$

Centroid: $x_{bar1} := x_{bar\_L} + D_R = 5.31 \cdot in$

$x_{bar2} := x_{bar\_R} + g = 6.69 \cdot in$

$A_L \cdot x_{bar1} = 44.65 \cdot in^3$

$A_R \cdot x_{bar2} = 21.01 \cdot in^3$

$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 65.66 \cdot in^3$

$x_0 := \dfrac{Ax_{total}}{A_T} = 5.69 \cdot in$

Moments of Inertia: $I_x := I_{xx} + I_R = 41.28 \cdot in^4$

$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 41.67 \cdot in^4$

$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 3.93 \cdot in^4$

$I_y := I_{bar\_yL} + I_{bar\_yR} = 45.6 \cdot in^4$

Radii of Gyration: $r_x := \sqrt{\dfrac{I_x}{A_T}} = 1.89 \cdot in$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.99 \cdot in$$

PROPERTIES SUMMARY

EXISTING LEG

Area: $A_L = 8.4 \cdot in^2$

Moment of Inertias: $I_{xL} := I_{xx} = 40.49 \cdot in^4$

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

Radii of Gyration: $r_{xL} = 2.195 \cdot in$

$r_{yL} = 2.19 \cdot in$

SOLID ROD RIENFORCEMENT

Area: $A_R = 3.14 \cdot in^2$

Moment of Inertias: $I_{xR} := I_R = 0.79 \cdot in^4$

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

Radii of Gyration: $r_{xR} := r_R = 0.5 \cdot in$

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

COMPOSITE SECTION

$A_T = 11.55 \cdot in^2$

Area:

Moment of Inertias: $I_x = 41.28 \cdot in^4$

$I_y = 45.6 \cdot in^4$

Radii of Gyration: $r_x = 1.891 \cdot in$

$r_y = 1.987 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max\left(0.5D_{L\_out}, 0.5 \cdot D_R\right)} = 12.46 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max\left(0.5D_{L\_out}, 0.5 \cdot D_R\right)} = 12.46 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5D_{L\_out} + g + D_R - x_{bar\_L}} = 5.93 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 8.02 \cdot in^3$$

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):

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

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \frac{K_L\cdot L_{u\_L}}{r_L} = 54.76$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} & \text{if } \dfrac{D_R}{0.5 \cdot D_R} \le 0.114 \dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5 \cdot D_R} \cdot F_{y\_R}} + \dfrac{2}{3} \right) \cdot F_{y\_L} & \text{if } 0.114 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 0.448 \dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot \text{ksi}$$

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:

$$KL\_r_R := \frac{K_R \cdot L_{u\_R}}{\min\left(r_{xR}, r_{yR}\right)} = 72$$

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

Minimum Radius of Gyration of Individual Component:

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

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

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

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:

$$KL\_r_o := \frac{1.0 \cdot \max\left(L_{u\_L}, L_{u\_R}\right)}{\min\left(r_x, r_y\right)} = 63.57$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \left| \begin{array}{ll} KL\_r_o & \text{if } \dfrac{a_i}{r_i} \le 40 \\ \sqrt{KL\_r_o^{\,2} + \left(\dfrac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \dfrac{a_i}{r_i} > 40 \end{array} \right. = 88.75$$

$$KL\_r_m := \left| \begin{array}{ll} \sqrt{KL\_r_o^{\,2} + \left(\dfrac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{array} \right. = 96.05$$

Spacing Requirement Verification:

$$KL\_r_m := \left| \begin{array}{ll} KL\_r_m & \text{if } \dfrac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \dfrac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} & \text{otherwise} \end{array} \right. = 240.4$$

$$KL\_r_m := \left| \begin{array}{ll} KL\_r_m & \text{if } \dfrac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{array} \right. = 240.4$$

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

$$F'y := \min(F'y\_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL\_r_R^{\,2}} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \left| \begin{array}{ll} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y & \text{if } \dfrac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{array} \right. = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

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]

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{KL\_r_L{}^2} = 95.44 \cdot ksi$$

$$F_{cr\_L} := \left| \begin{array}{ll} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L & \text{if } KL\_r_L \le 4.71\sqrt{\frac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} & \text{otherwise} \end{array} \right. = 40.15 \cdot ksi$$

$$A_L = 8.4 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 303.75 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 50.97 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 60.13 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 60.13 \cdot \%$$

$$Compressive_{Strength} := \left| \begin{array}{ll} Compressive_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Compressive_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 57.3 \cdot \%$$

Crushing Strength:

$$\phi C_{u\_Crushing} := \left| \begin{array}{ll} \phi_c \cdot F_{y\_L} \cdot A_L & \text{if } Crushing = \text{"Yes"} \\ \text{"N/A"} & \text{otherwise} \end{array} \right. = \text{"N/A"} \cdot kip$$

$$Crushing_{Strength} := \left| \begin{array}{ll} \frac{C_u}{\phi C_{u\_Crushing}} & \text{if } Crushing = \text{"Yes"} \\ 0\% & \text{otherwise} \end{array} \right. = 0 \cdot \%$$

$$Crushing_{Strength} := \left| \begin{array}{ll} Crushing_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Crushing_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \left| \begin{array}{ll} \text{"Redesign"} & \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% & \text{otherwise} \end{array} \right. = 0 \cdot \%$$

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

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

Design Strengths:

$$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 378.22 \cdot kip$$

$$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$$

$$Tension_{Yielding} := \begin{cases} \dfrac{T_u}{\phi T_{yn\_L}} & \text{if } Tension = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}} \right) & \text{otherwise} \end{cases} = 40.25 \cdot \%$$

$$Tension_{Yielding} := \begin{cases} Tension_{Yielding} & \text{if } S15Allowable = \text{"No"} \\ \dfrac{Tension_{Yielding}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 38.3 \cdot \%$$

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

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

Net Areas:

$$U := 1.0$$

$$A_{n\_L} := A_L \cdot U = 8.4 \cdot in^2$$

$$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$$

Design Strengths:

$$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 409.74 \cdot kip$$

$$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$$

$$Tension_{Rupture} := \begin{cases} \dfrac{T_u}{\phi T_{rn\_L}} & \text{if } Tension = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}} \right) & \text{otherwise} \end{cases} = 37.16 \cdot \%$$

$$Tension_{Rupture} := \begin{cases} Tension_{Rupture} & \text{if } S15Allowable = \text{"No"} \\ \dfrac{Tension_{Rupture}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 35.4 \cdot \%$$

ANALYSIS / DESIGN SUMMARY

$$\text{Compressive}_{\text{Strength}} = 57.27 \cdot \%$$

$$\text{Crushing}_{\text{Strength}} = 0 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} = 38.34 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} = 35.39 \cdot \%$$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$$\boxed{\text{RATING} = 57.27 \cdot \%}$$

Pipe with SR on Heel 20' to 30'

LOADS

Compression: $C_u := 265.219\text{kip}$

Tension: $T_u := 220.628\text{kip}$

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: [✓ 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: $\frac{D_{L\_out}}{T_L} = 15.34$

Inside Diameter: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 5.76 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}^{\ 2} - D_{L\_in}^{\ 2}\right) = 8.4 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}^{\ 4} - D_{L\_in}^{\ 4}\right) = 40.49 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}^{\ 2} + D_{L\_in}^{\ 2}}}{4} = 2.19 \cdot in$

Centroid Coordinates: $x_L := 0.5D_{L\_out} = 3.31 \cdot in$

$y_L := 0.5D_{L\_out} = 3.31 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

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

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

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

Gap: $g := 10in - \left(\dfrac{D_R}{2}\right) - \left(\dfrac{D_{L\_out}}{2}\right)$

$g = 5.69 \cdot in$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area: $A_T := A_L + A_R = 11.55 \cdot in^2$

Centroid: $x_{bar1} := x_{bar\_L} + D_R = 5.31 \cdot in$

$x_{bar2} := x_{bar\_R} + g = 6.69 \cdot in$

$A_L \cdot x_{bar1} = 44.65 \cdot in^3$

$A_R \cdot x_{bar2} = 21.01 \cdot in^3$

$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 65.66 \cdot in^3$

$x_0 := \dfrac{Ax_{total}}{A_T} = 5.69 \cdot in$

Moments of Inertia: $I_x := I_{xx} + I_R = 41.28 \cdot in^4$

$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 41.67 \cdot in^4$

$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 3.93 \cdot in^4$

$I_y := I_{bar\_yL} + I_{bar\_yR} = 45.6 \cdot in^4$

Radii of Gyration: $r_x := \sqrt{\dfrac{I_x}{A_T}} = 1.89 \cdot in$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.99 \cdot in$$

PROPERTIES SUMMARY

EXISTING LEG

Area:

$A_L = 8.4 \cdot in^2$

Moment of Inertias:

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

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

Radii of Gyration:

$r_{xL} = 2.195 \cdot in$

$r_{yL} = 2.19 \cdot in$

SOLID ROD RIENFORCEMENT

Area:

$A_R = 3.14 \cdot in^2$

Moment of Inertias:

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

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

Radii of Gyration:

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

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

COMPOSITE SECTION

Area:

$A_T = 11.55 \cdot in^2$

Moment of Inertias:

$I_x = 41.28 \cdot in^4$

$I_y = 45.6 \cdot in^4$

Radii of Gyration:

$r_x = 1.891 \cdot in$

$r_y = 1.987 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 12.46 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 12.46 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5D_{L\_out} + g + D_R - x_{bar\_L}} = 5.93 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 8.02 \cdot in^3$$

BUILT-UP SECTION ANALYSIS

LEG DATA

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

Diameter to Thickness Ratio: $\dfrac{D_{L\_out}}{T_L} = 15.34$

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

$$F'y\_L := \left| \begin{array}{l} F_{y\_L} \ \text{ if } \ \dfrac{D_{L\_out}}{T_L} \le 0.114\dfrac{E}{F_{y\_L}} \\ \left(\dfrac{0.0379E}{\dfrac{D_{L\_out}}{T_L}\cdot F_{y\_L}} + \dfrac{2}{3} \right)\cdot F_{y\_L} \ \text{ if } \ 0.114\dfrac{E}{F_{y\_L}} < \dfrac{D_{L\_out}}{T_L} \le 0.448\dfrac{E}{F_{y\_L}} \\ \dfrac{0.337E}{\dfrac{D_{L\_out}}{T_L}} \ \text{ if } \ 0.448\dfrac{E}{F_{y\_L}} < \dfrac{D_{L\_out}}{T_L} \le 300 \\ \text{"REDESIGN"} \ \text{ otherwise} \end{array} \right. = 50\cdot\text{ksi}$$

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \dfrac{K_L\cdot L_{u\_L}}{r_L} = 28.07$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} & \text{if } \dfrac{D_R}{0.5\cdot D_R} \le 0.114\dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5\cdot D_R}\cdot F_{y\_R}} + \dfrac{2}{3}\right)\cdot F_{y\_L} & \text{if } 0.114\dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5\cdot D_R} \le 0.448\dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5\cdot D_R}} & \text{if } 0.448\dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5\cdot D_R} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105\cdot \text{ksi}$$

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:

$$KL\_r_R := \frac{K_R\cdot L_{u\_R}}{\min\left(r_{xR}, r_{yR}\right)} = 72$$

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

Minimum Radius of Gyration of Individual Component:

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

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

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

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:

$$KL\_r_o := \frac{1.0\cdot \max\left(L_{u\_L}, L_{u\_R}\right)}{\min\left(r_x, r_y\right)} = 32.58$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL\_r_o & \text{if } \frac{a_i}{r_i} \le 40 \\ \sqrt{KL\_r_o^{\,2} + \left(\frac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \frac{a_i}{r_i} > 40 \end{cases} = 69.97$$

$$KL\_r_m := \begin{cases} \sqrt{KL\_r_o^{\,2} + \left(\frac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 79.03$$

Spacing Requirement Verification:

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \frac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \frac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} & \text{otherwise} \end{cases} = 123.2$$

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \frac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 123.2$$

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

$$F'y := \min(F'y\_R) = 105 \cdot ksi$$

$$F_e := \frac{\pi^2 \cdot E}{KL\_r_R^{\,2}} = 55.21 \cdot ksi$$

$$F_{cr} := \begin{cases} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y & \text{if } \frac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot ksi$$

$$A := A_R$$

Reduction Factor: $\phi_c := 0.9$

Design Compressive Strength (Reinforcement): $\phi C_{n\_R} := \phi_c \cdot A \cdot F_{cr} = 133.93 \cdot kip$

