dish wireless™

DISH WIRELESS SITE ID:

# DNDEN00092B

DISH WIRELESS SITE ADDRESS:

# 1444 SOUTH POTOMAC STREET
# AURORA, CO 80012

**City of Aurora Building Division**
**Project:** *Rooftop Antennae*
**Address:** *1444 South Potomac Way*
**Occupancy Group:** *U*
**Construction Type:** *VB*
**RSN:** *1541355*
**Permit:** *21-1975775-LT*

**City of Aurora Building Division**
**Reviewed for Code Compliance**
**Approved as Noted:** *Bobby McKinzie*
**Date:** *Jun 01, 2021*
**2015 INTERNATIONAL CODES & 2020 NEC**

Code violations that are found during inspection are required to be corrected. Permit issuance does not grant approval of a code violation. 2015 IBC 105.4.

## 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:

SECTOR SCOPE OF WORK:
- INSTALL (3) PROPOSED PANEL ANTENNAS (1 PER SECTOR)
- INSTALL (3) NON-PENTRATING ROOFTOP TRI-PODS (1 PER SECTOR)
- INSTALL PROPOSED JUMPERS
- INSTALL (6) PROPOSED RRUs (2 PER SECTOR)
- INSTALL (3) PROPOSED SURGE SUPPRESSION DEVICES (1 PER SECTOR)
- INSTALL (3) PROPOSED POWER CABLES (1 PER SECTOR)
- INSTALL (3) PROPOSED FIBER CABLES (1 PER SECTOR)
- INSTALL PROPOSED CABLE LADDER TRAY OR CABLE TRAY

ROOFTOP SCOPE OF WORK:
- INSTALL (1) PROPOSED METAL PLATFORM WITH H-FRAME
- INSTALL (1) PROPOSED CABLE LADDER TRAY OR CABLE TRAY
- INSTALL (1) PROPOSED BBU IN CABINET
- INSTALL (1) PROPOSED EQUIPMENT CABINET
- INSTALL (1) PROPOSED POWER CONDUIT
- INSTALL (1) PROPOSED TELCO CONDUIT
- INSTALL (1) PROPOSED NEMA 3 TELCO-FIBER BOX
- INSTALL (1) PROPOSED GPS UNIT

## SITE INFORMATION

| | |
|---|---|
| PROPERTY OWNER: | PODIATRY ASSOCIATES P.C. |
| ADDRESS: | 1444 SOUTH POTOMAC STREET<br>AURORA, CO 80012 |
| TOWER TYPE: | ROOFTOP |
| TOWER CO SITE ID: | X |
| TOWER APP NUMBER: | X |
| COUNTY: | ARAPAHOE |
| LATITUDE (NAD 83): | 39° 41' 25.2" N |
| LONGITUDE (NAD 83): | 104° 49' 48.7" W |
| ZONING JURISDICTION: | CITY OF AURORA |
| ZONING DISTRICT: | MU-OI |
| PARCEL NUMBER: | 1973-24-1-24-003 |
| OCCUPANCY GROUP: | U |
| CONSTRUCTION TYPE: | V-B |
| POWER COMPANY: | XCEL |
| TELEPHONE COMPANY: | AT&T |

## PROJECT DIRECTORY

| | |
|---|---|
| APPLICANT: | DISH WIRELESS<br>5701 SOUTH SANTA FE DRIVE<br>LITTLETON, CO 80120 |
| TOWER OWNER: | PODIATRY ASSOCIATES P.C.<br>1444 SOUTH POTOMAC STREET<br>AURORA, CO 80012<br>(303) 805-5156 |
| SITE DESIGNER: | TOWER ENGINEERING PROFESSIONALS<br>326 TRYON ROAD<br>RALEIGH, NC 27603<br>(919) 661-6351 |
| SITE ACQUISITION: | RICHARD GAITO<br>(303) 566-9924 |
| CONSTRUCTION MANAGER: | SCOTT TOMLINSON<br>(720) 788-6655 |
| RF ENGINEER: | ROBBIE CARISTAN<br>(720) 277-2221 |

## COLORADO 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 | 2015 IBC |
| MECHANICAL | 2015 IMC |
| ELECTRICAL | 2020 NEC |

Structural plan review is limited to a general survey for code compliance. No review is implied nor was undertaken to verify structural adequacy.

## SITE PHOTO

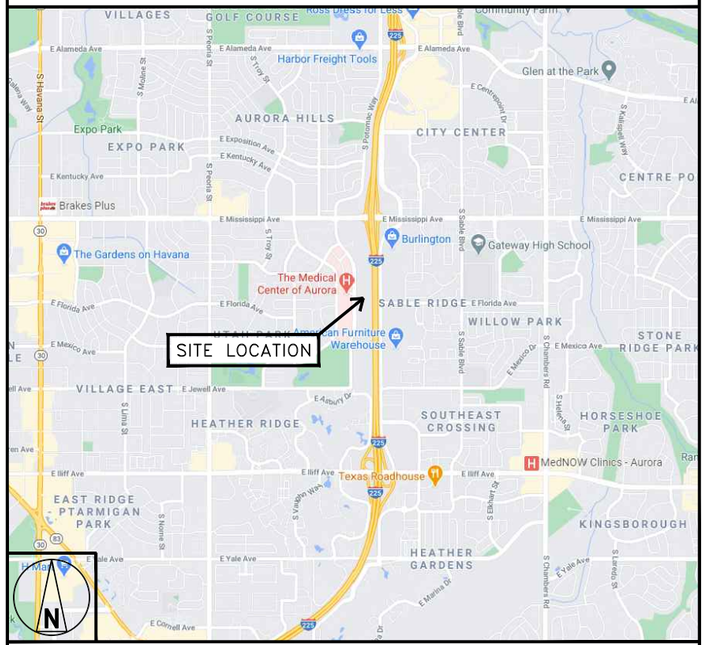


## DIRECTIONS

**DIRECTIONS FROM DISH WIRELESS OFFICE/AIRPORT/DOWNTOWN:**

FROM DISH WIRELESS OFFICE: TURN LEFT ONTO S SANTA FE DR. IN 0.9 MILES USE THE RIGHT 2 LANES TO MERGE ONTO CO-88 E/W BELLEVIEW AVE. IN 6.2 MILES USE THE LEFT 2 LANES TO TURN LEFT ONTO THE RAMP TO I-225 N. KEEP RIGHT AT THE FORK AND FOLLOW SIGNS FOR I-25 N/AIRPORT/AURORA/LIMON. KEEP LEFT TO CONTINUE ON EXIT 200 AND FOLLOW SIGNS FOR I-225. CONTINUE ONTO I-225 N FOR 5.9 MILES AND USE THE 2ND FROM THE RIGHT LANE TO TAKE EXIT 7 FOR MISSISSIPPI AVE. TURN LEFT ONTO E MISSISSIPPI AVE. USE THE LEFT 2 LANES TO TURN LEFT ONTO S POTOMAC ST. TURN LEFT IN 0.5 MILES AND THE DESTINATION WILL BE ON THE RIGHT.

## VICINITY MAP




NO SCALE

## SHEET INDEX

| SHEET NO. | SHEET TITLE |
|---|---|
| T-1 | TITLE SHEET |
| | |
| LS1 | SITE SURVEY |
| | |
| A-1 | OVERALL SITE PLAN AND EQUIPMENT PLAN |
| A-2 | ENLARGED BUILDING PLAN |
| A-3 | ANTENNA PLAN, ELEVATION AND SCHEDULE |
| A-4 | NORTH AND SOUTH ELEVATIONS |
| A-5 | EAST AND WEST ELEVATIONS |
| | |
| A-6 | EQUIPMENT PLATFORM AND H-FRAME DETAILS |
| A-7 | EQUIPMENT DETAILS |
| A-8 | EQUIPMENT DETAILS |
| | |
| E-1 | ELECTRICAL ROUTE PLAN, ELEVATION AND UTILITY ROOM |
| E-2 | ELECTRICAL DETAILS AND NOTES |
| E-3 | ELECTRICAL ONE-LINE, FAULT CALCS & PANEL SCHEDULE |
| | |
| G-1 | GROUNDING PLANS AND NOTES |
| G-2 | GROUNDING DETAILS |
| G-3 | GROUNDING DETAILS |
| | |
| RF-1 | RF CABLE COLOR CODE |
| RF-2 | RF PLUMBING DIAGRAM |
| RF-3 | RF DATA SHEET |
| | |
| GN-1 | LEGEND AND ABBREVIATIONS |
| GN-2 | GENERAL NOTES |
| GN-3 | GENERAL NOTES |
| GN-4 | GENERAL NOTES |

**UNDERGROUND SERVICE ALERT**
**UTILITY NOTIFICATION CENTER OF COLORADO**
**(800) 922-1987**
**WWW.COLORADO811.ORG**

CALL 2 WORKING DAYS UTILITY NOTIFICATION PRIOR TO CONSTRUCTION

811

## 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.

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www.tepgroup.net

COLORADO LICENSED
NICHOLAS M. COMBATALADE
45607
PROFESSIONAL ENGINEER

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| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| RS | JDS | --- |

RFDS REV #: 001

CONSTRUCTION DOCUMENTS

SUBMITTALS

| REV | DATE | DESCRIPTION |
|---|---|---|
| A | 01/15/2021 | ISSUED FOR REVIEW |
| B | 04/09/2021 | ISSUED FOR REVIEW |
| 1 | 04/29/2021 | ISSUED FOR CONSTRUCTION |

A&E PROJECT NUMBER

250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
1444 S POTOMAC STREET
AURORA, CO 80012

SHEET TITLE

TITLE SHEET

SHEET NUMBER

**T-1**

## LEGEND

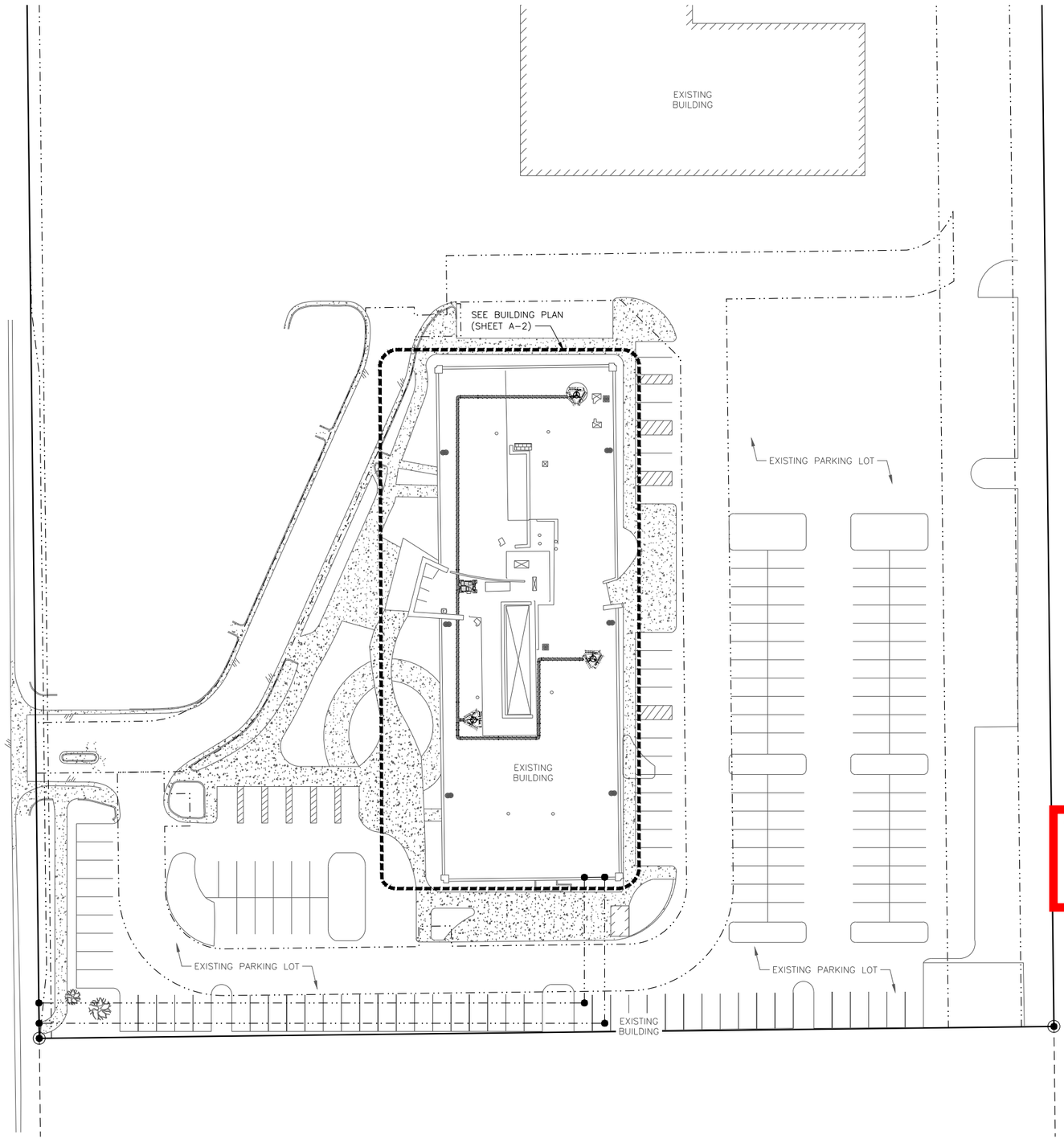
| | |
|---|---|
| ——— | EXIST. PROPERTY LINE |
| - - - - - - | ADJ. PROPERTY LINE |
| ——x——x—— | EXISTING FENCE |
| ——//—— | EDGE OF PAVEMENT |
| ——OHW—— | OVERHEAD UTILITY WIRE |
| ◉ | PROPERTY CORNER |
| ✣ | SECTION CORNER |
| | EXIST. UTILITY POLE |
| T | TELCO PEDESTAL |
| E | ELECTRICAL PEDESTAL |
| | IRRIGATION VALVE |
| XFMR | EXISTING TRANSFORMER |

## 1-A CERTIFICATION

| | |
|---|---|
| LATITUDE | N 39.690344° (NAD '83) |
| LONGITUDE | W 104.830196° (NAD'83) |
| BUILDING ELEV. (AMSL) | 5,599' (NAVD '88) |

**NOTES:**

1. BASIS OF THE BEARINGS AND COORDINATES IS THE COLORADO STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM (NAD 83/2011) BASED ON DIFFERENTIAL GPS OBSERVATIONS PERFORMED ON OCTOBER 01, 2020; TIED TO THE NATIONAL SPATIAL REFERENCE SYSTEM VIA CORS STATIONS AND OPUS; AND EXPRESSED IN US SURVEY FEET. THE BASIS OF BEARINGS IS THE NORTH LINE OF EAST BY SOUTHEAST SUBDIVISION FILING NO. 2. AS SHOWN HEREON.
2. VERTICAL INFORMATION BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD '88) AND EXPRESSED IN US SURVEY FEET.
3. DISTANCES ARE HORIZONTAL GROUND UNLESS OTHERWISE NOTED.
4. PROPERTY LOCATED IN FLOOD ZONE "X", AREA DETERMINED TO BE OUTSIDE 0.2% CHANCE OF ANNUAL FLOOD BASED UPON FEMA COMMUNITY PANEL# 08005C0179L, EFFECTIVE SEPTEMBER 04, 2020.