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

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{{KL\_r_L}^2} = 363.38 \cdot ksi$$

$$F_{cr\_L} := \begin{cases} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L & \text{if } KL\_r_L \le 4.71\sqrt{\frac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} & \text{otherwise} \end{cases} = 47.2 \cdot ksi$$

$$A_L = 8.4 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 357.06 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 53.88 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 54.07 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 54.07 \cdot \%$$

$$Compressive_{Strength} := \begin{cases} Compressive_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Compressive_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 51.5 \cdot \%$$

Crushing Strength:

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

$$Crushing_{Strength} := \begin{cases} \frac{C_u}{\phi C_{u\_Crushing}} & \text{if } Crushing = \text{"Yes"} \\ 0\% & \text{otherwise} \end{cases} = 0 \cdot \%$$

$$Crushing_{Strength} := \begin{cases} Crushing_{Strength} & \text{if } S15Allowable = \text{"No"} \\ \frac{Crushing_{Strength}}{1.05} & \text{if } S15Allowable = \text{"Yes"} \end{cases} = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \begin{cases} \text{"Redesign"} & \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% & \text{otherwise} \end{cases} = 0 \cdot \%$$

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

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

Design Strengths:

$$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 378.22 \cdot kip$$

$$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$$

$$Tension_{Yielding} := \begin{cases} \dfrac{T_u}{\phi T_{yn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}}\right) & \text{otherwise} \end{cases} = 42.46 \cdot \%$$

$$Tension_{Yielding} := \begin{cases} Tension_{Yielding} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{Tension_{Yielding}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{cases} = 40.4 \cdot \%$$

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

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

Net Areas:

$$U := 1.0$$

$$A_{n\_L} := A_L \cdot U = 8.4 \cdot in^2$$

$$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$$

Design Strengths:

$$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 409.74 \cdot kip$$

$$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$$

$$Tension_{Rupture} := \begin{cases} \dfrac{T_u}{\phi T_{rn\_L}} & \text{if Tension} = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}}\right) & \text{otherwise} \end{cases} = 39.2 \cdot \%$$

$$Tension_{Rupture} := \begin{cases} Tension_{Rupture} & \text{if S15Allowable} = \text{"No"} \\ \dfrac{Tension_{Rupture}}{1.05} & \text{if S15Allowable} = \text{"Yes"} \end{cases} = 37.3 \cdot \%$$

ANALYSIS / DESIGN SUMMARY

$$\text{Compressive}_{\text{Strength}} = 51.49 \cdot \%$$

$$\text{Crushing}_{\text{Strength}} = 0 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} = 40.44 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} = 37.33 \cdot \%$$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$$\boxed{\text{RATING} = 51.49 \cdot \%}$$

Pipe with SR on Heel 0' to 20'

LOADS

Compression: $C_u := 297.529\,\text{kip}$

Tension: $T_u := 246.501\,\text{kip}$

Apply TIA-222-H Section 15.5? No [✓ Yes]

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: $L_{u\_R} := 36\,\text{in}$ (0.001in 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: $\frac{D_{L\_out}}{T_L} = 15.34$

Inside Diameter: $D_{L\_in} := D_{L\_out} - 2 \cdot T_L = 5.76 \cdot in$

Area: $A_L := \frac{\pi}{4} \cdot \left(D_{L\_out}^{\;2} - D_{L\_in}^{\;2}\right) = 8.4 \cdot in^2$

Moment of Inertia: $I_L := \frac{\pi}{64} \cdot \left(D_{L\_out}^{\;4} - D_{L\_in}^{\;4}\right) = 40.49 \cdot in^4$

Radius of Gyration: $r_L := \frac{\sqrt{D_{L\_out}^{\;2} + D_{L\_in}^{\;2}}}{4} = 2.19 \cdot in$

Centroid Coordinates: $x_L := 0.5 D_{L\_out} = 3.31 \cdot in$

$y_L := 0.5 D_{L\_out} = 3.31 \cdot in$

Location of Centroid of Cross-Section

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

Pipe Properties

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

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

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

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

Section Moduli

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

SOLID ROUND REINFORCEMENT PROPERTIES

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

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

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

Moment of Inertia:

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

Section Modulus:

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

Radius of Gyration:

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

Gap:

$$g := 10in - \left(\frac{D_R}{2}\right) - \left(\frac{D_{L\_out}}{2}\right)$$

$$g = 5.69 \cdot in$$

COMPOSITE SECTION PROPERTIES (Parallel Axis Theorem)

Area:

$$A_T := A_L + A_R = 11.55 \cdot in^2$$

Centroid:

$$x_{bar1} := x_{bar\_L} + D_R = 5.31 \cdot in$$

$$x_{bar2} := x_{bar\_R} + g = 6.69 \cdot in$$

$$A_L \cdot x_{bar1} = 44.65 \cdot in^3$$

$$A_R \cdot x_{bar2} = 21.01 \cdot in^3$$

$$Ax_{total} := A_L \cdot x_{bar1} + A_R \cdot x_{bar2} = 65.66 \cdot in^3$$

$$x_0 := \frac{Ax_{total}}{A_T} = 5.69 \cdot in$$

Moments of Inertia:

$$I_x := I_{xx} + I_R = 41.28 \cdot in^4$$

$$I_{bar\_yL} := I_{yy} + A_L \cdot \left(x_0 - x_{bar1}\right)^2 = 41.67 \cdot in^4$$

$$I_{bar\_yR} := I_R + A_R \cdot \left(x_0 - x_{bar2}\right)^2 = 3.93 \cdot in^4$$

$$I_y := I_{bar\_yL} + I_{bar\_yR} = 45.6 \cdot in^4$$

Radii of Gyration:

$$r_x := \sqrt{\frac{I_x}{A_T}} = 1.89 \cdot in$$

$$r_y := \sqrt{\frac{I_y}{A_T}} = 1.99 \cdot in$$

PROPERTIES SUMMARY

EXISTING LEG

Area: $A_L = 8.4 \cdot in^2$

Moment of Inertias: $I_{xL} := I_{xx} = 40.49 \cdot in^4$

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

Radii of Gyration: $r_{xL} = 2.195 \cdot in$

$r_{yL} = 2.19 \cdot in$

SOLID ROD RIENFORCEMENT

Area: $A_R = 3.14 \cdot in^2$

Moment of Inertias: $I_{xR} := I_R = 0.79 \cdot in^4$

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

Radii of Gyration: $r_{xR} := r_R = 0.5 \cdot in$

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

COMPOSITE SECTION

Area: $A_T = 11.55 \cdot in^2$

Moment of Inertias: $I_x = 41.28 \cdot in^4$

$I_y = 45.6 \cdot in^4$

Radii of Gyration: $r_x = 1.891 \cdot in$

$r_y = 1.987 \cdot in$

Elastic Section Moduli:

$$S_{x\_top} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 12.46 \cdot in^3$$

$$S_{x\_bot} := \frac{I_x}{\max(0.5D_{L\_out}, 0.5 \cdot D_R)} = 12.46 \cdot in^3$$

$$S_{y\_right} := \frac{I_y}{0.5D_{L\_out} + g + D_R - x_{bar\_L}} = 5.93 \cdot in^3$$

$$S_{y\_left} := \frac{I_y}{x_0} = 8.02 \cdot in^3$$

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):

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

Effective Length Factor: $K_L := 1.0$

Effective Slenderness Ratio: $KL\_r_L := \frac{K_L\cdot L_{u\_L}}{r_L} = 54.77$

REINFORCEMENT DATA

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

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

$$F'y\_R := \begin{cases} F_{y\_R} & \text{if } \dfrac{D_R}{0.5 \cdot D_R} \le 0.114 \dfrac{E}{F_{y\_R}} \\ \left(\dfrac{0.0379E}{\dfrac{D_R}{0.5 \cdot D_R} \cdot F_{y\_R}} + \dfrac{2}{3} \right) \cdot F_{y\_L} & \text{if } 0.114 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 0.448 \dfrac{E}{F_{y\_R}} \\ \dfrac{0.337E}{\dfrac{D_R}{0.5 \cdot D_R}} & \text{if } 0.448 \dfrac{E}{F_{y\_R}} < \dfrac{D_R}{0.5 \cdot D_R} \le 300 \\ \text{"REDESIGN"} & \text{otherwise} \end{cases} = 105 \cdot ksi$$

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:

$$KL\_r_R := \frac{K_R \cdot L_{u\_R}}{\min(r_{xR}, r_{yR})} = 72$$

<u>BUILT-UP MEMBER (TIA-222-H Section 4.5.3):</u>

Minimum Radius of Gyration of Individual Component:

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

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

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

Distance between Connectors:

$$a_i := L_{u\_R} = 36 \cdot in$$

Effective Length Factor for Individual Members:

$$K_i := 0.86$$

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

$$KL\_r_o := \frac{1.0 \cdot \max(L_{u\_L}, L_{u\_R})}{\min(r_x, r_y)} = 63.58$$

Modified Effective Slenderness Ratio:

$$KL_{rw} := \begin{cases} KL\_r_o & \text{if } \dfrac{a_i}{r_i} \le 40 \\ \sqrt{KL\_r_o^{\,2} + \left(\dfrac{K_i \cdot a_i}{r_{ib}}\right)^2} & \text{if } \dfrac{a_i}{r_i} > 40 \end{cases} = 88.75$$

$$KL\_r_m := \begin{cases} \sqrt{KL\_r_o^{\,2} + \left(\dfrac{a_i}{r_i}\right)^2} & \text{if Intermediate} = \text{"Bolted"} \\ KL_{rw} & \text{if Intermediate} = \text{"Welded"} \end{cases} = 96.05$$

Spacing Requirement Verification:

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \dfrac{a_i}{r_i} \le 0.75 \cdot KL\_r_o \\ \dfrac{\max\left(K_L \cdot L_{u\_L}, K_R \cdot L_{u\_R}\right)}{r_{ib}} & \text{otherwise} \end{cases} = 240.41$$

$$KL\_r_m := \begin{cases} KL\_r_m & \text{if } \dfrac{a_i}{r_i} \le KL\_r_m \\ \text{"Design Rqmts Not Met"} & \text{otherwise} \end{cases} = 240.41$$

<u>COMPRESSIVE STRENGTH (REINFORCEMENT) [AISC 15th Ed. Section E3]</u>

$$F'y := \min(F'y\_R) = 105 \cdot \text{ksi}$$

$$F_e := \frac{\pi^2 \cdot E}{KL\_r_R^{\,2}} = 55.21 \cdot \text{ksi}$$

$$F_{cr} := \begin{cases} 0.658^{\left(\frac{F'y}{F_e}\right)} \cdot F'y & \text{if } \dfrac{F'y}{F_e} \le 2.25 \\ 0.877 \cdot F_e & \text{otherwise} \end{cases} = 47.37 \cdot \text{ksi}$$

$$A := A_R$$

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]

$$F'y\_L = 50 \cdot ksi$$

$$F_{e\_L} := \frac{\pi^2 \cdot E}{KL\_r_L^{\;2}} = 95.43 \cdot ksi$$

$$F_{cr\_L} := \left| \begin{array}{l} 0.658^{\left(\frac{F'y\_L}{F_{e\_L}}\right)} \cdot F'y\_L \quad \text{if } KL\_r_L \le 4.71\sqrt{\frac{E}{F'y\_L}} \\ 0.877 \cdot F_{e\_L} \quad \text{otherwise} \end{array} \right. = 40.15 \cdot ksi$$

$$A_L = 8.4 \cdot in^2$$

Reduction Factor (Original Leg):

$$\phi_{c\_L} := 0.9$$

Design Compressive Strength (Original Leg):

$$\phi C_{n\_L} := \phi_{c\_L} \cdot A_L \cdot F_{cr\_L} = 303.74 \cdot kip$$

$$C_{reinf} := \frac{A_R}{A_T} \frac{C_u}{\phi C_{n\_R}} = 60.44 \cdot \% \qquad C_{Leg} := \frac{A_L}{A_T} \frac{C_u}{\phi C_{n\_L}} = 71.3 \cdot \%$$

$$Compressive_{Strength} := \max\left(C_{reinf}, C_{Leg}\right) = 71.3 \cdot \%$$

$$Compressive_{Strength} := \left| \begin{array}{l} Compressive_{Strength} \quad \text{if } S15Allowable = \text{"No"} \\ \dfrac{Compressive_{Strength}}{1.05} \quad \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 67.9 \cdot \%$$