## 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.

THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

OVERALL SITE PLAN

30' 20' 10' 0 30' 60'
1"=30'

1

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| RS | JDS | --- |

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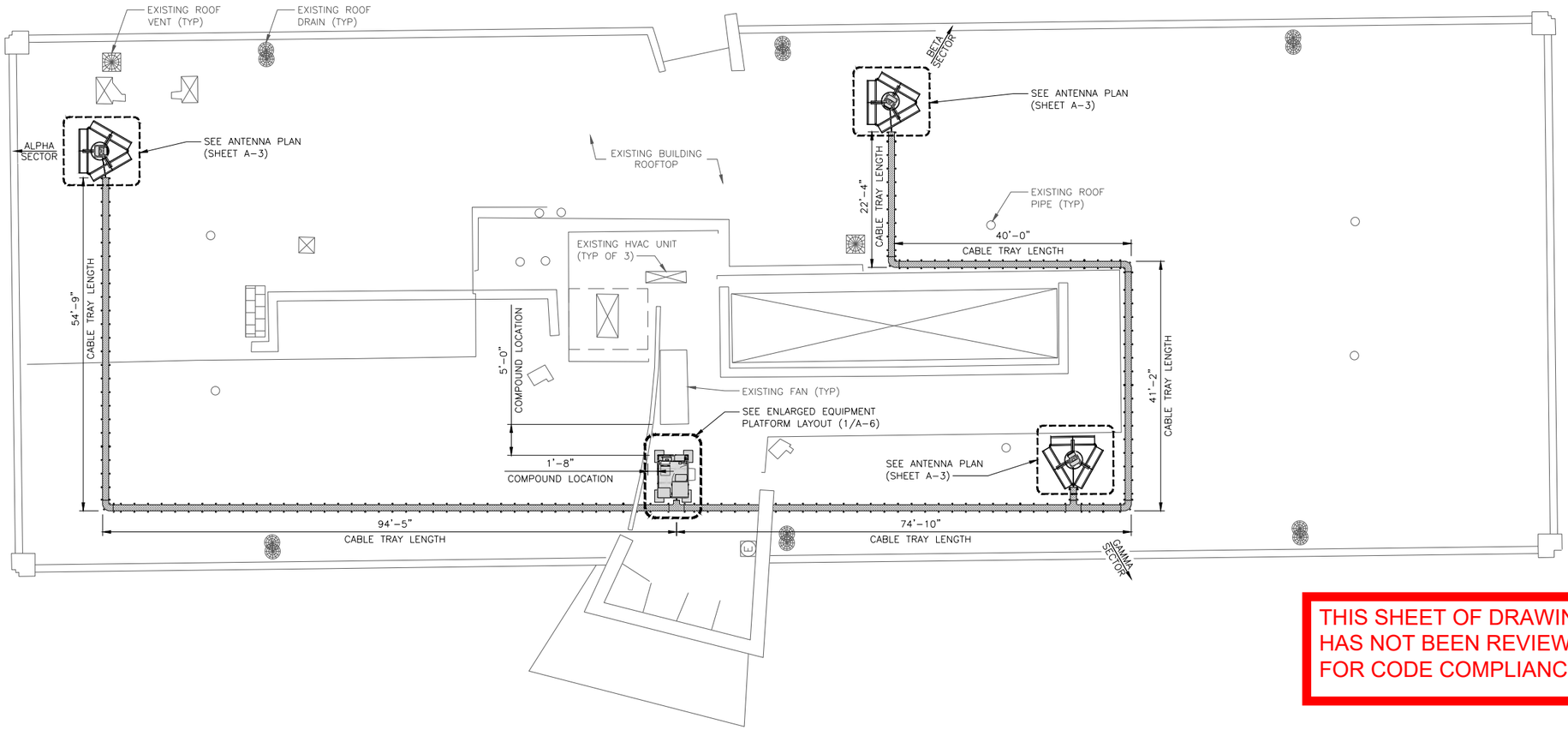
SHEET TITLE
OVERALL AND ENLARGED SITE PLAN

SHEET NUMBER
**A-1**

| HYBRID CABLE LENGTHS | | |
|---|---|---|
| ALPHA | FIBER | 154' +/- |
| | POWER | 154' +/- |
| BETA | FIBER | 181' +/- |
| | POWER | 181' +/- |
| GAMMA | FIBER | 75' +/- |
| | POWER | 75' +/- |

## NOTES

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2. CONTRACTOR SHALL MAINTAIN A 10'-0" MINIMUM SEPARATION BETWEEN THE PROPOSED GPS UNIT, TRANSMITTING ANTENNAS AND EXISTING GPS UNITS.
3. CONTRACTOR TO VERIFY WITH DISH WIRELESS C.M. THE LOCATION OF THE POWER AND FIBER SOURCE PRIOR TO CONSTRICTION.
4. UTILITY RUBBER MAT TO BE IN STALLED UNDER ALL DISH WIRELESS EQUIPMENT THAT IS RESTING ON OR AFFIXED TO ROOF MEMBRANE




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ENLARGED BUILDING PLAN

3/32"=1'-0"

1

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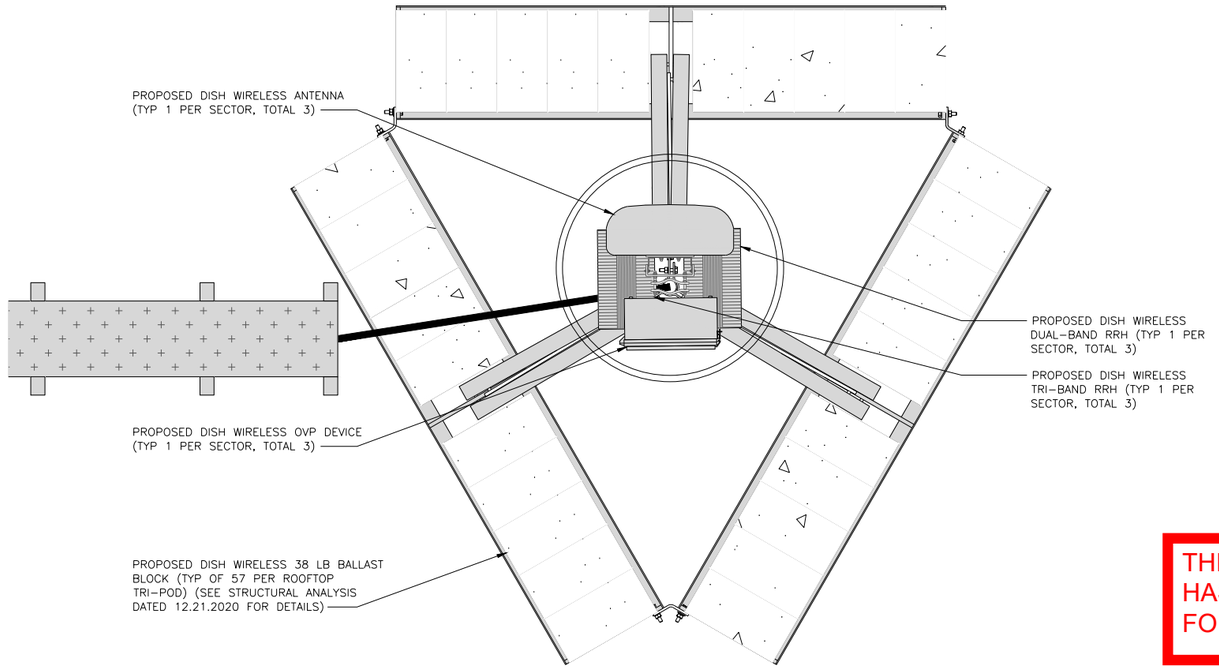
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ADDRESS:
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AURORA, CO 80012

SHEET TITLE
ENLARGED BUILDING PLAN

SHEET NUMBER
**A-2**

## 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. ALPHA SECTOR SHOWN TYPICAL FOR BETA AND GAMMA SECTORS.



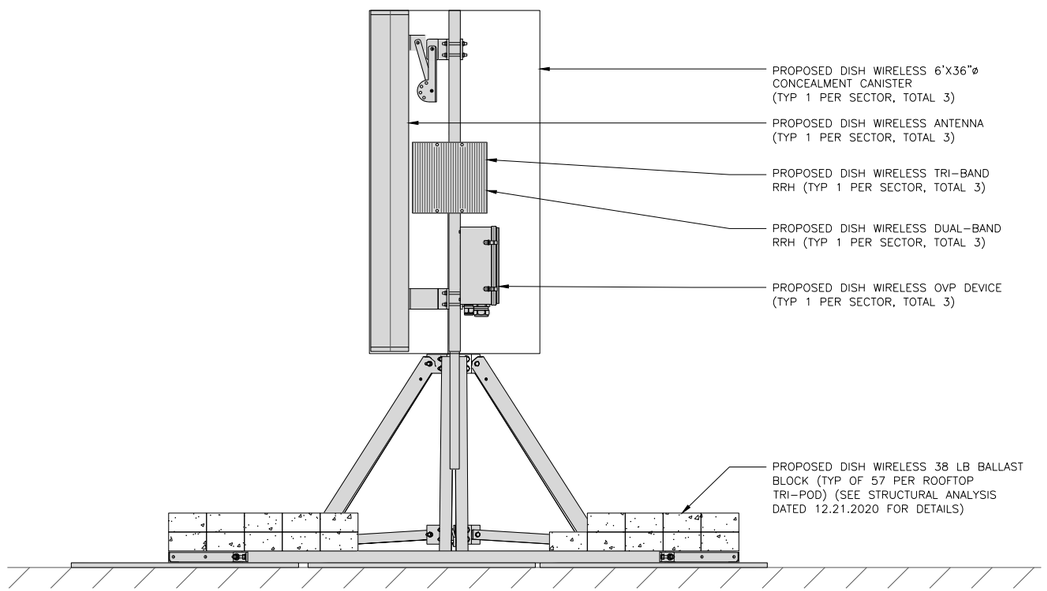

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N

ANTENNA PLAN (TYPICAL PER SECTOR)

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

1




ANTENNA ELEVATION

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 MX08FRO665-21 | 5G | 72.0" x 20.0" | 0° | 48'-0" | (1) POWER CABLE (154' LONG) (1) FIBER CABLE (154' LONG) |
| BETA | B1 | PROPOSED | JMA MX08FRO665-21 | 5G | 72.0" x 20.0" | 120° | 48'-0" | (1) POWER CABLE (181' LONG) (1) FIBER CABLE (181' LONG) |
| GAMMA | C1 | PROPOSED | JMA MX08FRO665-21 | 5G | 72.0" x 20.0" | 240° | 48'-0" | (1) POWER CABLE (75' LONG) (1) FIBER CABLE (75' LONG) |

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.

ANTENNA SCHEDULE

NO SCALE

3

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SHEET TITLE

ANTENNA PLAN, ELEVATION AND SCHEDULE

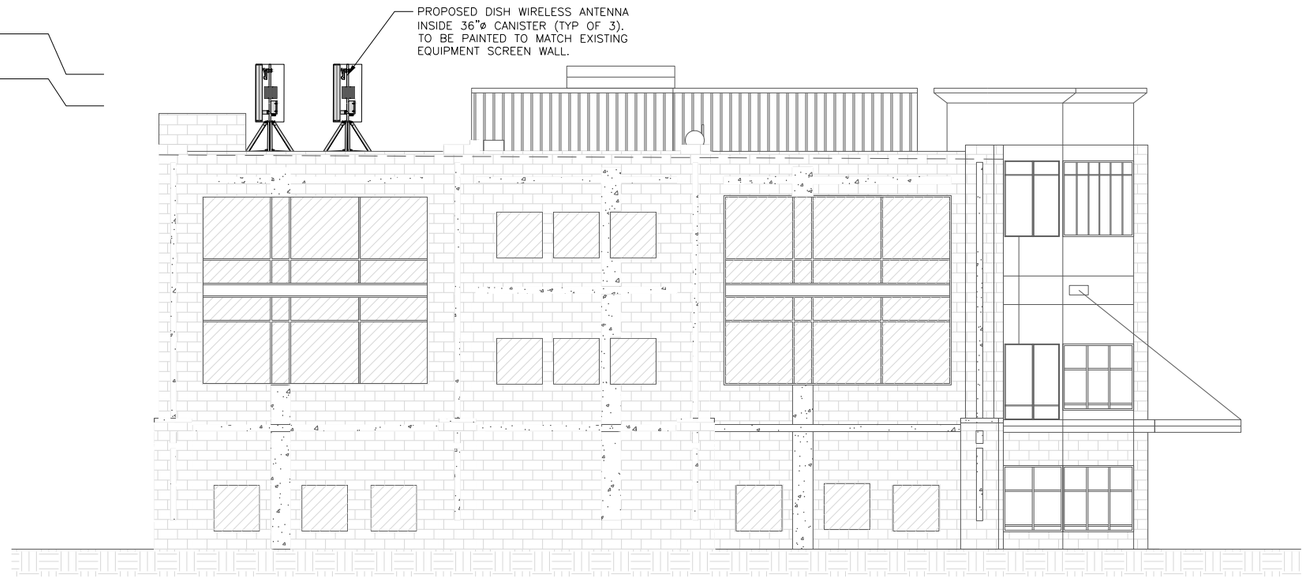
SHEET NUMBER

**A-3**

PROPOSED DISH WIRELESS CANISTER (TYPICAL 1 PER SECTOR, TOTAL OF 3)
TOP EL. @ 51'-0" AGL

PROPOSED DISH WIRELESS ANTENNA (TYPICAL PER SECTOR, TOTAL OF 3)
RAD CENTER @ 48'-0" AGL

EXISTING BUILDING ROOFTOP
42'-3" AGL




BUILDING NORTH ELEVATION

8' 4' 0 8' 16'
1/8"=1'-0"

1

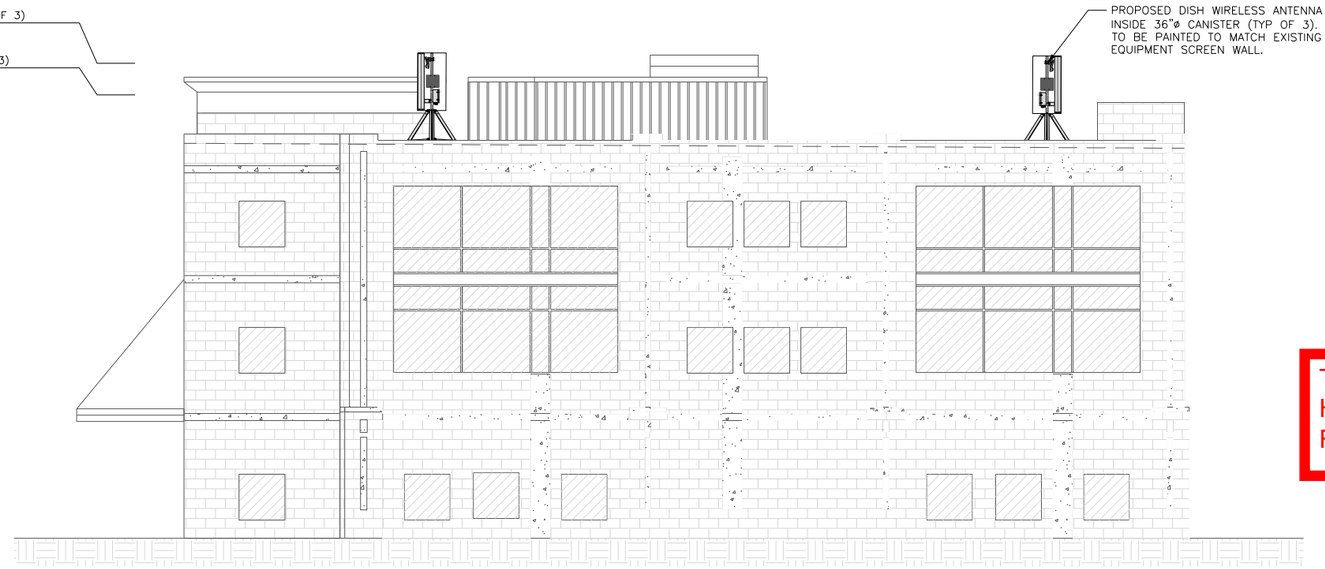
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PROPOSED DISH WIRELESS CANISTER (TYPICAL 1 PER SECTOR, TOTAL OF 3)
TOP EL. @ 51'-0" AGL

PROPOSED DISH WIRELESS ANTENNA (TYPICAL PER SECTOR, TOTAL OF 3)
RAD CENTER @ 48'-0" AGL

EXISTING BUILDING ROOFTOP
42'-3" AGL




THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

BUILDING SOUTH ELEVATION

8' 4' 0 8' 16'
1/8"=1'-0"

2

NOTES

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SHEET TITLE

OVERALL AND ENLARGED SITE PLAN

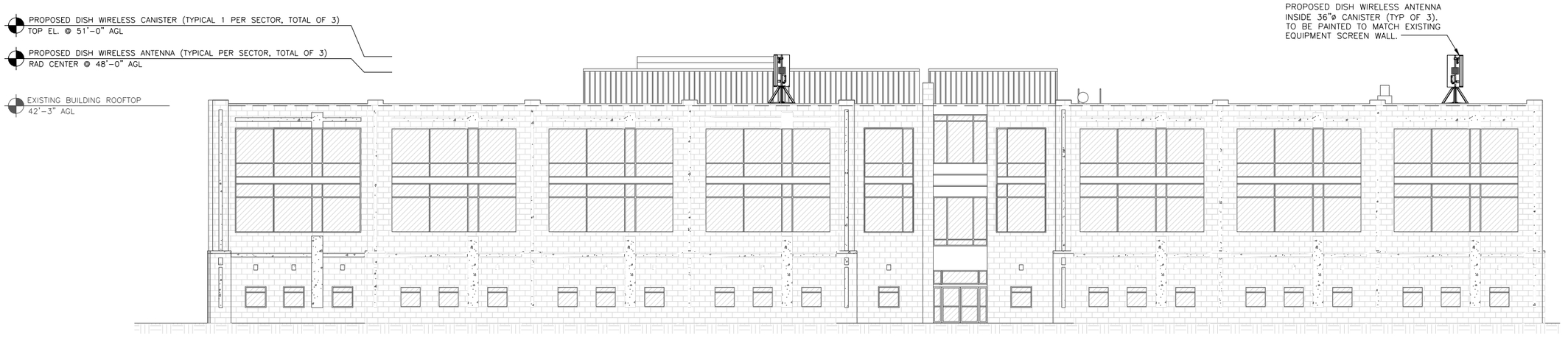
SHEET NUMBER

A-4

## NOTES

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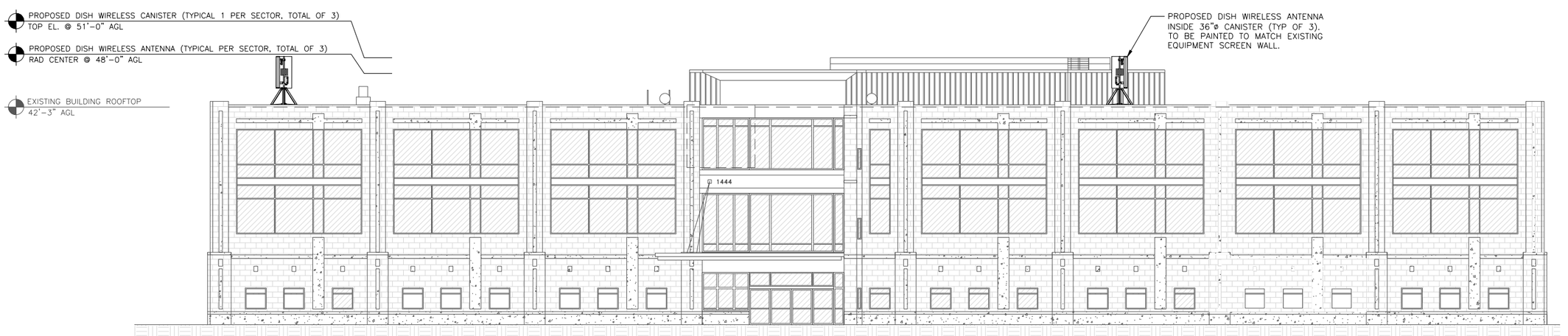

BUILDING EAST ELEVATION

12' 8' 4' 0 10' 20'
3/32"=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.




BUILDING WEST ELEVATION

12' 8' 4' 0 10' 20'
3/32"=1'-0"

2

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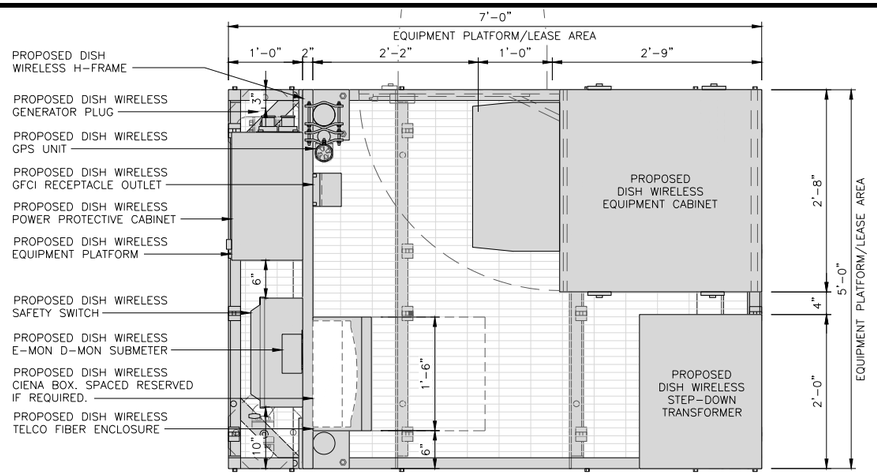
| REV | DATE | DESCRIPTION |
|---|---|---|
| A | 01/15/2021 | ISSUED FOR REVIEW |
| B | 04/09/2021 | ISSUED FOR REVIEW |
| 1 | 04/29/2021 | ISSUED FOR CONSTRUCTION |

A&E PROJECT NUMBER
250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
1444 S POTOMAC STREET
AURORA, CO 80012

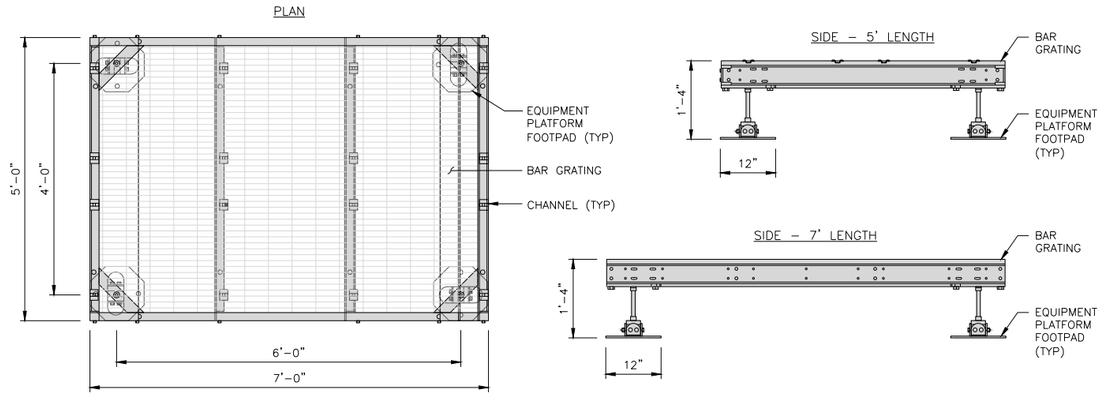
SHEET TITLE
OVERALL AND ENLARGED SITE PLAN

SHEET NUMBER
**A-5**



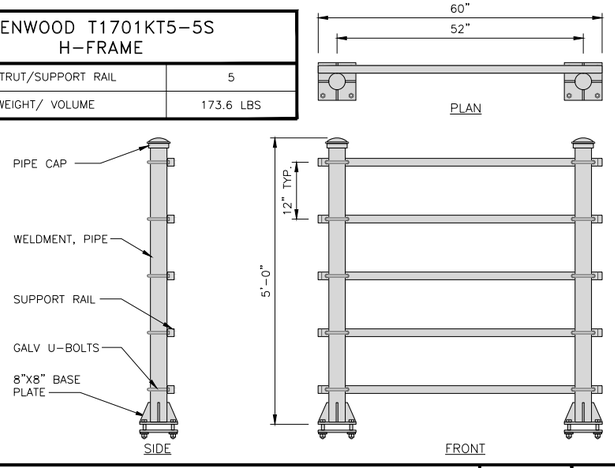

NO SCALE | 1

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




PLATFORM DETAIL | NO SCALE | 2

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



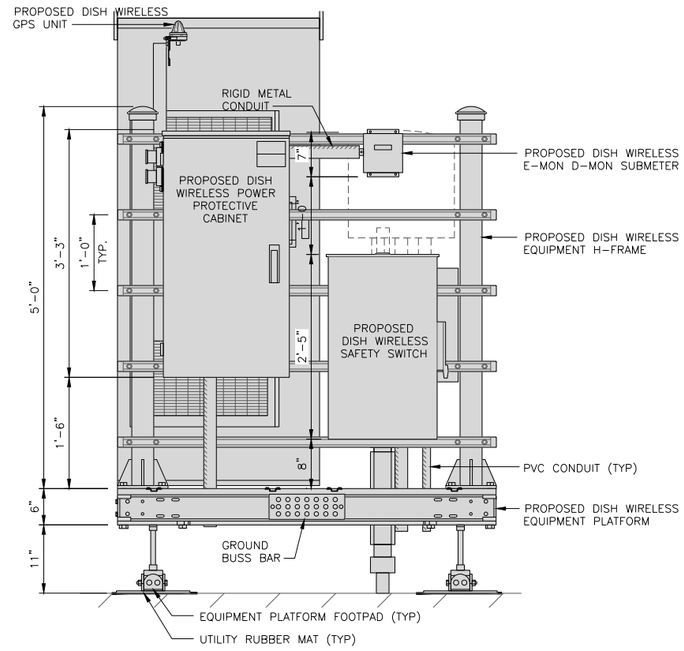

H-FRAME DETAIL | NO SCALE | 3

Structural plan review is limited to a general survey for code compliance. No review is implied nor was undertaken to verify structural adequacy.