Crushing Strength:

$$\phi C_{u\_Crushing} := \left| \begin{array}{l} \phi_c \cdot F_{y\_L} \cdot A_L \quad \text{if } Crushing = \text{"Yes"} \\ \text{"N/A"} \quad \text{otherwise} \end{array} \right. = \text{"N/A"} \cdot kip$$

$$Crushing_{Strength} := \left| \begin{array}{l} \dfrac{C_u}{\phi C_{u\_Crushing}} \quad \text{if } Crushing = \text{"Yes"} \\ 0\% \quad \text{otherwise} \end{array} \right. = 0 \cdot \%$$

$$Crushing_{Strength} := \left| \begin{array}{l} Crushing_{Strength} \quad \text{if } S15Allowable = \text{"No"} \\ \dfrac{Crushing_{Strength}}{1.05} \quad \text{if } S15Allowable = \text{"Yes"} \end{array} \right. = 0.0 \cdot \%$$

Flexural-Torsional Buckling:

$$Flexural\_Torsional := \left| \begin{array}{l} \text{"Redesign"} \quad \text{if } L_{u\_L} \le L_{u\_R} \\ 0\% \quad \text{otherwise} \end{array} \right. = 0 \cdot \%$$

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

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

Design Strengths:

$$\phi T_{yn\_L} := \phi_{ty} \cdot A_L \cdot F_{y\_L} = 378.22 \cdot kip$$

$$\phi T_{yn\_R} := \phi_{ty} \cdot A_R \cdot F_{y\_R} = 296.88 \cdot kip$$

$$Tension_{Yielding} := \begin{array}{|l} \dfrac{T_u}{\phi T_{yn\_L}} \text{ if } Tension = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{yn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{yn\_R}} \right) \text{ otherwise} \end{array} = 47.44 \cdot \%$$

$$Tension_{Yielding} := \begin{array}{|l} Tension_{Yielding} \text{ if } S15Allowable = \text{"No"} \\ \dfrac{Tension_{Yielding}}{1.05} \text{ if } S15Allowable = \text{"Yes"} \end{array} = 45.2 \cdot \%$$

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

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

Net Areas:

$$U := 1.0$$

$$A_{n\_L} := A_L \cdot U = 8.4 \cdot in^2$$

$$A_{n\_R} := A_R \cdot U = 3.14 \cdot in^2$$

Design Strengths:

$$\phi T_{rn\_L} := \phi_{tr} \cdot A_{n\_L} \cdot F_{u\_L} = 409.74 \cdot kip$$

$$\phi T_{rn\_R} := \phi_{tr} \cdot A_{n\_R} \cdot F_{u\_R} = 294.52 \cdot kip$$

$$Tension_{Rupture} := \begin{array}{|l} \dfrac{T_u}{\phi T_{rn\_L}} \text{ if } Tension = \text{"No"} \\ \max\left(\dfrac{T_u \dfrac{A_L}{A_T}}{\phi T_{rn\_L}}, \dfrac{T_u \dfrac{A_R}{A_T}}{\phi T_{rn\_R}} \right) \text{ otherwise} \end{array} = 43.79 \cdot \%$$

$$Tension_{Rupture} := \begin{array}{|l} Tension_{Rupture} \text{ if } S15Allowable = \text{"No"} \\ \dfrac{Tension_{Rupture}}{1.05} \text{ if } S15Allowable = \text{"Yes"} \end{array} = 41.7 \cdot \%$$

ANALYSIS / DESIGN SUMMARY

$$\text{Compressive}_{\text{Strength}} = 67.91 \cdot \%$$

$$\text{Crushing}_{\text{Strength}} = 0 \cdot \%$$

$$\text{Tension}_{\text{Yielding}} = 45.18 \cdot \%$$

$$\text{Tension}_{\text{Rupture}} = 41.71 \cdot \%$$

$$\text{RATING} := \max\left(\text{Compressive}_{\text{Strength}}, \text{Crushing}_{\text{Strength}}, \text{Tension}_{\text{Yielding}}, \text{Tension}_{\text{Rupture}}\right)$$

$$\boxed{\text{RATING} = 67.91 \cdot \%}$$

Self Support Anchor Rod Capacity

Site Info	
BU #	806478
Site Name	HRT 080 953381
Order #	553396 Rev. 0

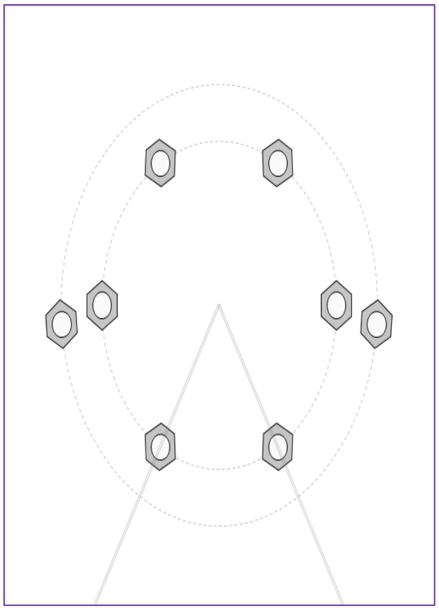
Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	See Custom Sheet
I_{ar} (in)	See Custom Sheet

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

Anchor Rod Data

GROUP 1: (6) 1" ø bolts (A449 N; Fy=92 ksi, Fu=120 ksi) on 12.625" BC

I_{ar} (in): 0

GROUP 2: (2) 1" ø bolts (A193 Gr. B7 N; Fy=105 ksi, Fu=125 ksi) on 17" BC

pos. (deg): 355, 185

I_{ar} (in): 0

Analysis Results

Anchor Rod Summary *(units of kips, kip-in)*

GROUP 1:

Pu_t = 33.77	ϕPn_t = 54.54	**Stress Rating**
Vu = 4.59	ϕVn = 35.34	**59.0%**
Mu = n/a	ϕMn = n/a	Pass

GROUP 2:

Pu_t = 31.36	ϕPn_t = 56.81	**Stress Rating**
Vu = 0	ϕVn = 36.82	**52.6%**
Mu = n/a	ϕMn = 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?: ☐
Block Foundation?: ☐
Rectangular Pad?: ☐

Superstructure Analysis Reactions

Compression, **P_{comp}**:	305.12	kips
Compression Shear, Vu_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, **Fy**:	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, Qnet:	30.000	ksf
Cohesion, **Cu**:	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

Version 4.0.1

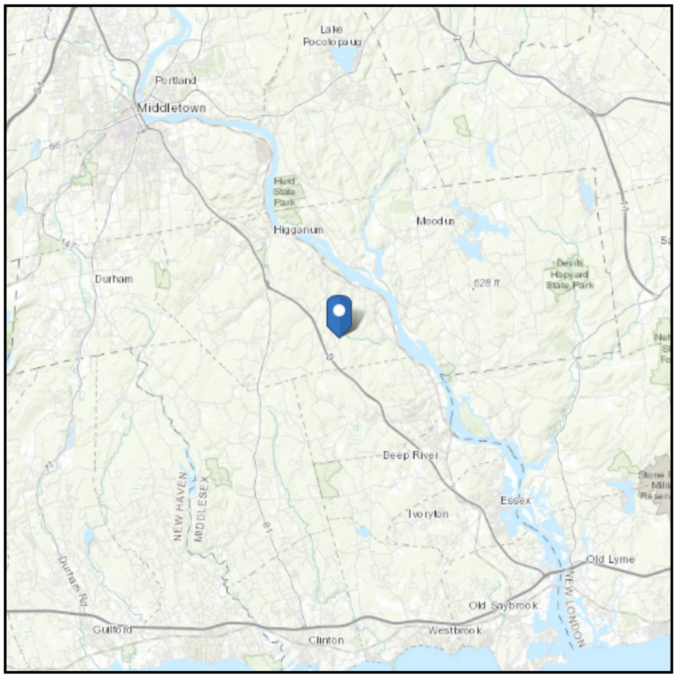
Modified

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

Date Accessed: Wed Mar 31 2021

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.

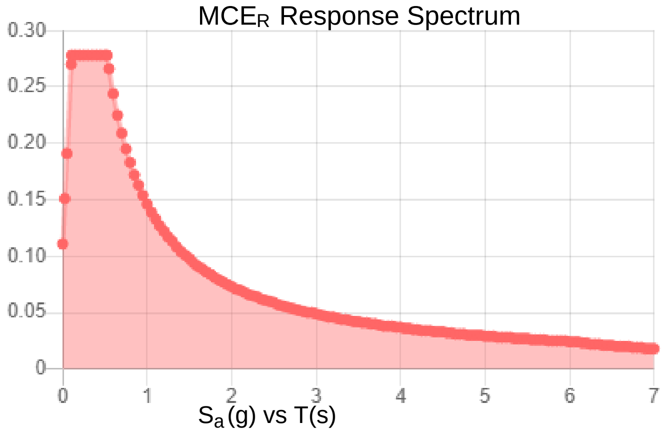
Seismic

Site Soil Class: D - Stiff Soil

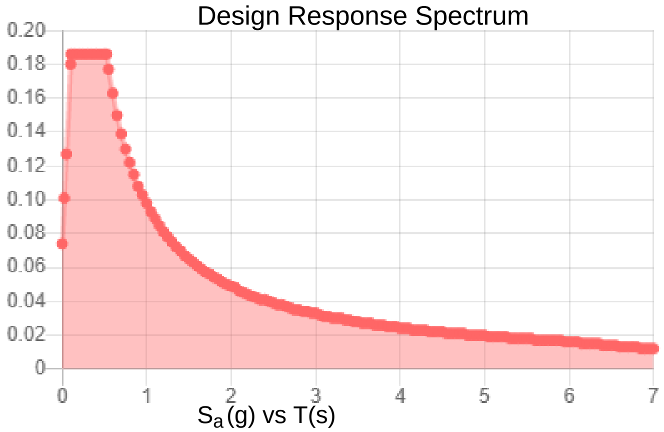
Results:

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


MCE_R Response Spectrum

S_a(g) vs T(s)


Design Response Spectrum

S_a(g) vs T(s)

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.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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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.

CLIFF ABERNATHY
No. 31022
7-30-21

TABLE OF CONTENTS

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 S_1:	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. Trylon 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

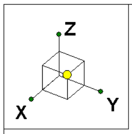
The mount has sufficient capacity to carry the proposed loading configuration. In order for the results of the analysis to be considered valid, the proposed mount listed below must be installed.

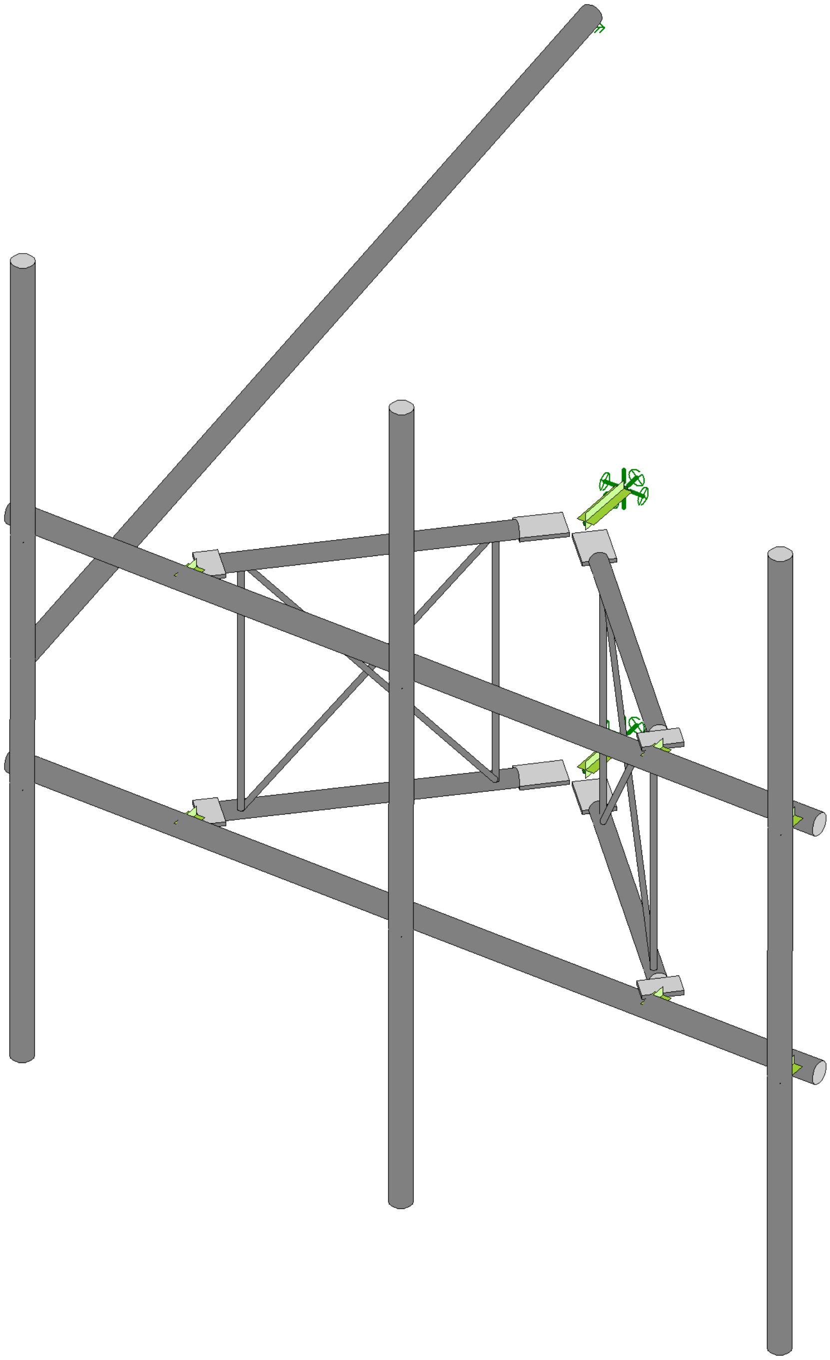
1. Commscope, MTC3975083. The connection point needs to be within 25% ends of tower leg.

No structural modifications are required at this time, provided that the above-listed changes are implemented.

APPENDIX A

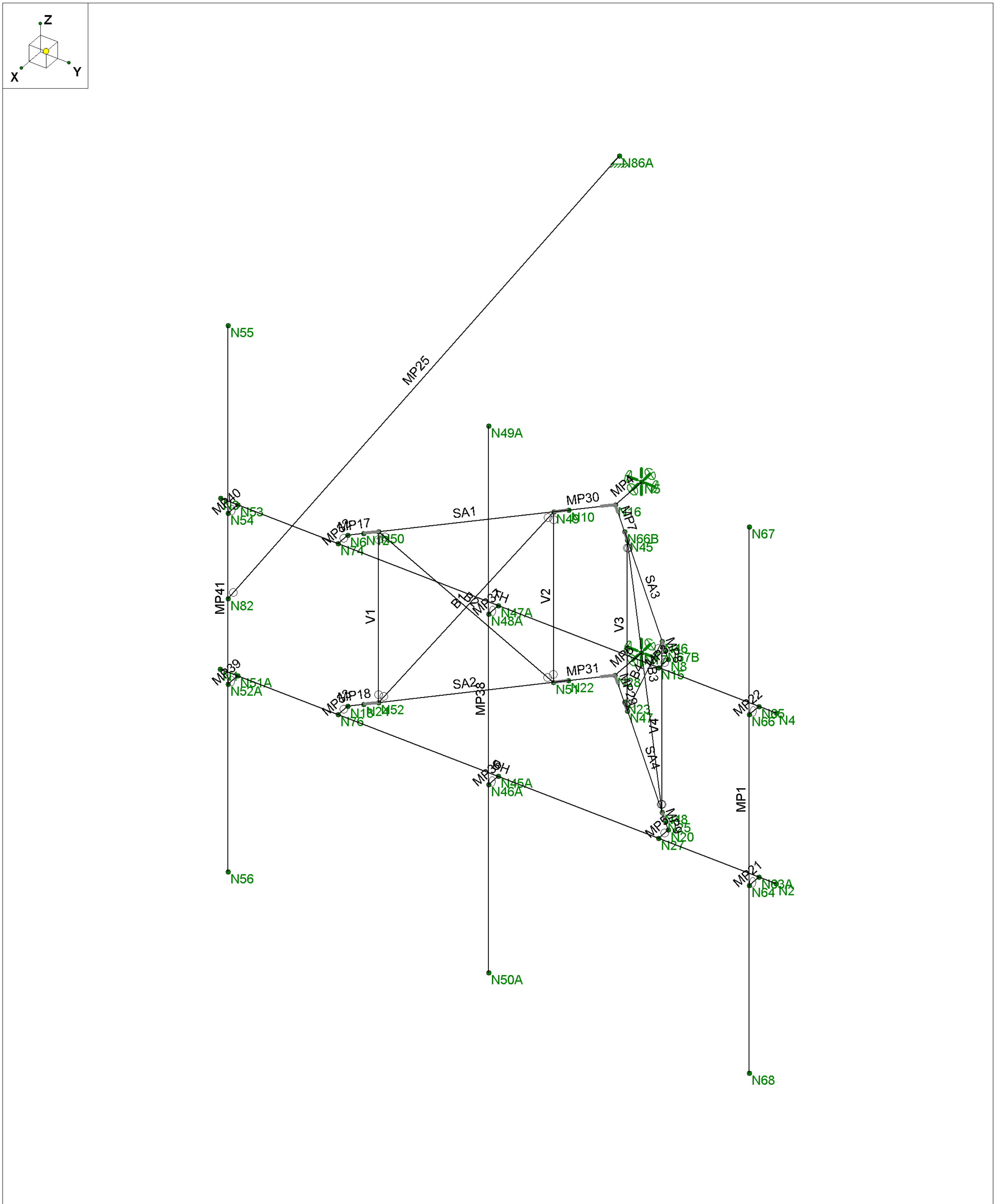
WIRE FRAME AND RENDERED MODELS





Envelope Only Solution

Trylon	806478	SK - 1
AB		July 30, 2021 at 2:45 PM
189058		806478.r3d



Envelope Only Solution

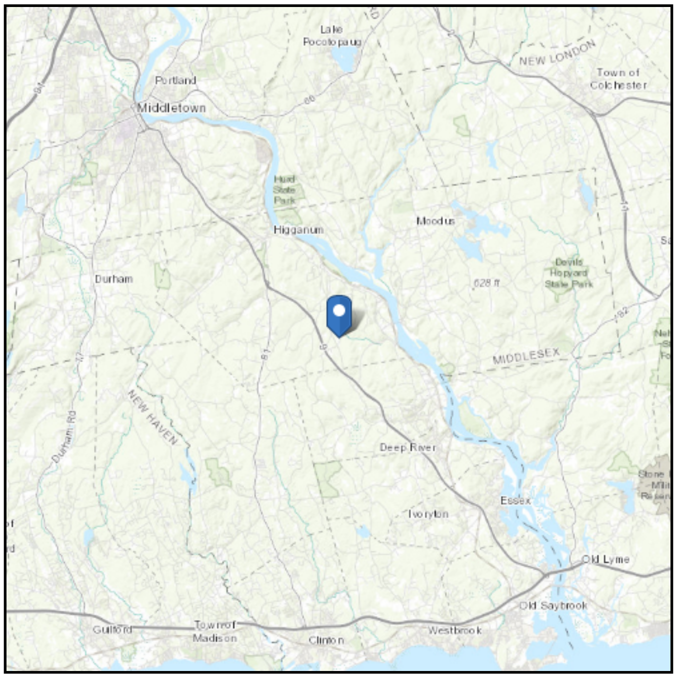
Trylon	806478	SK - 2
AB		July 30, 2021 at 2:45 PM
189058		806478.r3d

APPENDIX B

SOFTWARE INPUT CALCULATIONS

ASCE 7 Hazards Report

Address:		**Standard:**	ASCE/SEI 7-10	**Elevation:**	504.12 ft (NAVD 88)
No Address at This Location		**Risk Category:**	II	**Latitude:**	41.443056
		Soil Class:	D - Stiff Soil	**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 (Gh):	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 (Cs):	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
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

EQUIPMENT LOADING

Appurtenance Name/Location	Qty.	Elevation [ft]	--	EPA $_N$ (ft2)	EPA $_T$ (ft2)	Weight (lbs)
MX08FRO665-20	1	140	No Ice	8.01	3.21	82.50
MP1, 0	--	--	w/ Ice	9.63	4.63	287.57
TA08025-B604	1	140	No Ice	1.96	0.98	63.90
MP1, 0	--	--	w/ Ice	2.39	1.31	69.99
TA08025-B605	1	140	No Ice	1.96	1.13	75.00
MP1, 0	--	--	w/ Ice	2.39	1.47	74.56
RDIDC-9181-PF-48	1	140	No Ice	2.01	1.17	21.85
MP1, 0	--	--	w/ Ice	2.44	1.53	73.49
			No Ice			
--	--	--	w/ Ice			
			No Ice			
--	--	--	w/ Ice			
			No Ice			
--	--	--	w/ Ice			
			No Ice			
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			No Ice			
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			No Ice			
--	--	--	w/ Ice			

EQUIPMENT LOADING [CONT.]

Appurtenance Name/Location	*Qty.*	*Elevation [ft]*	--	*EPA $_N$ (ft2)*	*EPA $_T$ (ft2)*	*Weight (lbs)*
			No Ice			
--	--	--	w/ Ice			
			No Ice			
--	--	--	w/ Ice			
			No Ice			
--	--	--	w/ Ice			
			No Ice			
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			No Ice			
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			No Ice			
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			No Ice			
--	--	--	w/ Ice			

EQUIPMENT WIND CALCULATIONS

Appurtenance Name	Qty.	Elevation [ft]	K_{zt}	K_z	K_d	t_d	q_z [psf]	q_{zi} [psf]
MX08FRO665-20	1	140	1.00	1.09	0.95	1.73	43.91	6.50
TA08025-B604	1	140	1.00	1.09	0.95	1.73	43.91	6.50
TA08025-B605	1	140	1.00	1.09	0.95	1.73	43.91	6.50
RDIDC-9181-PF-48	1	140	1.00	1.09	0.95	1.73	43.91	6.50

EQUIPMENT LATERAL WIND FORCE CALCULATIONS

Appurtenance Name	Qty.	--	0° 180°	30° 210°	60° 240°	90° 270°	120° 300°	150° 330°
MX08FRO665-20	1	No Ice	316.53	174.27	269.11	126.85	269.11	174.27
MP1, 0	--	w/ Ice	56.31	34.39	49.00	27.08	49.00	34.39
TA08025-B604	1	No Ice	77.59	48.48	67.89	38.77	67.89	48.48
MP1, 0	--	w/ Ice	13.96	9.24	12.39	7.67	12.39	9.24
TA08025-B605	1	No Ice	77.59	52.87	69.35	44.63	69.35	52.87
MP1, 0	--	w/ Ice	13.96	9.95	12.62	8.62	12.62	9.95
RDIDC-9181-PF-48	1	No Ice	79.50	54.50	71.17	46.16	71.17	54.50
MP1, 0	--	w/ Ice	14.28	10.26	12.94	8.92	12.94	10.26
		No Ice						
--	--	w/ Ice						
		No Ice						
--	--	w/ Ice						
		No Ice						
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		No Ice						
--	--	w/ Ice						
		No Ice						
--	--	w/ Ice						

EQUIPMENT LATERAL WIND FORCE CALCULATIONS [CONT.]