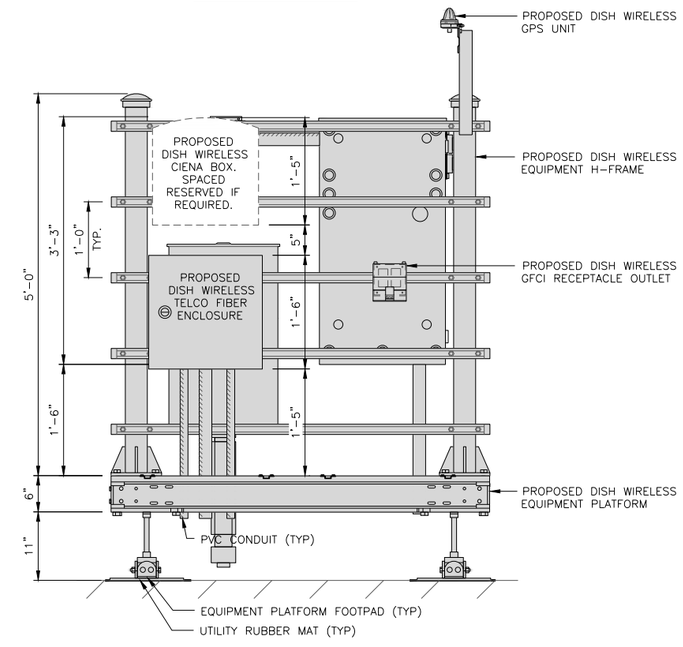
NOT USED | NO SCALE | 4

NOTE

1. EQUIPMENT CABINET AND STEP-DOWN TRANSFORMER OMITTED FOR CLARITY




FRONT ELEVATION




BACK ELEVATION

H-FRAME EQUIPMENT ELEVATION | NO SCALE | 5

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| DRAWN BY: | CHECKED BY: | APPROVED BY: |
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| RS | JDS | --- |

RFDS REV #: 001

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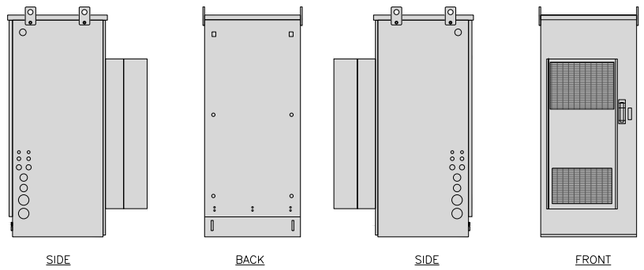
SHEET TITLE

EQUIPMENT PLATFORM AND H-FRAME DETAILS

SHEET NUMBER

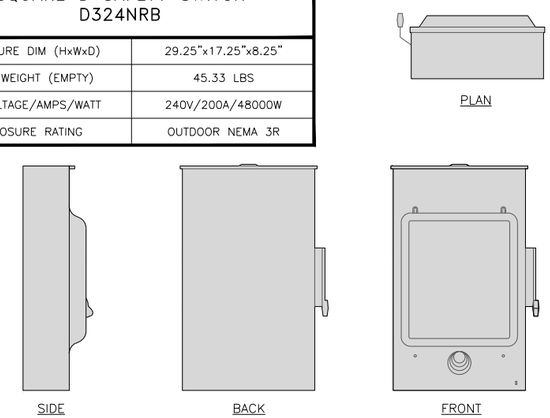
**A-6**

| CHARLES INDUSTRY HEX CUBE–PM369155N4 | |
|---|---|
| DIMENSIONS (HxWxD): | 74"x32"x32" |
| POWER PLANT: | –48VDC ABB |
| TOTAL WEIGHT (EMPTY) | 394 LBS |



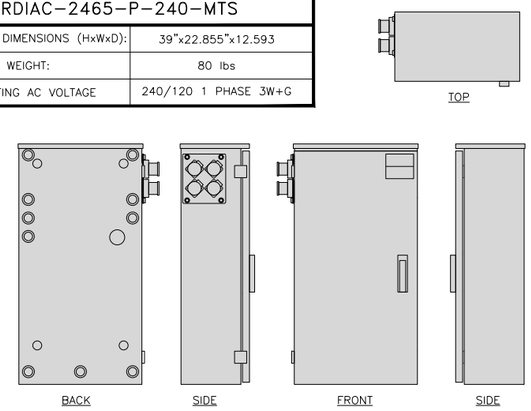

CABINET DETAIL | NO SCALE | 1

| SQUARE D SAFETY SWITCH D324NRB | |
|---|---|
| ENCLOSURE DIM (HxWxD) | 29.25"x17.25"x8.25" |
| TOTAL WEIGHT (EMPTY) | 45.33 LBS |
| MAX VOLTAGE/AMPS/WATT | 240V/200A/48000W |
| ENCLOSURE RATING | OUTDOOR NEMA 3R |



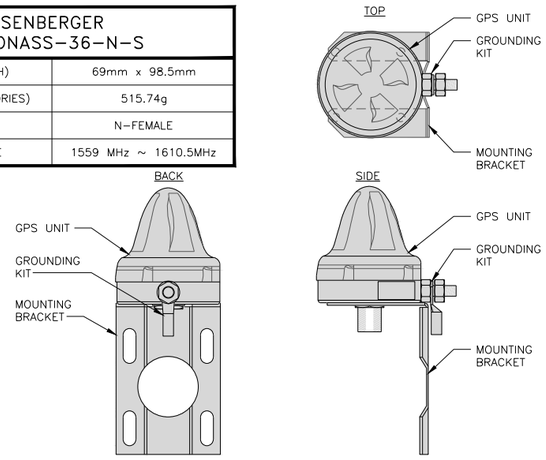

SAFETY SWITCH | NO SCALE | 2

| 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 |

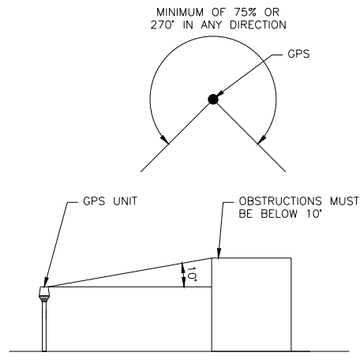



POWER PROTECTION CABINET (PPC) DETAIL | NO SCALE | 3

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

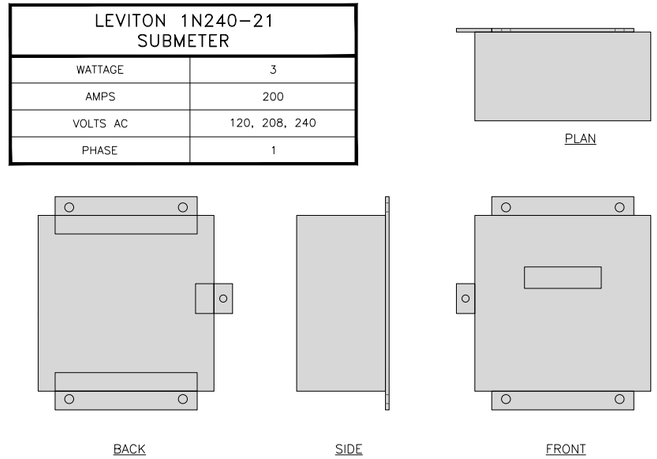



GPS ANTENNA DETAIL | NO SCALE | 4



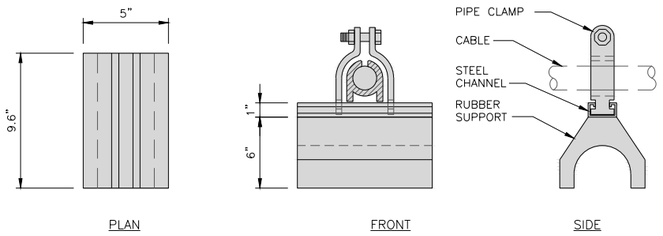

GPS MINIMUM SKY VIEW REQUIREMENTS | NO SCALE | 5

| LEVITON 1N240–21 SUBMETER | |
|---|---|
| WATTAGE | 3 |
| AMPS | 200 |
| VOLTS AC | 120, 208, 240 |
| PHASE | 1 |



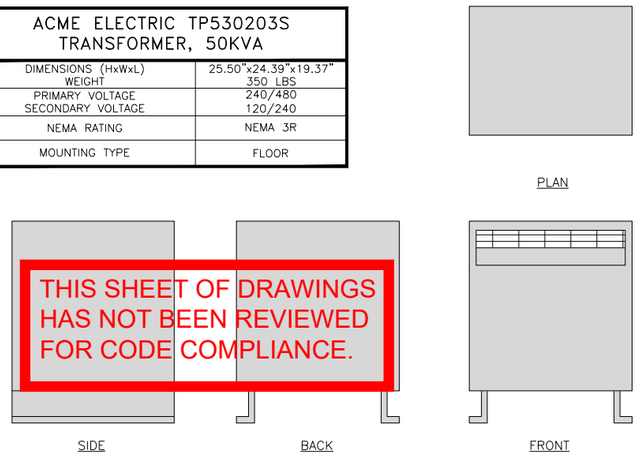

E–MON D–MON DETAIL | NO SCALE | 6

| DURA–BLOK DB10 ROOFTOP CABLE SUPPORT | |
|---|---|
| DIMENSIONS (HxWxL) | 5"x6"x9.6" |
| WEIGHT/ VOLUME | 5.28 LBS |
| ULTIMATE LOAD CAPACITY | 500 LBS |
| NOTE: NON–PENETRATING | |




ROOFTOP CABLE SUPPORT DETAIL | NO SCALE | 7

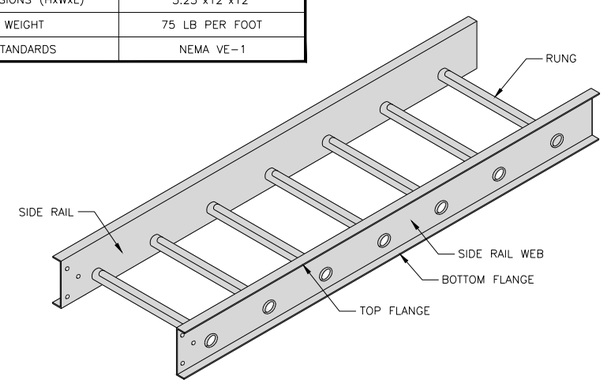
| ACME ELECTRIC TP530203S TRANSFORMER, 50KVA | |
|---|---|
| DIMENSIONS (HxWxL) | 25.50"x24.39"x19.37" |
| WEIGHT | 350 LBS |
| PRIMARY VOLTAGE | 240/480 |
| SECONDARY VOLTAGE | 120/240 |
| NEMA RATING | NEMA 3R |
| MOUNTING TYPE | FLOOR |




THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

NOT USED | NO SCALE | 8

| COPE 1B48–12SL–12–09 ROOFTOP LADDER TRAY | |
|---|---|
| DIMENSIONS (HxWxL) | 5.25"x12"x12' |
| WEIGHT | 75 LB PER FOOT |
| STANDARDS | NEMA VE–1 |




ROOFTOP LADDER TRAY DETAIL | NO SCALE | 9

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RFDS REV #: 001

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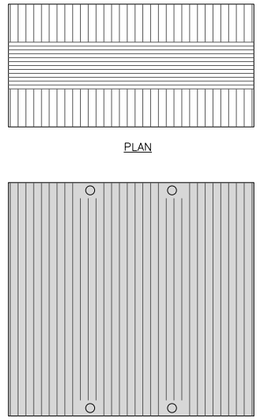
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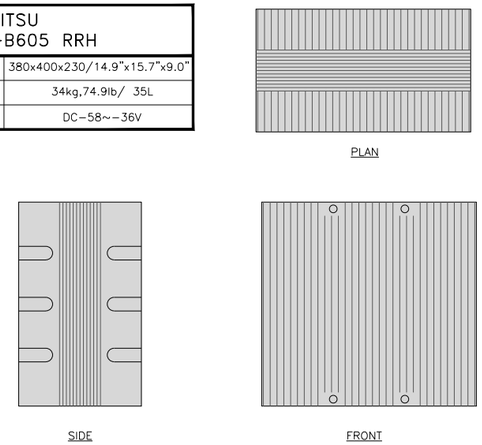
SHEET NUMBER
**A-7**

| 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 |



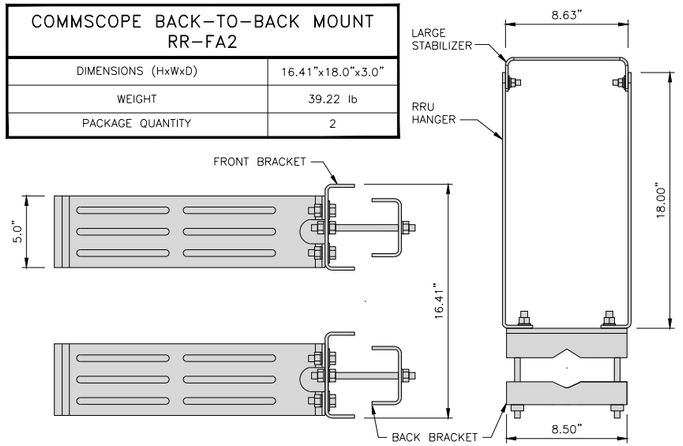

REMOTE RADIO HEAD DETAIL | NO SCALE | 1

| 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 |



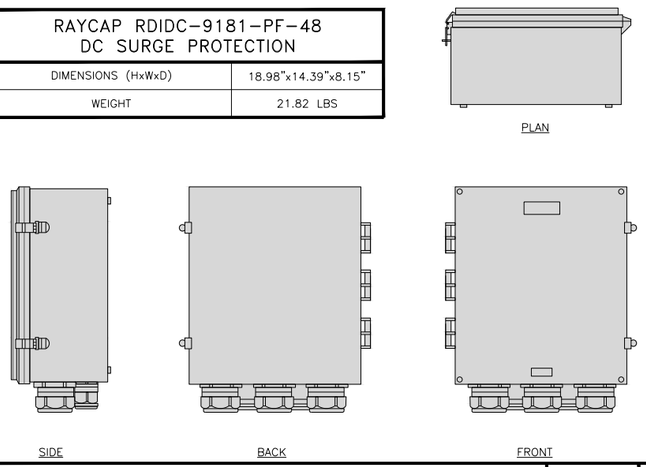

REMOTE RADIO HEAD DETAIL | NO SCALE | 2

| COMMSCOPE BACK-TO-BACK MOUNT RR-FA2 | |
|---|---|
| DIMENSIONS (HxWxD) | 16.41"x18.0"x3.0" |
| WEIGHT | 39.22 lb |
| PACKAGE QUANTITY | 2 |



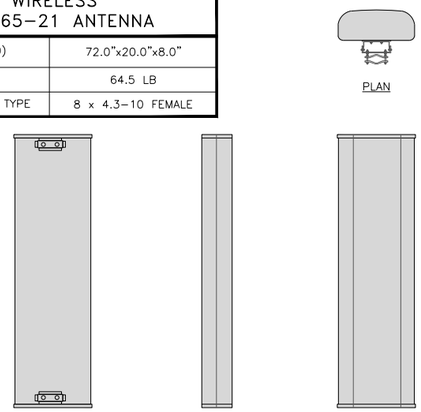

REMOTE RADIO MOUNT DETAIL | NO SCALE | 3

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



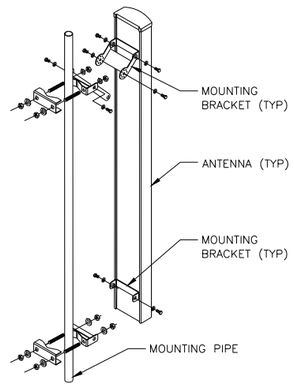

SURGE SUPPRESSION DETAIL | NO SCALE | 4

| JMA WIRELESS MX08FRO665-21 ANTENNA | |
|---|---|
| DIMENSIONS (HxWxD) | 72.0"x20.0"x8.0" |
| TOTAL WEIGHT | 64.5 LB |
| RF PORTS, CONNECTOR TYPE | 8 x 4.3-10 FEMALE |



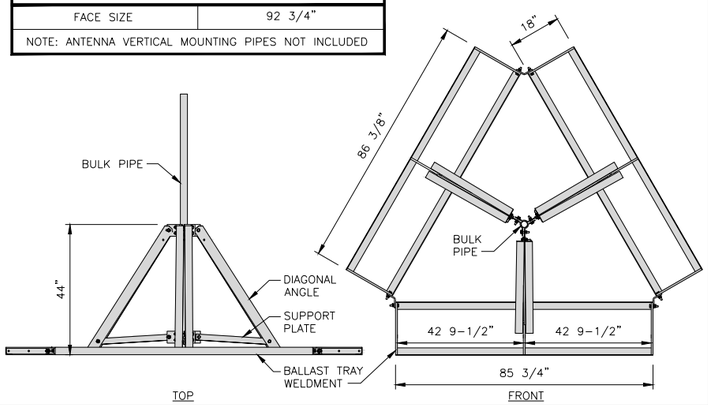

ANTENNA DETAIL | NO SCALE | 5

| M04 MOUNTING BRACKET HPA-33R-BUU-H4-K | |
|---|---|
| WIDTH | 5" (135mm) |
| DEPTH | 2" (51mm) |
| HEIGHT | 8" (213mm) |
| TOTAL WEIGHT (WITH BRACKETS) | 1.5 LBS (15.50 Kg) |
| HOUSING MATERIAL | ASA/ABS/ALUMINUM |
| RADOME COLOR | LIGHT GRAY |
| CONNECTOR | 1X8-PIN DAISY CHAIN |




ANTENNA MOUNTING DETAIL | NO SCALE | 6

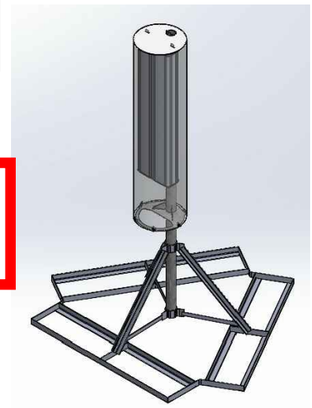
| SITEPRO1 TRPD-HD NON-PENETRATING TRIPOD MOUNT | |
|---|---|
| FACE SIZE | 92 3/4" |
| NOTE: ANTENNA VERTICAL MOUNTING PIPES NOT INCLUDED | |




ANTENNA FRAME DETAIL | NO SCALE | 7

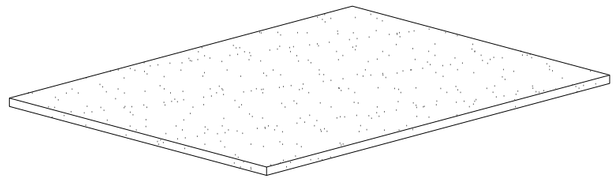
| CONCEALFAB CORPORATION 36" ANTENNA CANISTER | |
|---|---|
| DIMENSIONS (HxW) | 96"x36" |

THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.