Appurtenance Name	*Qty.*	--	*0° 180°*	*30° 210°*	*60° 240°*	*90° 270°*	*120° 300°*	*150° 330°*
		No Ice						
--	--	w/ Ice						
		No Ice						
--	--	w/ Ice						
		No Ice						
--	--	w/ Ice						
		No Ice						
--	--	w/ Ice						
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		No Ice						
--	--	w/ Ice						
		No Ice						
--	--	w/ Ice						

EQUIPMENT SEISMIC FORCE CALCULATIONS

Appurtenance Name	***Qty.***	***Elevation [ft]***	***Weight [lbs]***	F_p [lbs]
MX08FRO665-20	1	140	82.5	9.24
TA08025-B604	1	140	63.9	7.16
TA08025-B605	1	140	75	8.40
RDIDC-9181-PF-48	1	140	21.85	2.45

APPENDIX C

SOFTWARE ANALYSIS OUTPUT

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Z
Global Member Orientation Plane	XY
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 15th(360-16): LRFD
Cold Formed Steel Code	AISI S100-16: LRFD
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-16
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd X	1
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.4	65	1.3

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]	Yield[ksi]	Fu[ksi]
1	A653 SS Gr33	29500	11346	.3	.65	.49	33	45
2	A653 SS Gr50/1	29500	11346	.3	.65	.49	50	65

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	PIPE_2.0	PIPE_2.0	Beam	Pipe	A53 Gr.B	Typical	1.02	.627	.627	1.25
2	PIPE_1.5	PIPE_1.5	Beam	Pipe	A53 Gr.B	Typical	.749	.293	.293	.586
3	SR 5/8	SR 5/8	Beam	BAR	A36 Gr.36	Typical	.307	.007	.007	.015
4	3.5x0.5	3.5x0.5	Beam	RECT	A36 Gr.36	Typical	1.75	.036	1.786	.133
5	4.25x0.5	4.25x0.5	Beam	RECT	A36 Gr.36	Typical	2.125	.044	3.199	.164
6	SR 1/2"	SR 1/2"	Beam	BAR	A36 Gr.36	Typical	.196	.003	.003	.006

Cold Formed Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rul...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	CF1	162T125-18	Beam	None	A653 SS ...	Typical	.078	.013	.042	9e-6

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N5	Reaction	Reaction	Reaction	Reaction	Reaction	
2	N17	Reaction	Reaction	Reaction	Reaction	Reaction	
3	N86A	Reaction	Reaction	Reaction			

Basic Load Cases

	BLC Description	Category	X Gravi...	Y Gravi...	Z Gravity	Joint	Point	Distrib...	Area(Memb...	Surface...
1	Self Weight	DL			-1		5			
2	Structure Wind X	WLX						26		
3	Structure Wind Y	WLY						26		
4	Wind Load 0 AZI	WLX					5			
5	Wind Load 30 AZI	None					10			
6	Wind Load 45 AZI	None					10			
7	Wind Load 60 AZI	None					10			
8	Wind Load 90 AZI	WLY					5			
9	Wind Load 120 AZI	None					10			
10	Wind Load 135 AZI	None					10			
11	Wind Load 150 AZI	None					10			
12	Ice Weight	OL1					5	26		
13	Structure Ice Wind X	OL2						26		
14	Structure Ice Wind Y	OL3						26		
15	Ice Wind Load 0 AZI	OL2					5			
16	Ice Wind Load 30 AZI	None					10			
17	Ice Wind Load 45 AZI	None					10			
18	Ice Wind Load 60 AZI	None					10			
19	Ice Wind Load 90 AZI	OL3					5			
20	Ice Wind Load 120 AZI	None					10			
21	Ice Wind Load 135 AZI	None					10			
22	Ice Wind Load 150 AZI	None					10			
23	Seismic Load X	ELX	-.112				5			
24	Seismic Load Y	ELY		-.112			5			
25	Live Load 1 (Lv)	LL					1			
26	Live Load 2 (Lv)	LL					1			
27	Maintenance Load 1 (Lm)	None					1			
28	Maintenance Load 2 (Lm)	None					1			
29	Maintenance Load 3 (Lm)	None					1			

Load Combinations

	Description	Solve	PD...	S...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Factor	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.4DL	Yes	Y		DL	1.4																		
2	1.2DL + 1WL 0 AZI	Yes	Y		DL	1.2	2	1	3		4	1												
3	1.2DL + 1WL 30 AZI	Yes	Y		DL	1.2	2	.866	3	.5	5	1												
4	1.2DL + 1WL 45 AZI	Yes	Y		DL	1.2	2	.707	3	.707	6	1												

Load Combinations (Continued)

	Description	Solve	PD...	S...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Factor	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
5	1.2DL + 1WL 60 AZI	Yes	Y		DL	1.2	2	.5	3	.866	7	1												
6	1.2DL + 1WL 90 AZI	Yes	Y		DL	1.2	2		3	1	8	1												
7	1.2DL + 1WL 120 AZI	Yes	Y		DL	1.2	2	-.5	3	.866	9	1												
8	1.2DL + 1WL 135 AZI	Yes	Y		DL	1.2	2	-.7...	3	.707	10	1												
9	1.2DL + 1WL 150 AZI	Yes	Y		DL	1.2	2	-.8...	3	.5	11	1												
10	1.2DL + 1WL 180 AZI	Yes	Y		DL	1.2	2	-1	3		4	-1												
11	1.2DL + 1WL 210 AZI	Yes	Y		DL	1.2	2	-.8...	3	-.5	5	-1												
12	1.2DL + 1WL 225 AZI	Yes	Y		DL	1.2	2	-.7...	3	-.7...	6	-1												
13	1.2DL + 1WL 240 AZI	Yes	Y		DL	1.2	2	-.5	3	-.8...	7	-1												
14	1.2DL + 1WL 270 AZI	Yes	Y		DL	1.2	2		3	-1	8	-1												
15	1.2DL + 1WL 300 AZI	Yes	Y		DL	1.2	2	.5	3	-.8...	9	-1												
16	1.2DL + 1WL 315 AZI	Yes	Y		DL	1.2	2	.707	3	-.7...	10	-1												
17	1.2DL + 1WL 330 AZI	Yes	Y		DL	1.2	2	.866	3	-.5	11	-1												
18	0.9DL + 1WL 0 AZI	Yes	Y		DL	.9	2	1	3		4	1												
19	0.9DL + 1WL 30 AZI	Yes	Y		DL	.9	2	.866	3	.5	5	1												
20	0.9DL + 1WL 45 AZI	Yes	Y		DL	.9	2	.707	3	.707	6	1												
21	0.9DL + 1WL 60 AZI	Yes	Y		DL	.9	2	.5	3	.866	7	1												
22	0.9DL + 1WL 90 AZI	Yes	Y		DL	.9	2		3	1	8	1												
23	0.9DL + 1WL 120 AZI	Yes	Y		DL	.9	2	-.5	3	.866	9	1												
24	0.9DL + 1WL 135 AZI	Yes	Y		DL	.9	2	-.7...	3	.707	10	1												
25	0.9DL + 1WL 150 AZI	Yes	Y		DL	.9	2	-.8...	3	.5	11	1												
26	0.9DL + 1WL 180 AZI	Yes	Y		DL	.9	2	-1	3		4	-1												
27	0.9DL + 1WL 210 AZI	Yes	Y		DL	.9	2	-.8...	3	-.5	5	-1												
28	0.9DL + 1WL 225 AZI	Yes	Y		DL	.9	2	-.7...	3	-.7...	6	-1												
29	0.9DL + 1WL 240 AZI	Yes	Y		DL	.9	2	-.5	3	-.8...	7	-1												
30	0.9DL + 1WL 270 AZI	Yes	Y		DL	.9	2		3	-1	8	-1												
31	0.9DL + 1WL 300 AZI	Yes	Y		DL	.9	2	.5	3	-.8...	9	-1												
32	0.9DL + 1WL 315 AZI	Yes	Y		DL	.9	2	.707	3	-.7...	10	-1												
33	0.9DL + 1WL 330 AZI	Yes	Y		DL	.9	2	.866	3	-.5	11	-1												
34	1.2DL + 1DLi + 1WLi 0...	Yes	Y		DL	1.2	O...	1	13	1	14		15	1										
35	1.2DL + 1DLi + 1WLi 3...	Yes	Y		DL	1.2	O...	1	13	.866	14	.5	16	1										
36	1.2DL + 1DLi + 1WLi 4...	Yes	Y		DL	1.2	O...	1	13	.707	14	.707	17	1										
37	1.2DL + 1DLi + 1WLi 6...	Yes	Y		DL	1.2	O...	1	13	.5	14	.866	18	1										
38	1.2DL + 1DLi + 1WLi 9...	Yes	Y		DL	1.2	O...	1	13		14	1	19	1										
39	1.2DL + 1DLi + 1WLi 1...	Yes	Y		DL	1.2	O...	1	13	-.5	14	.866	20	1										
40	1.2DL + 1DLi + 1WLi 1...	Yes	Y		DL	1.2	O...	1	13	-.7...	14	.707	21	1										
41	1.2DL + 1DLi + 1WLi 1...	Yes	Y		DL	1.2	O...	1	13	-.8...	14	.5	22	1										
42	1.2DL + 1DLi + 1WLi 1...	Yes	Y		DL	1.2	O...	1	13	-1	14		15	-1										
43	1.2DL + 1DLi + 1WLi 2...	Yes	Y		DL	1.2	O...	1	13	-.8...	14	-.5	16	-1										
44	1.2DL + 1DLi + 1WLi 2...	Yes	Y		DL	1.2	O...	1	13	-.7...	14	-.7...	17	-1										
45	1.2DL + 1DLi + 1WLi 2...	Yes	Y		DL	1.2	O...	1	13	-.5	14	-.8...	18	-1										
46	1.2DL + 1DLi + 1WLi 2...	Yes	Y		DL	1.2	O...	1	13		14	-1	19	-1										
47	1.2DL + 1DLi + 1WLi 3...	Yes	Y		DL	1.2	O...	1	13	.5	14	-.8...	20	-1										
48	1.2DL + 1DLi + 1WLi 3...	Yes	Y		DL	1.2	O...	1	13	.707	14	-.7...	21	-1										
49	1.2DL + 1DLi + 1WLi 3...	Yes	Y		DL	1.2	O...	1	13	.866	14	-.5	22	-1										
50	(1.2+0.2Sds) + 1.0E 0 ...	Yes	Y		DL	1.2...	E...	1	E...															
51	(1.2+0.2Sds) + 1.0E 3...	Yes	Y		DL	1.2...	E...	.866	E...	.5														
52	(1.2+0.2Sds) + 1.0E 4...	Yes	Y		DL	1.2...	E...	.707	E...	.707														
53	(1.2+0.2Sds) + 1.0E 6...	Yes	Y		DL	1.2...	E...	.5	E...	.866														
54	(1.2+0.2Sds) + 1.0E 9...	Yes	Y		DL	1.2...	E...		E...	1														
55	(1.2+0.2Sds) + 1.0E 1...	Yes	Y		DL	1.2...	E...	-.5	E...	.866														
56	(1.2+0.2Sds) + 1.0E 1...	Yes	Y		DL	1.2...	E...	-.7...	E...	.707														

Load Combinations (Continued)

	Description	Solve	PD…	S…	BLC	Fa…	B…	Fa…	B…	Fa…	B…	Fa…	B…	Factor	B…	Fa…	B…	Fa…	B…	Fa…	B…	Fa…	B…	Fa…
57	(1.2+0.2Sds) + 1.0E 1…	Yes	Y		DL	1.2…	E…	-.8…	E…	.5													
58	(1.2+0.2Sds) + 1.0E 1…	Yes	Y		DL	1.2…	E…	-1	E…														
59	(1.2+0.2Sds) + 1.0E 2…	Yes	Y		DL	1.2…	E…	-.8…	E…	-.5													
60	(1.2+0.2Sds) + 1.0E 2…	Yes	Y		DL	1.2…	E…	-.7…	E…	-.7…													
61	(1.2+0.2Sds) + 1.0E 2…	Yes	Y		DL	1.2…	E…	-.5	E…	-.8…													
62	(1.2+0.2Sds) + 1.0E 2…	Yes	Y		DL	1.2…	E…		E…	-1													
63	(1.2+0.2Sds) + 1.0E 3…	Yes	Y		DL	1.2…	E…	.5	E…	-.8…													
64	(1.2+0.2Sds) + 1.0E 3…	Yes	Y		DL	1.2…	E…	.707	E…	-.7…													
65	(1.2+0.2Sds) + 1.0E 3…	Yes	Y		DL	1.2…	E…	.866	E…	-.5													
66	(0.9-0.2Sds) + 1.0E 0 …	Yes	Y		DL	.863	E…	1	E…														
67	(0.9-0.2Sds) + 1.0E 30…	Yes	Y		DL	.863	E…	.866	E…	.5													
68	(0.9-0.2Sds) + 1.0E 45…	Yes	Y		DL	.863	E…	.707	E…	.707													
69	(0.9-0.2Sds) + 1.0E 60…	Yes	Y		DL	.863	E…	.5	E…	.866													
70	(0.9-0.2Sds) + 1.0E 90…	Yes	Y		DL	.863	E…		E…	1													
71	(0.9-0.2Sds) + 1.0E 12…	Yes	Y		DL	.863	E…	-.5	E…	.866													
72	(0.9-0.2Sds) + 1.0E 13…	Yes	Y		DL	.863	E…	-.7…	E…	.707													
73	(0.9-0.2Sds) + 1.0E 15…	Yes	Y		DL	.863	E…	-.8…	E…	.5													
74	(0.9-0.2Sds) + 1.0E 18…	Yes	Y		DL	.863	E…	-1	E…														
75	(0.9-0.2Sds) + 1.0E 21…	Yes	Y		DL	.863	E…	-.8…	E…	-.5													
76	(0.9-0.2Sds) + 1.0E 22…	Yes	Y		DL	.863	E…	-.7…	E…	-.7…													
77	(0.9-0.2Sds) + 1.0E 24…	Yes	Y		DL	.863	E…	-.5	E…	-.8…													
78	(0.9-0.2Sds) + 1.0E 27…	Yes	Y		DL	.863	E…		E…	-1													
79	(0.9-0.2Sds) + 1.0E 30…	Yes	Y		DL	.863	E…	.5	E…	-.8…													
80	(0.9-0.2Sds) + 1.0E 31…	Yes	Y		DL	.863	E…	.707	E…	-.7…													
81	(0.9-0.2Sds) + 1.0E 33…	Yes	Y		DL	.863	E…	.866	E…	-.5													
82	1.2D + 1.5 Lv1	Yes	Y		DL	1.2	25	1.5															
83	1.2D + 1.5 Lv2	Yes	Y		DL	1.2	26	1.5															
84	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	4	.053	2	.053	3										
85	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	5	.053	2	.046	3	.027									
86	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	6	.053	2	.038	3	.038									
87	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	7	.053	2	.027	3	.046									
88	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	8	.053	2		3	.053									
89	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	9	.053	2	-.0…	3	.046									
90	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	10	.053	2	-.0…	3	.038									
91	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	11	.053	2	-.0…	3	.027									
92	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	4	.053	2	-.0…	3										
93	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	5	.053	2	-.0…	3	-.027									
94	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	6	.053	2	-.0…	3	-.038									
95	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	7	.053	2	-.0…	3	-.046									
96	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	8	.053	2		3	-.053									
97	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	9	.053	2	.027	3	-.046									
98	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	10	.053	2	.038	3	-.038									
99	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	27	1.5	11	.053	2	.046	3	-.027									
100	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	4	.053	2	.053	3										
101	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	5	.053	2	.046	3	.027									
102	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	6	.053	2	.038	3	.038									
103	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	7	.053	2	.027	3	.046									
104	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	8	.053	2		3	.053									
105	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	9	.053	2	-.0…	3	.046									
106	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	10	.053	2	-.0…	3	.038									
107	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	11	.053	2	-.0…	3	.027									
108	1.2D + 1.5Lm + 1.0W…	Yes	Y		DL	1.2	28	1.5	4	.053	2	-.0…	3										

Load Combinations (Continued)

	Description	Solve	PD...	S...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Factor	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
109	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	5	.053	2	-.0...	3	-.027										
110	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	6	.053	2	-.0...	3	-.038										
111	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	7	.053	2	-.0...	3	-.046										
112	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	8	.053	2		3	-.053										
113	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	9	.053	2	.027	3	-.046										
114	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	10	.053	2	.038	3	-.038										
115	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	28	1.5	11	.053	2	.046	3	-.027										
116	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	4	.053	2	.053	3											
117	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	5	.053	2	.046	3	.027										
118	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	6	.053	2	.038	3	.038										
119	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	7	.053	2	.027	3	.046										
120	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	8	.053	2		3	.053										
121	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	9	.053	2	-.0...	3	.046										
122	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	10	.053	2	-.0...	3	.038										
123	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	11	.053	2	-.0...	3	.027										
124	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	4	.053	2	-.0...	3											
125	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	5	.053	2	-.0...	3	-.027										
126	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	6	.053	2	-.0...	3	-.038										
127	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	7	.053	2	-.0...	3	-.046										
128	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	8	.053	2		3	-.053										
129	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	9	.053	2	.027	3	-.046										
130	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	10	.053	2	.038	3	-.038										
131	1.2D + 1.5Lm + 1.0W...	Yes	Y		DL	1.2	29	1.5	11	.053	2	.046	3	-.027										

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N5	max	457.3094	18	640.4222	119	897.4488	35	266.9155	84	-160.7694	27	0	131
2		min	-1593.2697	42	-1331.9982	96	197.8232	28	-132.3727	131	-753.7792	35	0	1
3	N17	max	1571.7165	49	1344.2697	88	783.5891	43	228.1877	92	-160.4935	20	0	131
4		min	-336.7189	25	-627.7878	128	197.2651	20	-104.7694	130	-658.1916	44	0	1
5	N86A	max	678.2592	9	110.5986	8	66.1849	38	0	131	0	131	0	131
6		min	-684.0854	33	-112.6476	32	15.4095	79	0	1	0	1	0	1
7	Totals:	max	1039.8677	18	654.8718	6	1743.403	41						
8		min	-1039.8702	10	-654.8715	30	412.9788	79						

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc...	L...	She...	Loc...	...	LC	phi*Pnc [lb]	phi*Pnt [lb]	phi*Mn y...	phi*Mn ...	Cb	Eqn
1	MP9	4.25x0.5	.505	.20...	91	.113	2.5...	y	107	66620.1047	68850	717.1875	6096.0...	2.1...	H1-1b
2	MP8	4.25x0.5	.499	.20...	84	.108	2.5...	y	101	66620.1047	68850	717.1875	6071.3...	1	H1-1b
3	SA4	PIPE_1.5	.488	27....	91	.116	27....		99	20972.6144	23593.5	1105.125	1105.125	2.0...	H1-1b
4	MP7	3.5x0.5	.454	0	91	.134	4.8...	y	101	54863.5923	56700	590.625	4134.375	1	H1-1b
5	SA3	PIPE_1.5	.440	27....	84	.119	27....		92	20972.6144	23593.5	1105.125	1105.125	2.0...	H1-1b
6	B3	SR 1/2"	.425	0	90	.009	0		100	1056.7592	6361.74	53.015	53.015	1	H1-1...
7	BH	PIPE_2.0	.421	76	84	.083	76		91	24976.1263	32130	1871.625	1871.625	1	H1-1b
8	TH	PIPE_2.0	.416	76	91	.105	76		2	24976.1263	32130	1871.625	1871.625	1	H1-1b
9	MP29	3.5x0.5	.401	0	85	.139	4.8...	y	107	54863.5923	56700	590.625	4134.375	1.0...	H1-1b
10	MP18	4.25x0.5	.366	.20...	1...	.113	.20...	y	108	66620.1047	68850	717.1875	6071.3...	1	H1-1b
11	MP17	4.25x0.5	.362	.20...	1...	.112	.20...	y	100	66620.1047	68850	717.1875	6096.0...	2.0...	H1-1b
12	SA2	PIPE_1.5	.352	27....	1...	.092	27....		130	20972.6144	23593.5	1105.125	1105.125	2.0...	H1-1b

Envelope AISC 15th(360-16): LRFD Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc...	L...	She...	Loc...	...	LC	phi*Pnc [lb]	phi*Pnt [lb]	phi*Mn y...	phi*Mn ...	Cb	Eqn
13	SA1	PIPE_1.5	.318	2.1...	1...	.094	2.1...		123	20972.6144	23593.5	1105.125	1105.125	2.0..	H1-1b
14	B1	SR 1/2"	.304	0	1...	.011	0		84	1056.7592	6361.74	53.015	53.015	1	H1-1...
15	MP30	3.5x0.5	.295	0	1...	.138	0	y	100	54863.5923	56700	590.625	4134.375	1.0..	H1-1b
16	MP31	3.5x0.5	.256	0	1...	.139	0	y	108	54863.5923	56700	590.625	4134.375	1	H1-1b
17	V4	SR 5/8	.250	11....	84	.026	0		99	4134.294	9946.8	96.768	96.768	1	H1-1a
18	V3	SR 5/8	.235	18....	91	.063	0		84	4134.294	9946.8	96.768	96.768	1	H1-1a
19	MP1	PIPE_2.0	.203	33	2	.054	33		10	13787.8471	32130	1871.625	1871.625	1.4..	H1-1b
20	MP41	PIPE_2.0	.193	48	17	.046	33		17	13787.8471	32130	1871.625	1871.625	1.6..	H1-1b
21	V1	SR 5/8	.178	0	1...	.027	0		99	4134.294	9946.8	96.768	96.768	1	H1-1...
22	V2	SR 5/8	.168	30	1...	.063	0		84	4134.294	9946.8	96.768	96.768	1	H1-1...
23	MP25	PIPE_2.0	.098	61....	41	.007	0		46	9290.69	32130	1871.625	1871.625	1.1..	H1-1b
24	MP38	PIPE_2.0	.046	33	11	.068	63		84	13787.8471	32130	1871.625	1871.625	1.4..	H1-1b
25	B2	SR 1/2"	.016	0	91	.012	39....		92	1056.7592	6361.74	53.015	53.015	1	H1-1...
26	B4	SR 1/2"	.000	0	1...	.007	0		129	1056.7592	6361.74	53.015	53.015	1	H1-1a

Envelope AISI S100-16: LRFD Cold Formed Steel Code Checks

	Member	Shape	Code...	Loc[in]	LC	Shear...	Loc[in]	Dir	LC	phi*Pn[lb]	phi*Tn[lb]	phi*Mn...	phi*Mn...	phi*V...	phi*V...	Cb	Eqn
No Data to Print ...																	

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

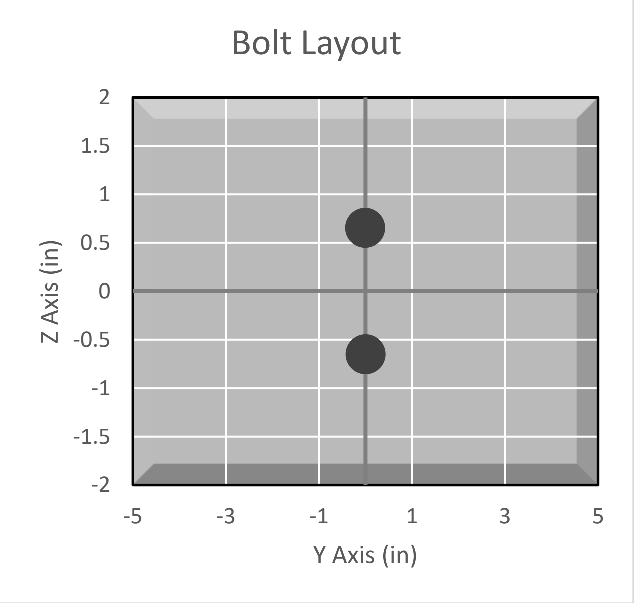
Connection Description
Stand-off arm to Tower connection kit

Code	
Design Standard:	TIA-222-H
Slip Check:	No
Pretension Standard:	AISC

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 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