ANTENNA CANISTER | NO SCALE | 8

| UTILITY RUBBER MAT, BLACK | |
|---|---|
| DIMENSIONS | 4'x 3'x 1/2" |
| WEIGHT/ VOLUME | 36.5 LB AVERAGE |
| MATERIAL | 100% RECYCLE RUBBER |



UTILITY RUBBER MAT DETAIL | NO SCALE | 9

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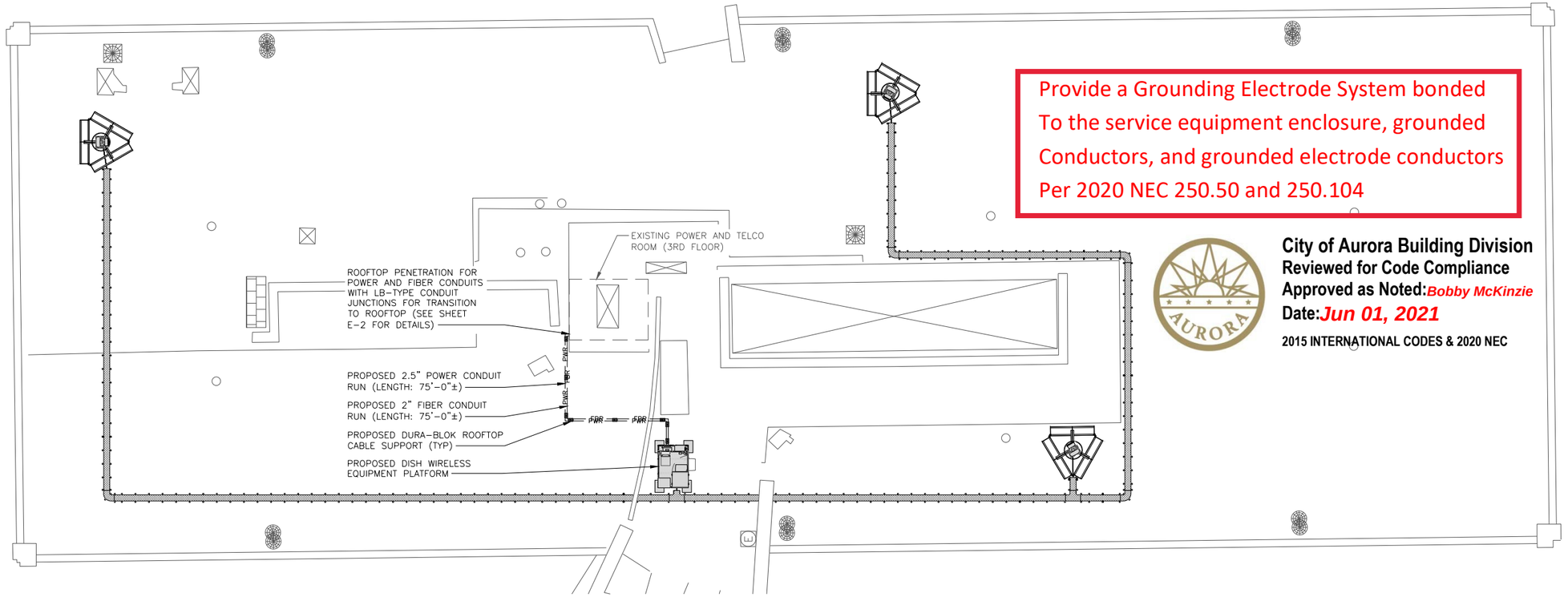
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SHEET TITLE
EQUIPMENT DETAILS

SHEET NUMBER
**A-8**

NOTE

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.




Provide a Grounding Electrode System bonded
To the service equipment enclosure, grounded
Conductors, and grounded electrode conductors
Per 2020 NEC 250.50 and 250.104

**City of Aurora Building Division**
**Reviewed for Code Compliance**
**Approved as Noted:** ***Bobby McKinzie***
**Date:** ***Jun 01, 2021***
**2015 INTERNATIONAL CODES & 2020 NEC**

UTILITY ROUTE PLAN

10' 0 10' 20'
1"=10'

1




UTILITY ROUTE ELEVATION

10' 0 10' 20'
1"=10'

2

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SHEET TITLE

ELECTRICAL/FIBER ROUTE PLAN AND NOTES

SHEET NUMBER

**E-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.

## ELECTRICAL NOTES — NO SCALE — 1

THE ENGINEER OF RECORD HAS PERFORMED ALL REQUIRED SHORT CIRCUIT CALCULATIONS AND THE AIC RATINGS FOR EACH DEVICE IS ADEQUATE TO PROTECT THE EQUIPMENT AND THE ELECTRICAL SYSTEM.

THE ENGINEER OF RECORD HAS PERFORMED ALL REQUIRED VOLTAGE DROP CALCULATIONS AND ALL BRANCH CIRCUIT AND FEEDERS COMPLY WITH THE NEC (LISTED ON T−1) ARTICLE 210.19(A)(1) FPN NO. 4.

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).

#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.
0.75" 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

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

RECTIFIER CONDUCTORS (2 CONDUITS): USING THWN−2, CU.

#10 − 0.0211 SQ. IN X 4 = 0.0844 SQ. IN
#10 − 0.0211 SQ. IN X 1 = 0.0211 SQ. IN <GROUND
TOTAL = 0.1055 SQ. IN

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

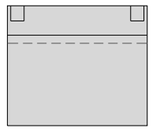
PPC FEED CONDUCTORS (1 CONDUIT): USING THWN, CU.

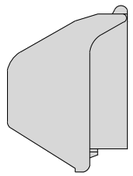
3/0 − 0.2679 SQ. IN X 3 = 0.8037 SQ. IN
#6 − 0.0507 SQ. IN X 1 = 0.0507 SQ. IN <GROUND
TOTAL = 0.8544 SQ. IN

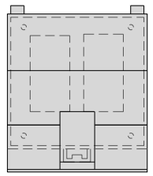
3.0" SCH 40 PVC CONDUIT IS ADEQUATE TO HANDLE THE TOTAL OF (4) WIRES, INCLUDING GROUND WIRE, AS INDICATED ABOVE.

## ELECTRICAL ONE−LINE NOTES — NO SCALE — 6

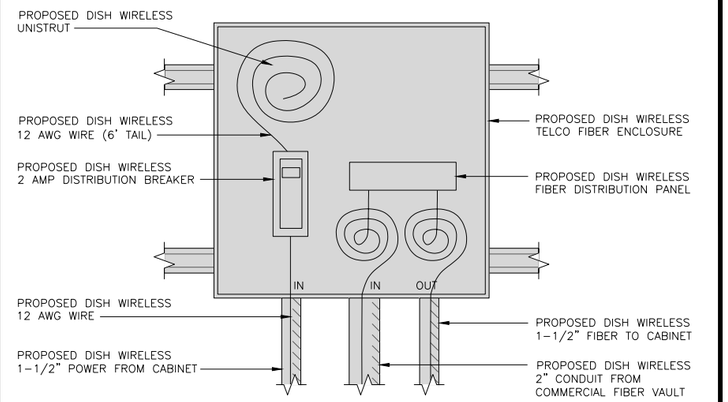
| GFCI OUTLET 2CKUR TWO−GFCI RECEPTACLE COVER | |
|---|---|
| DIMENSIONS (HxWxD) | 6.25"x5.25"x4.5" |
| WEIGHT | 1.1LB |
| NUMBER OF GANGS | 2 |
| VERTICAL COVER | 2CKU |


PLAN


SIDE

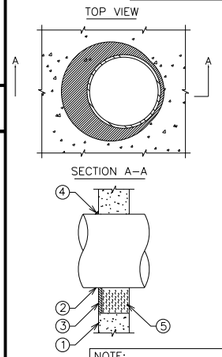

FRONT

## GFCI OUTLET DETAIL — NO SCALE — 2




## DARK TELCO BOX − INTERIOR WIRING LAYOUT — NO SCALE — 3

U.L. SYSTEM NO. C−AJ−1498
METAL PIPE THROUGH CONCRETE FLOOR, WALL, OR BLOCK WALL




F RATING = 2−HR.
T RATING = 0−HR.

1. CONCRETE FLOOR OR WALL ASSEMBLY :
   A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR (MINIMUM 4−1/2" THICK).
   B. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE WALL (MINIMUM 4−1/2" THICK).
   C. ANY U.L. CLASSIFIED CONCRETE BLOCK WALL.
2. THROUGH PENETRATIONS TO INCLUDE ANY OF THE FOLLOWING:
   A. MAXIMUM 8" NOMINAL DIAMETER STEEL PIPE.
   B. MAXIMUM 4" NOMINAL DIAMETER COPPER PIPE.
   C. MAXIMUM 4" NOMINAL DIAMETER EMT.
   D. MAXIMUM 4" NOMINAL DIAMETER STEEL CONDUIT.
3. MINIMUM. 1/2" DEPTH HILTI FS−ONE HIGH PERFORMANCE INTUMESCENT 2−HR FIRESTOP SEALANT.
4. MINIMUM. 1/2" BEAD HILTI FS−ONE HIGH PERFORMANCE INTUMESCENT 2−HR FIRESTOP SEALANT. 5. MINIMUM 4" THICK MINERAL WOOL (MINIMUM. 4 PCF DENSITY) (SEE NOTE NO. 4).

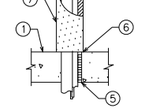
NOTES :
1. USE GROUND PENETRATING RADAR PRIOR TO CORE DRILLING. NO CUTTING/DAMAGING OF EXISTING REBAR IS ALLOWED.
2. MAXIMUM DIAMETER OF OPENING = 8".
3. ANNULAR SPACE = MINIMUM 0", MAXIMUM 2".
4. WALLS REQUIRE 1/2" DEPTH OF SEALANT FLUSH WITH BOTH SIDES.
5. IF MAXIMUM PIPE SIZE IS 4" NOMINAL DIAMETER, A MINIMUM 3" THICKNESS OF MINERAL WOOL MAY BE USED.

NOTE:
HILTI FS−ONE MATERIAL IS SUITABLE FOR USE IN CONCRETE, BRICK, TILE, GYPSUM, AND WOOD WALLS

SEE HILTI FIRESTOP INSTALLATION MANUAL FOR ADDITIONAL INSTRUCTIONS HILTI, INC. TULSA, OK 1−800−879−8000

## FLOOR/WALL PENETRATION — NO SCALE — 4

U.L. SYSTEM NO. C−BJ−8020
MULTIPLE PENETRANTS THROUGH CONCRETE FLOOR/WALL OR BLOCK WALL
F RATING = 2−HR; T RATING = 0−HR OR 2−HR.




1. CONCRETE FLOOR ASSEMBLY (2HR FIRE RATING):
   A. LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR OR WALL (MINIMUM 6" THICK). B. PRECAST (HOLLOW−CORE) CONCRETE FLOOR (MINIMUM 6" THICK).
   C. ANY UL/cUL CLASSIFIED CONCRETE BLOCK WALL.
2. ANY CONBONATION OF THE FOLLOWING METALLIC PENETRANTS MAY BE WITHIN GROUPING (ONLY 1 PIPE MAY EXCEED 1" NOMINAL DIAMETER):
   A. MAXIMUM 2" NOMINAL DIAMETER STEEL PIPE (SCHEDULE 10 OR HEAVIER).
   B. MAXIMUM 2" NOMINAL DIAMETER CAST OR DUCTILE IRON PIPE.
   C. MAXIMUM 2" NOMINAL DIAMETER STEEL CONDUIT OR EMT.
3. MAXIMUM 1/4" NOMINAL DIAMETER COPPER PIPE OR TUBING (MAX QTY. = 2) MAY BE WITHIN GROUPING.
4. MAXIMUM 7/C NO.12 AWG POWER CABLE (MAX QTY. =3) MAYBE WITHIN GROUPING.
5. MINIMUM 5−3/4" THICKNESS MINERAL WOOL (MIN. 4PCF DENSITY) TIGHTLY PACKED.
6. MINIMUM 1/4" DEPTH HILTI FS−ONE INTUMESCENT FIRESTOP SEALANT.
7. [OPTIONAL] NOMINAL 1" THICK GLASS−FIBER PIPE INSULATION (12"HIGH) INSTALLED AROUND GROUPING OF PENETRANTS, RESTING FLUSH WITH TOP SURFACE OF FLOOR.

NOTES :
1. MAXIMUM DIAMETER OF OPENING = 4"
2. ANNULAR SPACE = MINIMUM 0", MAXIMUM 2".
3. ONE GROUPING OF ANY COMBINATION OF THE ABOVE LISTED PIPES, TUBING, CONDUITS AND CABLES TO BE INSTALLED WITHIN THE OPENING.
4. WHEN PIPE IS USED , T−RATING = 2HR.
5. WHEN PIPE INSULATION IS USED, APPLY A MINIMUM 1/2" DEPTH HILTI FS−ONE INTUMESCENT FIRESTOP SEALANT BETWEEN THE GROUPING OF PENETRANTS AND THE PIPE INSULATION, FLUSH WITH TOP END OF INSULATION.
6. MINIMUM 1/4" DEPTH HILTI FS−ONE INTUMESCENT FIRESTOP SEALANTIS REQUIRED ON BOTH SIDES OF A WALL.

## MULTIPLE PENETRANTS THROUGH CONCRETE/BLOCK FLOOR/WALL — NO SCALE — 5

**City of Aurora Building Division**
**Reviewed for Code Compliance**
**Approved as Noted:** *Bobby McKinzie*
**Date:** *Jun 01, 2021*
**2015 INTERNATIONAL CODES & 2020 NEC**

Install electrical connections per 2020 NEC 110.14, Identify disconnects per 2020 NEC 110.22 and provide working space around Electrical equipment per 2020 NEC 110.26

## NOT USED — NO SCALE — 7

## NOT USED — NO SCALE — 8

dish wireless
5701 SOUTH SANTA FE DRIVE
LITTLETON, CO 80120

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-3530
OFFICE: (919) 661-6351
www.tepgroup.net

COLORADO LICENSED NICHOLAS M. CONSTANTINO 45607 PROFESSIONAL ENGINEER

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: |
|---|---|---|
| RS | JDS | --- |

RFDS REV #: 001

CONSTRUCTION DOCUMENTS

SUBMITTALS

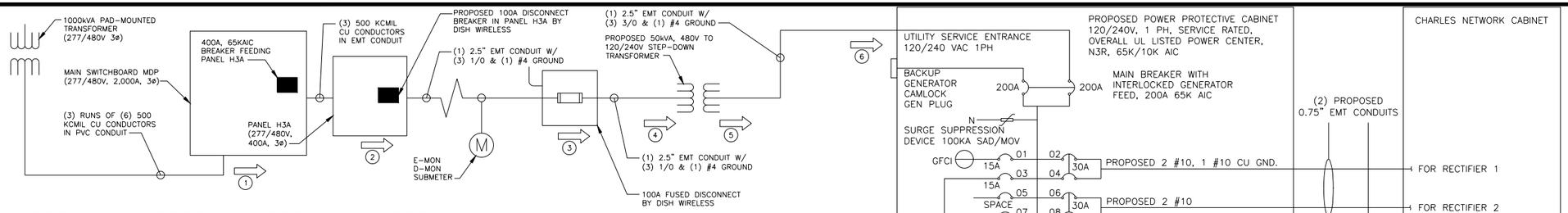
| REV | DATE | DESCRIPTION |
|---|---|---|
| A | 01/15/2021 | ISSUED FOR REVIEW |
| B | 04/09/2021 | ISSUED FOR REVIEW |
| 1 | 04/29/2021 | ISSUED FOR CONSTRUCTION |

A&E PROJECT NUMBER
250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
1444 S POTOMAC STREET
AURORA, CO 80012

SHEET TITLE
ELECTRICAL DETAILS

SHEET NUMBER
**E-2**




## FAULT CURRENT AT EQUIPMENT

| # | EQUIPMENT | FAULT CURRENT | AIC RATING |
|---|---|---|---|
| 1 | MAIN SWITCHBOARD MDP | 25,700A | 65kA |
| 2 | HOUSE PANEL H3A | 13,388A | 42kA |
| 3 | DISCONNECT EQUIPMENT | 9,115A | 10kA (MIN.) |
| 4 | PRIMARY OF TRANSFORMER | 8,743A | N/A |
| 5 | SECONDARY OF TRANSFORMER | 8,247A | N/A |
| 6 | DISH 200A PANEL | 7,450A | 10kA (MIN.) |

*CONTRACTOR WILL PROVIDE PERMANENTLY ENGRAVED PLAQUE AT THE SUB-METER/DISCONNECT THAT LISTS THE AVAILABLE FAULT CURRENT AND DATE OF CALCULATION (05/28/21)

Install electrical connections per 2020 NEC 110.14, Identify disconnects per 2020 NEC 110.22 and provide working space around Electrical equipment per 2020 NEC 110.26

Every circuit and circuit modification shall be legibly Identified as to it's clear, evident and specific purpose or use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. 2020 NEC 408.4

PPC ONE-LINE RISER DIAGRAM — NO SCALE — 1

## PROPOSED CHARLES PANEL SCHEDULE

| LOAD SERVED | VOLT AMPS (WATTS) L1 | VOLT AMPS (WATTS) L2 | TRIP | CKT # | PHASE | CKT # | TRIP | VOLT AMPS (WATTS) L1 | VOLT AMPS (WATTS) L2 | LOAD SERVED |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | VOLT AMPS |
| | 98 | 98 | AMPS |
| | 98 | | MAX AMPS |
| | 123 | | MAX 125% |

PROPOSED PANEL SCHEDULE — NO SCALE — 2

## H3A PANEL SCHEDULE

| LOAD SERVED | VOLT AMPS (WATTS) L1 | L2 | L3 | TRIP | CKT # | PHASE | CKT # | TRIP | VOLT AMPS (WATTS) L1 | L2 | L3 | LOAD SERVED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FTU-5 | - | | | 30A | 1 | A | 2 | 20A | - | | | LIGHTING-RECEPTION |
| FTU-2 | | - | | 30A | 3 | B | 4 | 20A | | - | | LIGHTING-SW BATHROOM |
| FTU-3 | | | - | 30A | 5 | C | 6 | 20A | | | - | LIGHTING-RECORDS |
| TU-6 | - | | | 30A | 7 | A | 8 | 20A | - | | | LIGHTING-NORTHWEST |
| FTU-4 | | - | | 30A | 9 | B | 10 | 20A | | - | | LIGHTING-NORTH |
| FTU-7 | | | - | 30A | 11 | C | 12 | 20A | | | - | LIGHTING-NORTH |
| EF-1 | - | | | 15A | 13 | A | 14 | 15A | - | | | -SPARE- |
| | | - | | | 15 | B | 16 | | | - | | |
| | | | - | | 17 | C | 18 | | | | - | |
| FTU-1 | - | | | 30A | 19 | A | 20 | 20A | - | | | LIGHTING-CORRIDOR W |
| -SPARE- | | - | | 20A | 21 | B | 22 | 20A | | - | | LIGHTING-EAST |
| FTU-SUITE 360 | | | - | 30A | 23 | C | 24 | 20A | | | - | LIGHTING-EAST |
| -BLANK- | - | | | - | 25 | A | 26 | 20A | - | | | -SPARE- |
| DISH WIRELESS | | 11,700 | | 100A | 27 | B | 28 | 20A | | - | | -SPARE- |
| | | | 11,700 | | 29 | C | 30 | | | | - | |
| -SPARE- | - | | | 20A | 31 | A | 32 | 40A | - | | | LIGHTING-SUITE 360 |
| -SPARE- | | - | | 20A | 33 | B | 34 | | | - | | |
| -SPARE- | | | - | 20A | 35 | C | 36 | - | | | - | -BLANK- |
| FTU-18 | - | | | 40A | 37 | A | 38 | 40A | - | | | FTU-15 |
| | | - | | | 39 | B | 40 | | | - | | |
| | | | - | | 41 | C | 42 | | | | - | |
| UNKNOWN | - | | | 40A | 43 | A | 44 | 40A | - | | | UNKNOWN |
| | | - | | | 45 | B | 46 | | | - | | |
| | | | - | | 47 | C | 48 | | | | - | |
| UNKNOWN | - | | | 40A | 49 | A | 50 | 40A | - | | | UNKNOWN |
| | | - | | | 51 | B | 52 | | | - | | |
| | | | - | | 53 | C | 54 | | | | - | |
| VOLT AMPS | - | - | - | | | | | | - | - | - | VOLT AMPS |

| 400A MCB, 3ϕ, 4W, 277/480V | | | |
|---|---|---|---|
| MB RATING: 42,000 AIC | | | |
| | L1 | L2 | L3 |
| EXISTING LOAD (30-DAY STUDY) - AMPS | 124 | 98 | 108 |
| PROPOSED ADDED LOAD - AMPS | 0 | 98 | 98 |
| TOTAL LOAD - AMPS | 124 | 196 | 206 |
| MAX AMPS | | 206 | |
| MAX 125% | | 258 | |

BUILDING PANEL SCHEDULE — NO SCALE — 3

David Hoss, President
Golden. Co. 80403
303 940 6000
720 490 1700 m

Advanced Electric Solutions Corp.

***Reference 30Day + power Demand Recording 2000 amp 277/480 v 3 phase Delta***

| 14444 s. Potomac Auora Co. | Den00092b | Dec. 30, 2020 |
|---|---|---|

We have performed a 30-day minimum required load study for the additional load to be added by **Dish**.

The existing designed 3 phase service needs engineered calculations to verify expansion capabilities. **This building has a spare 2000amp service not being used.**

**Peak demands below in RED**

Both 480 v

| | Panel | Amps_A | Amps_B | Amps_C |
|---|---|---|---|---|
| 12/2/2020 8:40 | 400 a | **124.406** | 66.828 | 66.531 |
| 12/12/2020 8:30 | 3rd flr | 108.563 | 98.188 | 38.469 |
| 12/29/2020 9:40 | | 83.906 | 63.391 | 108.125 |

2000 amp gear 480v

| | Panel | Amps_A | Amps_B | Amps_C |
|---|---|---|---|---|
| 11/25/2020 6:48 | mdp | **348.628** | 330.064 | 346.378 |
| 11/25/2020 6:48 | 2000a | 348.628 | 330.064 | 346.378 |
| 11/29/2020 6:30 | | 316.654 | 305.782 | 356.5 |

**City of Aurora Building Division**
**Reviewed for Code Compliance**
**Approved as Noted:** *Bobby McKinzie*
**Date:** *Jun 01, 2021*
**2015 INTERNATIONAL CODES & 2020 NEC**

The meter was set thru
11/24/2020 12/29/2020
at 1 min increments. The meters used were Veris/Hawkeye 8036 style,1600amp rated.

Should you have any additional questions or concerns please contact me.

LOAD STUDY REPORT — NO SCALE — 4

dish wireless.
5701 SOUTH SANTA FE DRIVE
LITTLETON, CO 80120

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-3530
OFFICE: (919) 661-6351
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COLORADO LICENSED — CHUCKS M. COMBATTA — 45607 — PROFESSIONAL ENGINEER

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| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| RS | JDS | --- |

RFDS REV #: 001

CONSTRUCTION DOCUMENTS

SUBMITTALS

| REV | DATE | DESCRIPTION |
|---|---|---|
| A | 01/15/2021 | ISSUED FOR REVIEW |
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A&E PROJECT NUMBER
250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
1444 S POTOMAC STREET
AURORA, CO 80012

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

SHEET NUMBER
**E-3**

**DNDEN00092B**

**Dish Wireless Collocation**

## Available Fault Current Calculation

by:John Sokolik Ver. 2014
jmp1jds@comcast.net

**Utility Fault Current** 25,700 amperes

kVA = 
E = 480
trans. FLA = 0

**I = kVA x 1000 = trans. FLA**
**E x 1.732**

**Isca = trans. FLA x 100 x PF / transformer Z =**

PF = 
Z = 

Isca = ampere short-circuit current RMS symmetrical. Isca = 0 amperes

**Point to Point Method** — Three Phase 480/277

**'f ' factor = 1.732 x L x I / N x C x E L-N**

Length (distance) (ASC) FEET — L = 220 — Copper in Metal Raceway
Isca = 25,700
# conductors per phase N = 1
Phase conductor constant C = 22,185 **Phase Conductor** 500 kcmil
Volt Line to Line E L - L = **480** Volt
f = 0.920
Neutral conductor constant C = 22,185 **Neutral Conductor** 500 kcmil
Volt Line to Neutral E L - N = **277** Volt
f = 2.390

**Multiplier**

**M = 1 / 1 + f**

Line to Line M = 0.521
Line to Neutral M = 0.295

**Fault Current at Service Equipment**

**Isca x M = fault current at terminals of main disconnect L- L =** → **13,388 amperes**
**Isca x M = fault current at terminals of main disconnect L- N =** → **7,580 amperes**

---

**Fault Current from** Panel H3A to Dish Wireless Disconnect — Copper in Metal Raceway — Single Phase

**Single Phase Feeder** — **'f ' factor = 2 x L x I / N x C x E L-N**

Length (distance) (ASC) — L = 75
Isca = 13,388 Phase 7,580 Neutral
# conductors per phase N = 1
Phase conductor constant C = 8,925 **Phase Conductor** 1/0
Volt Line to Line E L - L = **480** Volt
f = 0.469
Neutral conductor constant C = 8,925 **Neutral Conductor** 1/0
Volt Line to Neutral E L - N = **277** Volt
f = 0.460

**Multiplier**

**M = 1 / 1 + f**

Line to Line M = 0.681
Line to Neutral M = 0.685

**Isca x M = fault current at terminal of the panel L- L =** **9,115 amperes**
**Isca x M = fault current at terminal of the panel L- N =** **5,192 amperes**

**Calculation does not include motor contribution**

---

**Branch Circuit Fault from** Disconnect to Step Down Transformer — Copper in Metal Raceway — Single Phase

**Single Phase Branch** — **'f ' factor = 2 x L x I / N x C x E L-N**

Length (distance) (ASC) — L = 10
Isca = 9,115 Phase 5,192 Neutral
# conductors per phase N = 1
Phase conductor constant C = 8,925 **Phase Conductor** 1/0
Volt Line to Line E L - L = **480** Volt
f = 0.043
Neutral conductor constant C = 8,925 **Neutral Conductor** 1/0
Volt Line to Neutral E L - N = **277** Volt
f = 0.042

**Multiplier**

**M = 1 / 1 + f**

Line to Line M = 0.959
Line to Neutral M = 0.960

**Isca x M = fault current at terminal of the panel L- L =** **8,743 amperes**
**Isca x M = fault current at terminal of the panel L- N =** **4,983 amperes**