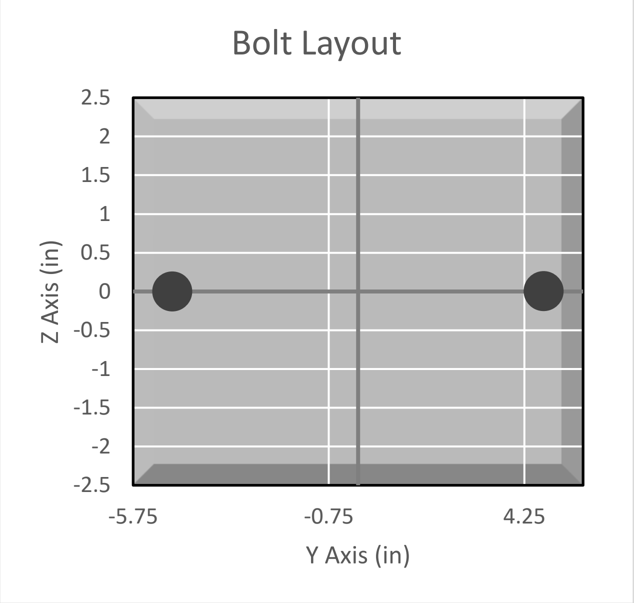


BOLT TOOL 1.5.2

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*

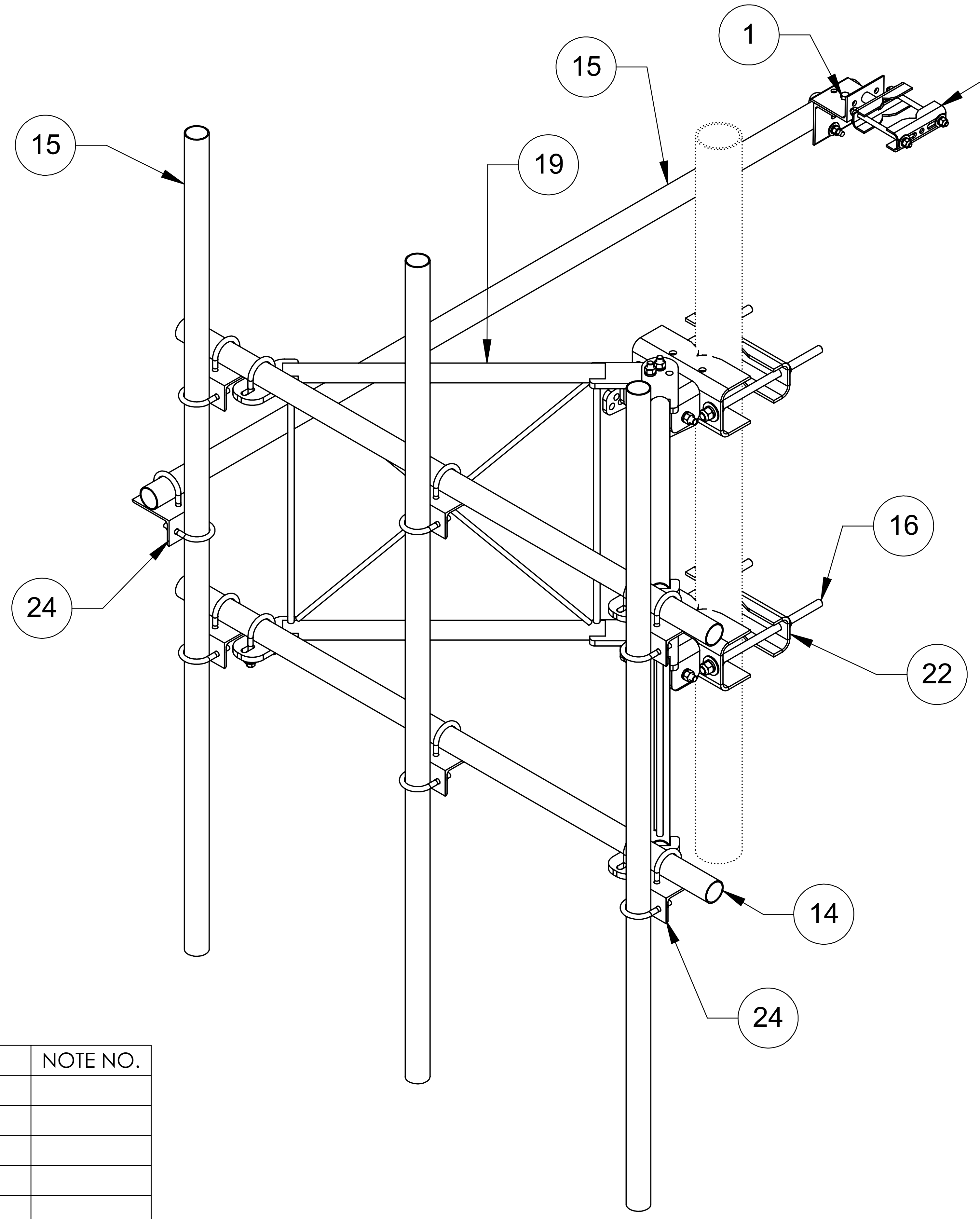
APPENDIX E
SUPPLEMENTAL DRAWINGS

NOTES:
1.0 ALL METRIC DIMENSIONS ARE IN BRACKETS.

REVISIONS				
REV.	ECN	DESCRIPTION	BY	DATE
PRE		REVIEW	DRH	01/28/21

www.Talleycom.com | Sales@Talleycom.com | 800.949.7079

TALLEY®



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	∅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	

COMMSCOPE, INC. OF NORTH CAROLINA

TOLERANCES
0 PLACE X ± .25
1 PLACE .X ± .12
2 PLACE .XX ± .06
ANGLES ± 2°

SAP MATERIAL MASTER
MTC3975083

FINISH
GALV A123

MATERIAL
A1011/A1018, A500, A529

DENSITY	0.28	lbs/in³
MASS	400.61	lbs
VOLUME	1421.66	in³
SURFACE AREA		in²
HEIGHT		
LENGTH		
WIDTH		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS INTERPRET PER ISO STANDARDS HANDBOOK,TECHNICAL DRAWINGS, VOLUMES 1 & 2, THIRD EDITION (2002)

	NAME	DATE
CE	RDLS	7/14/17
RW		
RV		
AD		
RE	TP	7/14/17
ECN		

TITLE
SECTOR FRAME, 8' FACE, (3) 96" PIPES

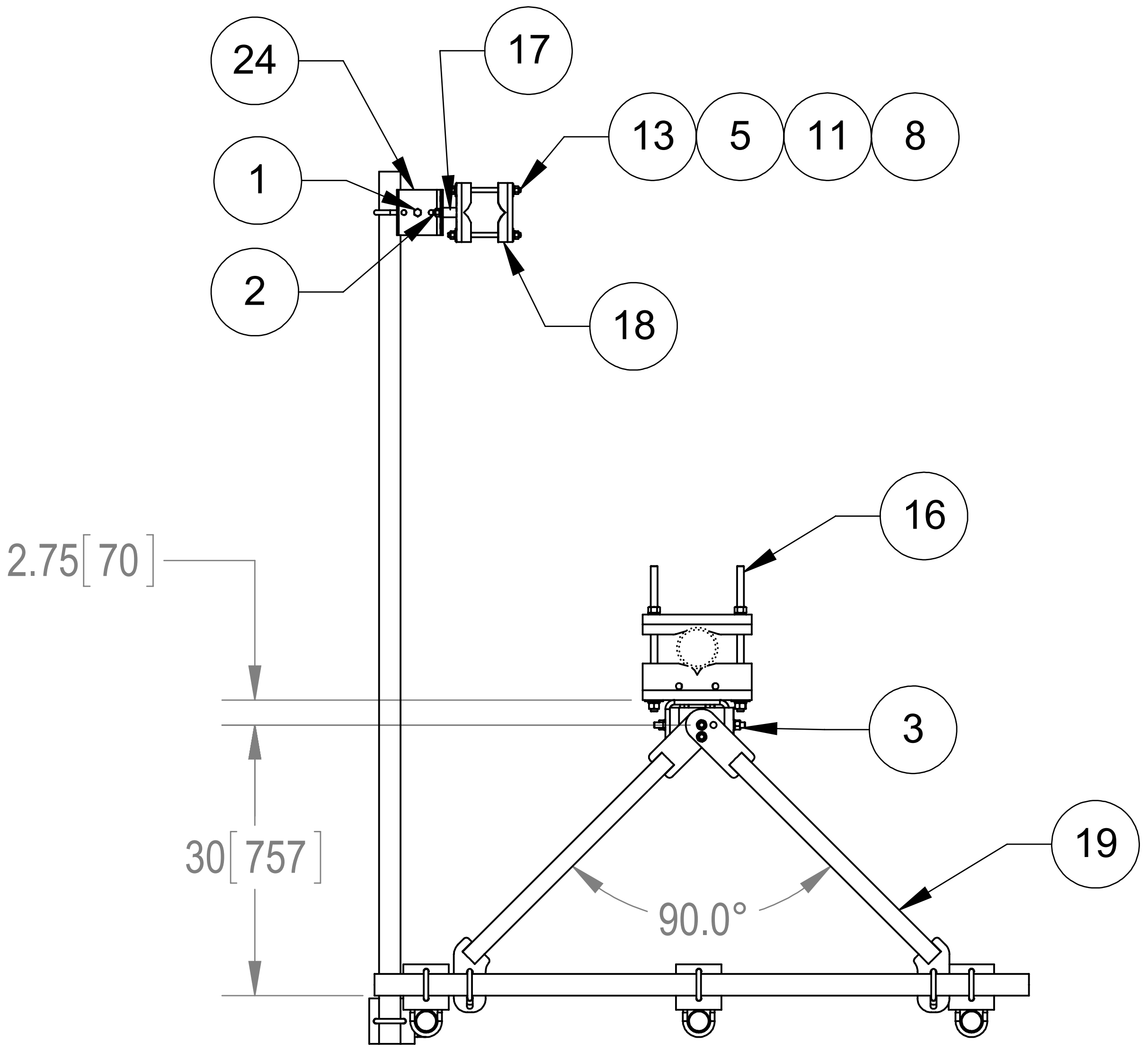
SCALE
1:12

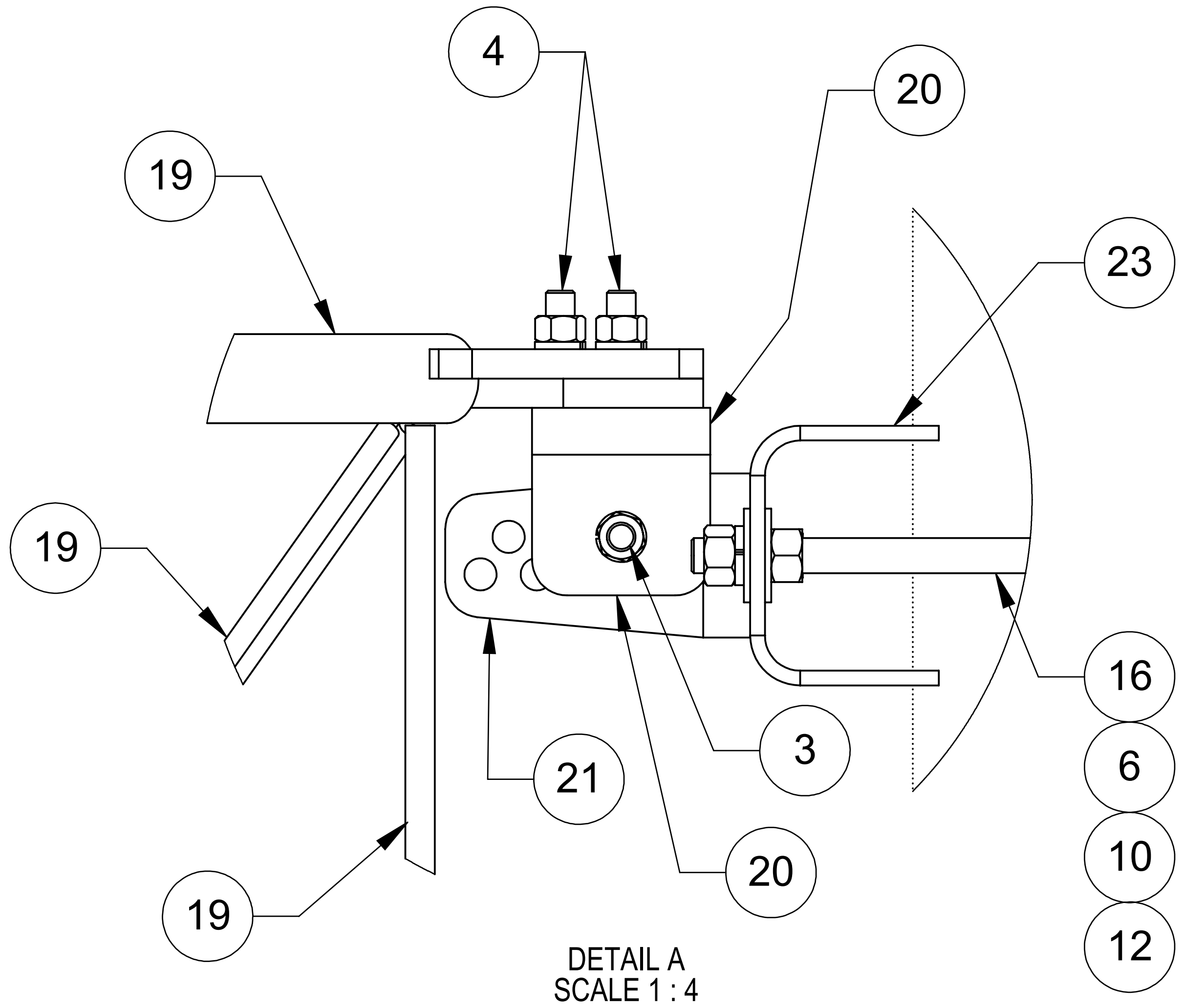
DOCUMENT NO.
MTC3975083

SIZE	WORK AREA	MODEL VERSION	MODEL STATUS	MODEL REVISION	DRAWING VERSION	DRAWING STATUS	DRAWING REVISION	SHEET
C	⊕						PRE	1 OF 2