**Calculation does not include motor contribution**

---

**Transformer name or location:** 50kVA 480V to 120/240V XFMR

Fault current at transformer primary winding: 8,743 Isc pri

Transformer primary voltage (V L-L): 480 V pri
Transformer secondary voltage (V L-L): 240 V sec
Transformer power (kVA): 50 kVA
Transformer impedance 1.5 %Z

$$f = \frac{(Isc\ pri) \times (V\ pri) \times 1.732 \times (\%Z)}{100{,}000 \times kVA}$$ = 2.180574144 f

$$M = \frac{1}{1+f}$$ = 0.314408643 M

$$\text{I sc sec} = \frac{V\ pri}{V\ sec} \times M \times (Isc\ pri)$$ = **5,498** I sc sec

---

## Available Fault Current Calculation

by:John Sokolik Ver. 2014
jmp1jds@comcast.net

**Utility Fault Current** 5,498 amperes

kVA = 
E = 240
trans. FLA = 0

**I = kVA x 1000 = trans. FLA**
**E**

**Isca = trans. FLA x 100 x PF / transformer Z =**

PF = 
Z = 

Isca = ampere short-circuit current RMS symmetrical. Isca = 0 amperes

**Point to Point Method** — Single Phase 240/120

**'f ' factor = 2 x L x I / N x C x E L-N**

Length (distance) (ASC) FEET — L = 0 — Copper in Metal Raceway
Isca = 5,498
# conductors per phase N = 1
Phase conductor constant C = 12,844 **Phase Conductor** 3/0
Volt Line to Line E L - L = **240** Volt
f = 0.000
Neutral conductor constant C = 12,844 **Neutral Conductor** 3/0
Volt Line to Neutral E L - N = **120** Volt
f = 0.000

**Multiplier**

**M = 1 / 1 + f**

Line to Line M = 1.000
Line to Neutral M = 1.000

**Fault Current at Service Equipment**

**Isca x M = fault current at terminals of main disconnect L- L =** → **5,498 amperes**
**Isca x M = fault current at terminals of main disconnect L- N =** → **8,247 amperes**

---

**Fault Current from** Step Down Transformer to Dish Power Panel — Copper in Metal Raceway — Single Phase

**Single Phase Feeder** — **'f ' factor = 2 x L x I / N x C x E L-N**

Length (distance) (ASC) — L = 10
Isca = 5,498 Phase 8,247 Neutral
# conductors per phase N = 1
Phase conductor constant C = 12,844 **Phase Conductor** 3/0
Volt Line to Line E L - L = **240** Volt
f = 0.036
Neutral conductor constant C = 12,844 **Neutral Conductor** 3/0
Volt Line to Neutral E L - N = **120** Volt
f = 0.107

**Multiplier**

**M = 1 / 1 + f**

Line to Line M = 0.966
Line to Neutral M = 0.903

**Isca x M = fault current at terminal of the panel L- L =** **5,309 amperes**
**Isca x M = fault current at terminal of the panel L- N =** **7,450 amperes**

**Calculation does not include motor contribution**

---

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COLORADO LICENSED — CHUCKS M. COMBATTA — 45607 — PROFESSIONAL ENGINEER

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|---|---|---|
| RS | JDS | --- |

RFDS REV #: 001

CONSTRUCTION DOCUMENTS

SUBMITTALS

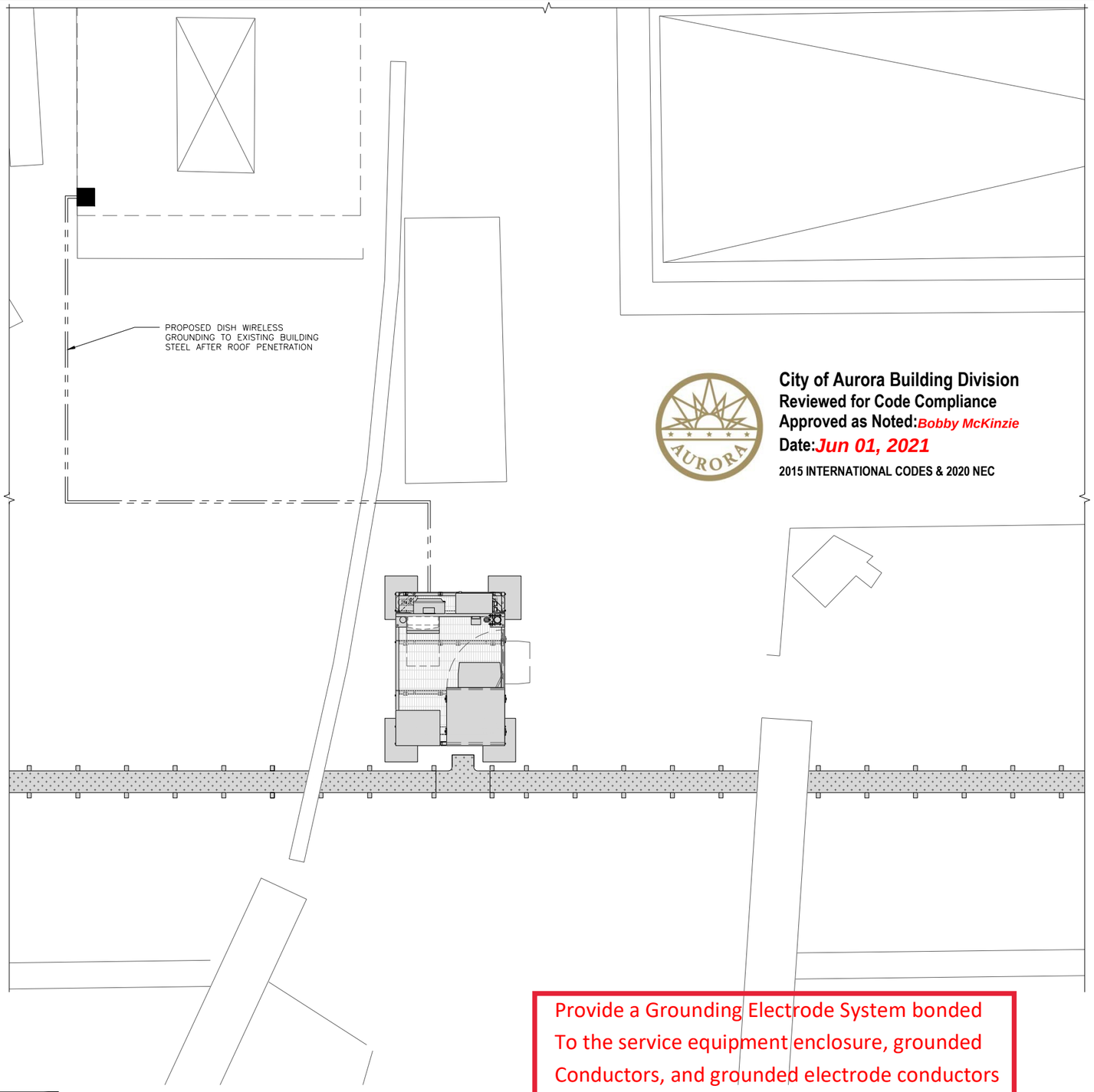
| REV | DATE | DESCRIPTION |
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| 1 | 04/29/2021 | ISSUED FOR CONSTRUCTION |
| 2 | 05/28/2021 | ISSUED FOR CONSTRUCTION |

A&E PROJECT NUMBER
250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
1444 S POTOMAC STREET
AURORA, CO 80012

SHEET TITLE
AVAILABLE FAULT CURRENT CALCULATIONS

SHEET NUMBER
**E-4**




City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *Bobby McKinzie*
Date: *Jun 01, 2021*
2015 INTERNATIONAL CODES & 2020 NEC

Provide a Grounding Electrode System bonded
To the service equipment enclosure, grounded
Conductors, and grounded electrode conductors
Per 2020 NEC 250.50 and 250.104

GROUNDING PLAN

12" 6" 0 1' 2' 3' 4' 5' 6' 7'
3/8"=1'-0"

1

- EXOTHERMIC CONNECTION
- MECHANICAL CONNECTION
- GROUND BUS BAR
- GROUND ROD
- 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 GROUNDING AND BONDING REQUIREMENTS AND MANUFACTURER'S SPECIFICATIONS.
3. ALL GROUND CONDUCTORS SHALL BE COPPER; NO ALUMINUM CONDUCTORS SHALL BE USED.
4. NO EXOTHERMIC WELDING ON ROOFTOP

## GROUNDING ROOFTOP KEY NOTES

(A) ROOF MOUNTED SUPPORT STRUCTURES: BOND ROOF-MOUNTED ANTENNA MASTS AND SUPPORT STRUCTURES TO THE EXISING LIGHTNING PROTECTION SYSTE, EXISTING BUILDING GROUND, NON-FIRE SUPPRESSION COLD WATER PIPE, OR GROUND RIN/ROD AT GROUND LEVEL USING #2 STRANDED GREEN INSULATED COPPER WIRE.

(B) BONDING: ALL ROOFTOP GROUND CONNECTIONS SHALL BE MECHANICAL WITH ANTI OXIDIZING COMPOUND BETWEEN MATING SURFACES. EXOTHERMIC WELDS ARE NOT ALLOWED ON ROOFTOP OR IN-BUILDING APPLICATIONS UNLESS THE COMPONENT IS SUPPLIED FROM THE MANUFACTURER PRE-WELDED.

(C) 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.

(D) 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.

(E) 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.

(F) 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. CHEMICAL GROUND RODS MAY BE USED WHEN APPLICABLE.

(G) 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 OR GROUND LEVEL GROUND ROD WITH (2) #2 SOLID TINNED COPPER CONDUCTORS.

(H) 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.

(J) 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.

(K) FRAME BONDING: THE BONDING POINT FOR TELECOM EQUIPMENT FRAMES SHALL BE THE GROUND BUSSBAR THAT IS NOT ISOLATED FROM THE EQUIPMENTS METAL FRAMEWORK. BOND THE FRAME GROUND TO THE "I" SECTION OF THE CELL REFERENCE GROUND BAR OR SUPPLEMENTARY CONDUCTOR. (SHEET G3 DETAIL1)

(L) INTERIOR UNIT BONDS: METAL FRAMES, CABINETS AND INDIVIDUAL METALLIC UNITS LOCATED WITH THE AREA OF THE INTERIOR GROUND RING REQUIRE A #6 AWG STRANDED GREEN INSULATED COPPER BOND TO THE INTERIOR GROUND RING.

(M) FENCE AND GATE GROUNDING: METAL FENCES WITHIN 7 FEET OF THE EXTERIOR GROUND RING OR OBJECTS BONDED TO THE EXTERIOR GROUND RING SHALL BE BONDED TO THE GROUND RING WITH A #2 AWG SOLID TINNED COPPER CONDUCTOR AT AN INTERVAL NOT EXCEEDING 25 FEET. BONDS SHALL BE MADE AT EACH GATE POST AND ACROSS GATE OPENINGS. IF THE FENCE AND GATE IS IN-BUILDING OR ON ROOF IT SHALL BE BONDED TO THE MAIN BUSSBAR GROUNDING SYSTEM. USING #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTOR

(N) EXTERIOR UNIT BONDS: METALLIC OBJECTS, EXTERNAL TO OR MOUNTED TO THE BUILDING, SHALL BE BONDED TO THE MAIN BUSSBAR GROUNDING SYSTEM. USING #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTOR

(P) CABLE TRAYS: EACH SECTION SHALL BE BONDED TO THE NEXT WITH #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTOR JUMPER. PROVIDE TWO HOLE LUGS AT BOTH ENDS OF THE JUMPER AND APPLY NO-OXIDIZING COMPOUND BETWEEN THE LUG AND CABLE TRAY. THE CABLE TRAY SHALL BE GROUNDED TO THE NEAREST BUSSBAR IN THE SAME MANNER.

(Q) DURING ALL DC POWER SYSTEM CHANGES INCLUDING DC SYSTEM CHANGE OUTS, RECTIFIER REPLACEMENTS OR ADDITIONS, BREAKER DISTRIBUTION CHANGES, BATTERY ADDITIONS, BATTERY REPLACEMENTS AND INSTALLATIONS OR CHANGES TO DC CONVERTER SYSTEMS IT SHALL BE REQUIRED THAT SERVICE CONTRACTORS VERIFY ALL DC POWER SYSTEMS ARE EQUIPPED WITH A MASTER DC SYSTEM RETURN GROUND CONDUCTOR FROM THE DC POWER SYSTEM COMMON RETURN BUS DIRECTLY CONNECTED TO THE CELL SITE REFERENCE GROUND BAR

(R) ALL ROOFTOP BUSSBARS ARE TO BE MECHANICALLY BONDED TO PROPOSED ANTENNA MOUNT.

REFER TO DISH WIRELESS GROUNDING NOTES.

GROUNDING KEY NOTES | NO SCALE | 2

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RFDS REV #: 001

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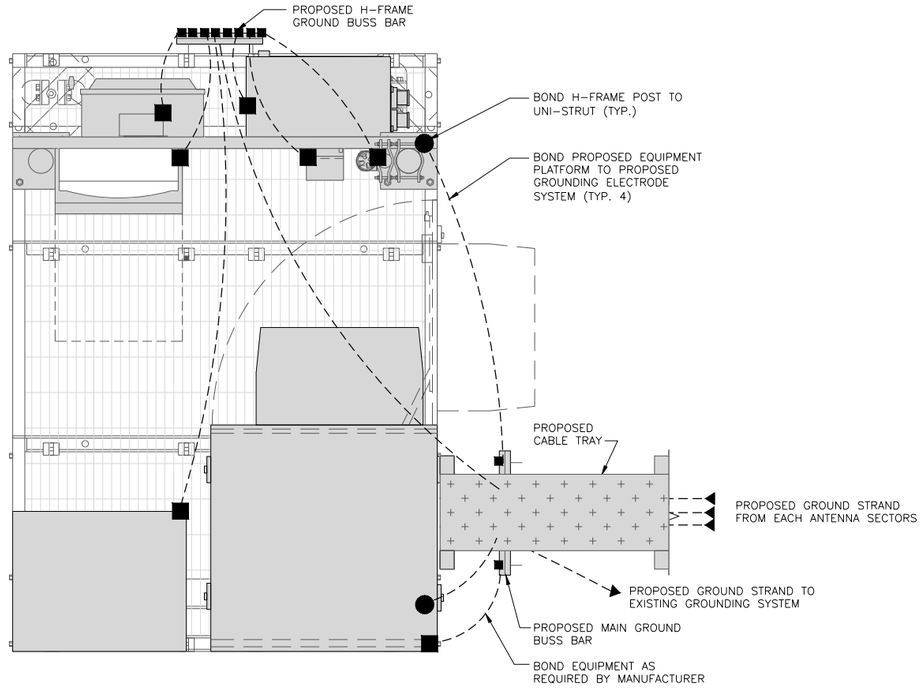
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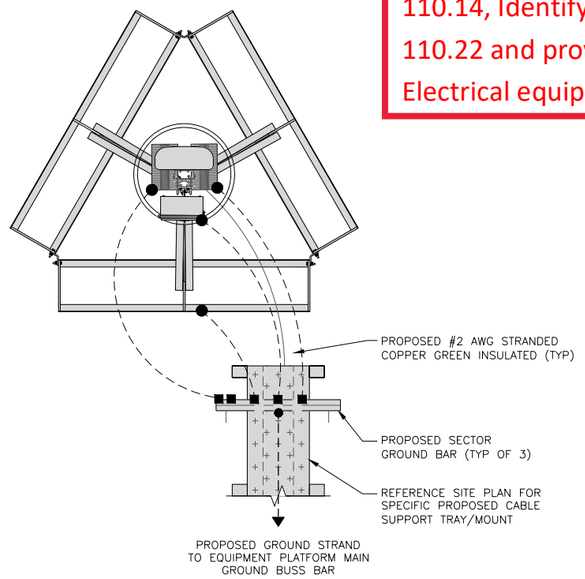
SHEET TITLE
GROUNDING PLANS AND NOTES