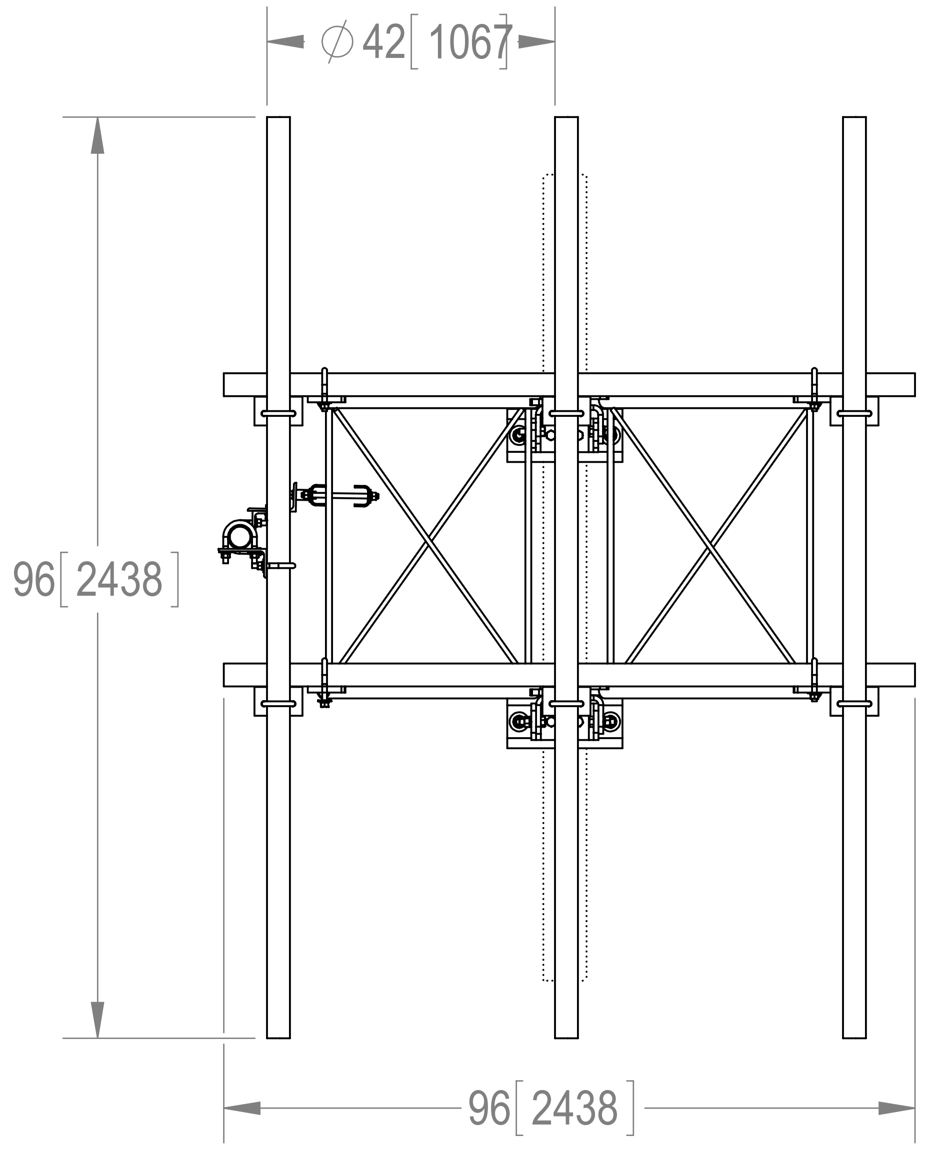
NOTES:

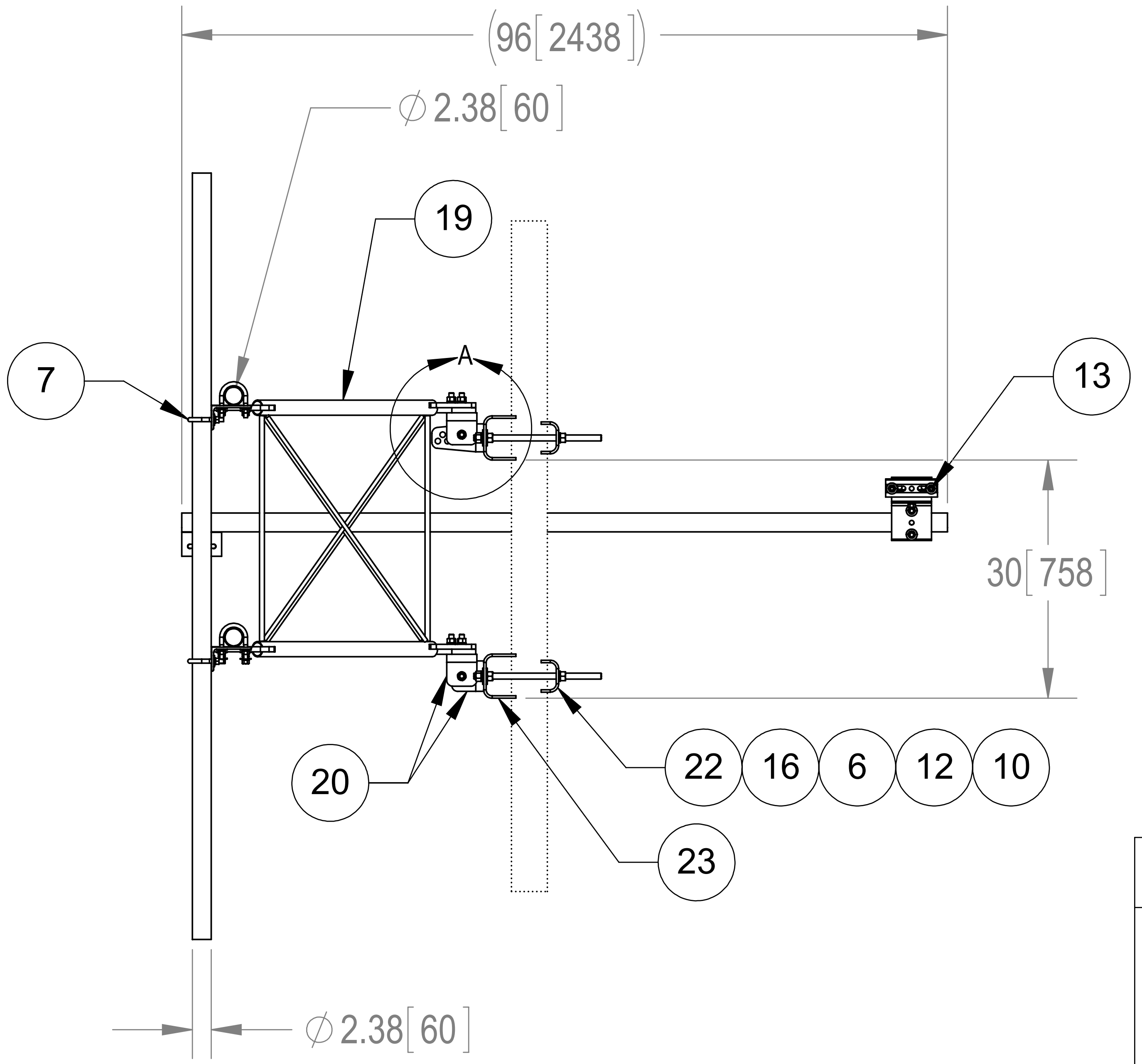
1.0 ALL METRIC DIMENSIONS ARE IN BRACKETS.





DETAIL A
SCALE 1 : 4





COMMSCOPE, INC. OF NORTH CAROLINA

TITLE

SECTOR FRAME, 8' FACE, (3) 96" PIPES

SIZE	SCALE	DOCUMENT NO.
C	1:20	**MTC3975083**

DRAWING

VERSION	STATUS	REVISION	SHEET
		PRE	2 OF 2

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

8618 Westwood Center Drive
Suite 315
Vienna, VA 22182
Voice: 703-276-1100
Fax: 703-276-1169

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	µW/cm^2
Maximum power density at ground level:	1.20118	µW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.12012	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (µW/cm^2)**	**Percent of MPE**	**Max Power Density (µW/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	μW/cm^2
Maximum power density at ground level:	1.78697	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.17870	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	0.86925	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.17089	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.21547	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.24738	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.34628	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.23758	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	2.68959	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.26896	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	2.68959	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.26896	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.83981	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.45995	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.66684	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.16668	%

					On Axis		**Area**	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.66684	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.16668	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.06632	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.18470	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm²
Maximum power density at ground level:	1.06632	μW/cm²
Highest percentage of Maximum Permissible Exposure:	0.18555	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density ($\mu W/cm^2$)**	**Percent of MPE**	**Max Power Density ($\mu W/cm^2$)**	**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	μW/cm^2
Maximum power density at ground level:	2.93944	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.29394	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.17692	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.11769	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.00653	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.10065	%

					On Axis		Area	
Antenna Make	Model	Height (feet)	Orientation (degrees true)	ERP (Watts)	Max Power Density (μW/cm^2)	Percent of MPE	Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	0.99491	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.21320	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	0.62981	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.15745	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	13.23477	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	1.32348	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	2.49895	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.24989	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	2.60820	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.26082	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	0.89650	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.17906	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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	μW/cm^2
Maximum power density at ground level:	1.63813	μW/cm^2
Highest percentage of Maximum Permissible Exposure:	0.28908	%

					On Axis		Area	
Antenna Make	**Model**	**Height (feet)**	**Orientation (degrees true)**	**ERP (Watts)**	**Max Power Density (μW/cm^2)**	**Percent of MPE**	**Max Power Density (μW/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

CROWN CASTLE

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 WIRLESS, 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
$7.95
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Flat Rate Env

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Click-N-Ship®

09/15/2021 Mailed from 01566

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Expected Delivery Date: 09/18/21
Ref#: 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

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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.**
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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
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Ref#: DS-806478

To:
RICH ZAJAC
CROWN CASTLE
4545 E RIVER RD
STE 320
W HENRIETTA NY 14586-9024

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usps.com 9405 5036 9930 0005 0393 70 0155 0000 0010 6438
$15.50
US POSTAGE
MD Flat Rate Box

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09/15/2021 Mailed from 01566

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Expected Delivery Date: 09/18/21
Ref#: DS-806478
0004

R002

SHIP TO: ROBERT MCGARRY
FIRST SELECTMAN
30 FIELD PARK DR
HADDAM CT 06438-1140

USPS TRACKING #

9405 5036 9930 0005 0393 70

Electronic Rate Approved #038555749

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Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0005 0393 70

Trans. #: 543688001
Print Date: 09/15/2021
Ship Date: 09/15/2021
Expected Delivery Date: 09/18/2021

Priority Mail® Postage: **$15.50**
Total: **$15.50**

From: DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Ref#: DS-806478

To: ROBERT MCGARRY
FIRST SELECTMAN
30 FIELD PARK DR
HADDAM CT 06438-1140

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Click-N-Ship®

09/15/2021
Mailed from 01566

PRIORITY MAIL 2-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Expected Delivery Date: 09/18/21
Ref#: 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

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Click-N-Ship® Label Record

USPS TRACKING # :
9405 5036 9930 0005 0393 87

Trans. #: 543688001
Print Date: 09/15/2021
Ship Date: 09/15/2021
Expected Delivery Date: 09/18/2021

Priority Mail® Postage: **$15.50**
Total: **$15.50**

From: DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Ref#: DS-806478

To: GARY VIVIAN
BUILDING OFFICIAL
30 FIELD PARK DR
HADDAM CT 06438-1140

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UNITED STATES POSTAL SERVICE®

Click-N-Ship®

9405 5036 9930 0005 0393 94 0155 0000 0041 5317

P

usps.com
$15.50
US POSTAGE
MD Flat Rate Box

U.S. POSTAGE PAID
Click-N-Ship®

09/15/2021 Mailed from 01566

PRIORITY MAIL 3-DAY™

DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Expected Delivery Date: 09/20/21
Ref#: 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.

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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
Print Date:	09/15/2021
Ship Date:	09/15/2021
Expected Delivery Date:	09/20/2021

Priority Mail® Postage:	**$15.50**
Total:	**$15.50**

From: DEBORAH CHASE
NORTHEAST SITE SOLUTIONS
420 MAIN ST
STE 1
STURBRIDGE MA 01566-1359

Ref#: DS-806478

To: 539 PLAINS RD LLC C/O CROWN ATLANTIC
4017 WASHINGTON RD
MCMURRAY PA 15317-2510

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Product	Qty	Unit Price	Price
Prepaid Mail Haddam, CT 06438 Weight: 2 lb 14.60 oz Acceptance Date: Fri 09/17/2021 Tracking #: 9405 5036 9930 0005 0393 70	1		$0.00
Prepaid Mail Canonsburg, PA 15317 Weight: 2 lb 14.30 oz Acceptance Date: Fri 09/17/2021 Tracking #: 9405 5036 9930 0005 0393 94	1		$0.00
Prepaid Mail Haddam, CT 06438 Weight: 2 lb 14.60 oz Acceptance Date: Fri 09/17/2021 Tracking #: 9405 5036 9930 0005 0393 87	1		$0.00
Grand Total:			$0.00

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