SHEET NUMBER
**G-1**




TYPICAL ROOFTOP EQUIPMENT GROUNDING PLAN | NO SCALE | 1

Install electrical connections per 2020 NEC 110.14, Identify disconnects per 2020 NEC 110.22 and provide working space around Electrical equipment per 2020 NEC 110.26

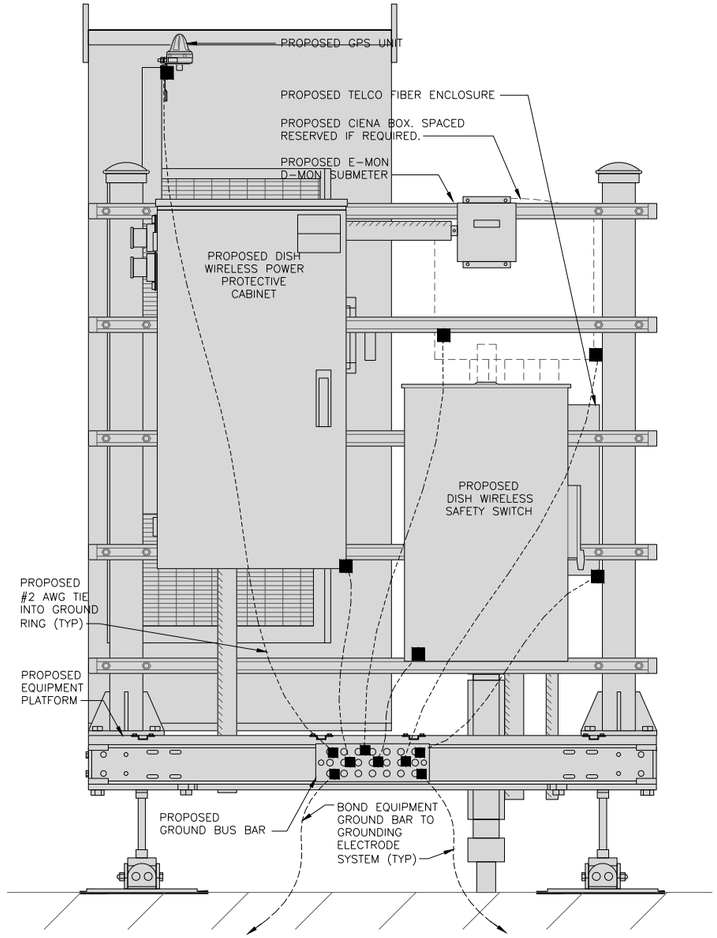



TYPICAL ROOFTOP ANTENNA GROUNDING PLAN | NO SCALE | 2

NOTE

EQUIPMENT CABINET OMITTED FOR CLARITY

City of Aurora Building Division
Reviewed for Code Compliance
Approved as Noted: *Bobby McKinzie*
Date: *Jun 01, 2021*
2015 INTERNATIONAL CODES & 2020 NEC




Provide a Grounding Electrode System bonded To the service equipment enclosure, grounded Conductors, and grounded electrode conductors Per 2020 NEC 250.50 and 250.104

H-FRAME GROUNDING DETAIL | NO SCALE | 3

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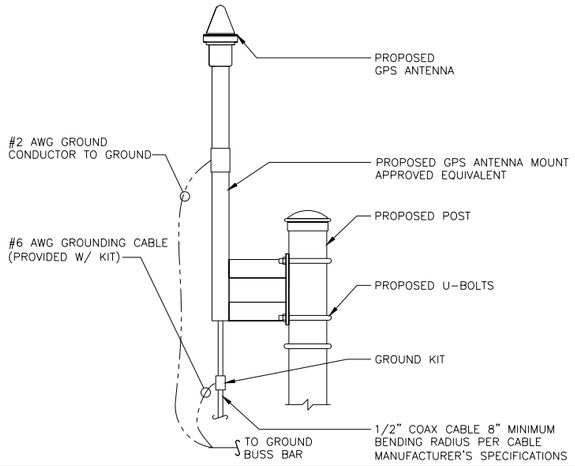
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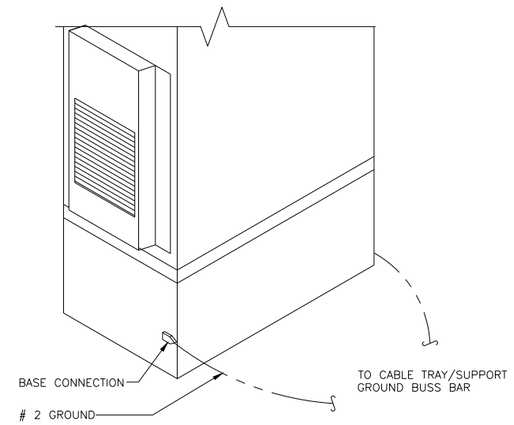
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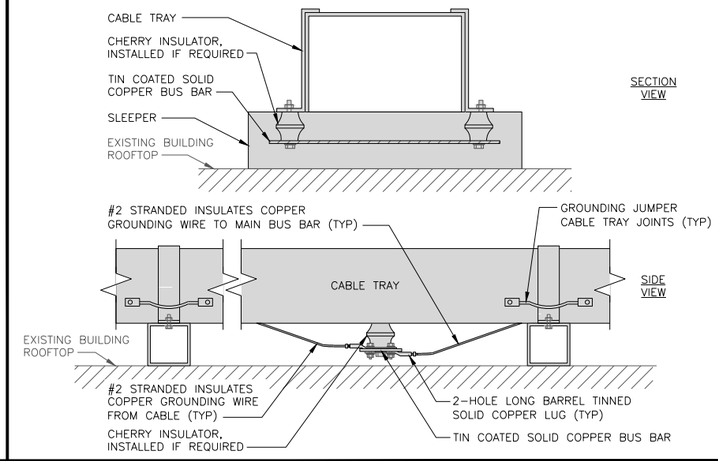
SHEET NUMBER
**G-2**




TYPICAL GPS UNIT GROUNDING | NO SCALE | 1



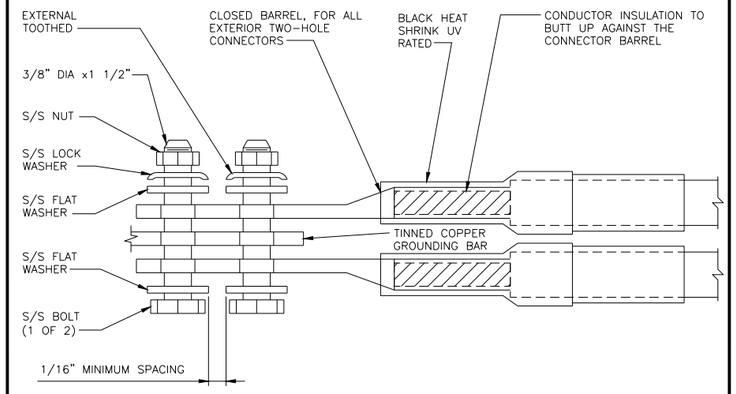

OUTDOOR CABINET GROUNDING | NO SCALE | 2



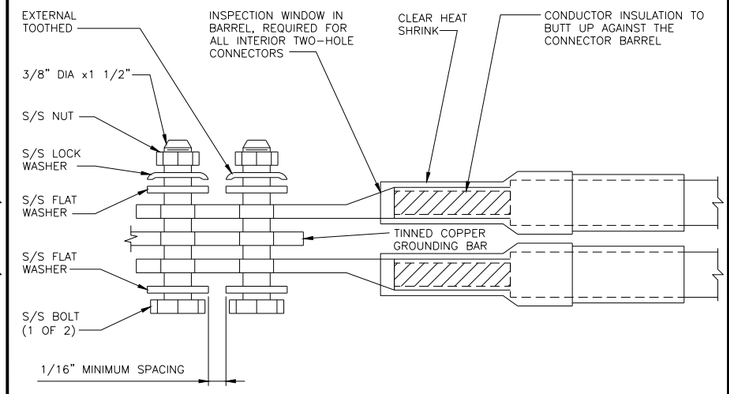

TYPICAL CABLE TRAY GROUND BUSS BAR | NO SCALE | 3

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).

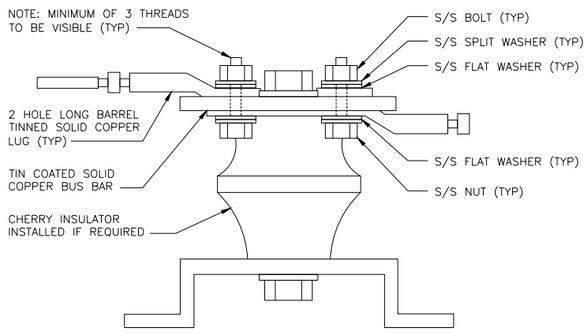
TYPICAL GROUNDING NOTES | NO SCALE | 4



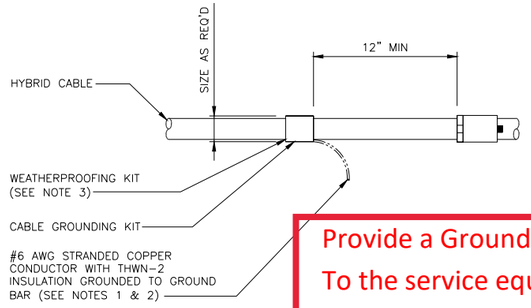

TYPICAL EXTERIOR TWO HOLE LUG | NO SCALE | 5



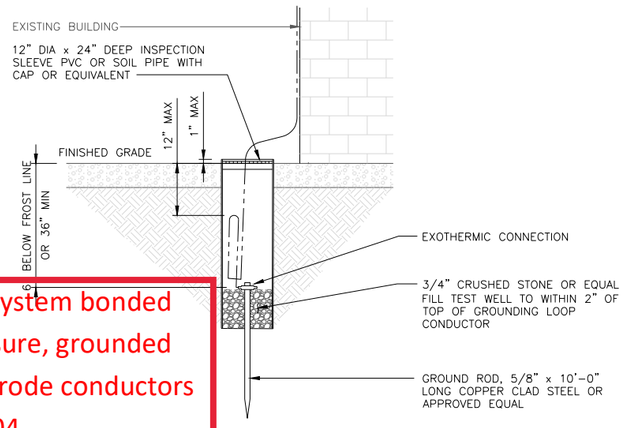

TYPICAL INTERIOR TWO HOLE LUG | NO SCALE | 6




LUG DETAIL | NO SCALE | 7




CONNECTION OF HYBRID CABLE GROUNDING KIT TO HYBRID TRUNK | NO SCALE | 8




TYPICAL GROUND ROD WITH INSPECTION SLEEVE DETAIL | NO SCALE | 9

Provide a Grounding Electrode System bonded
To the service equipment enclosure, grounded
Conductors, and grounded electrode conductors
Per 2020 NEC 250.50 and 250.104

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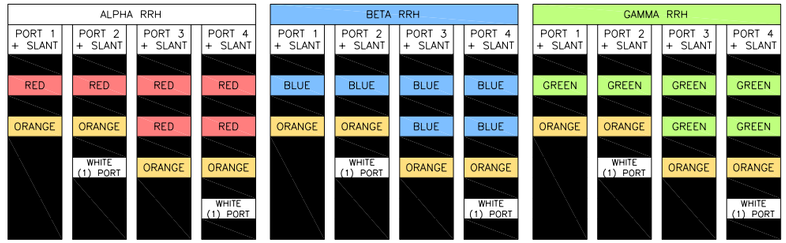
SHEET NUMBER
G-3

## RF JUMPER COLOR CODING

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

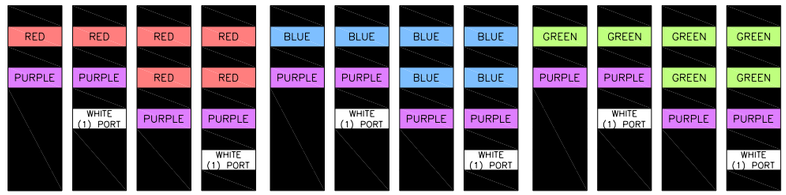
LOW-BAND RRH –
(600MHz N71 BASEBAND) +
(850MHz N26 BAND) +
(700MHz N29 BAND) – OPTIONAL PER MARKET

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




MID-BAND RRH –
(AWS BANDS N66+N70)

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

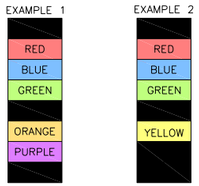



### HYBRID/DISCREET CABLES

INCLUDE SECTOR BANDS BEING SUPPORTED AM LONG WITH FREQUENCY BANDS

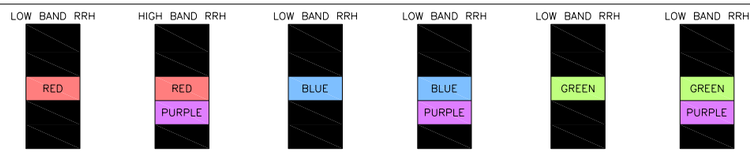
EXAMPLE 1 – HYBRID, OR DISCREET, SUPPORTS ALL SECTORS, BOTH LOW-BANDS AND MID-BANDS

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



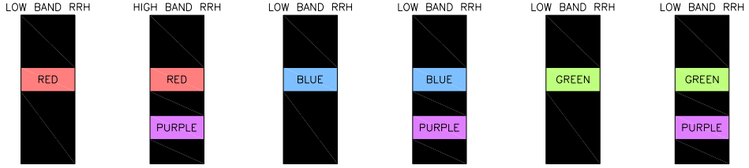

### HYBRID/DISCREET CABLES

LOW-BAND RRH FIBER CABLES HAVE SECTOR STRIPE ONLY

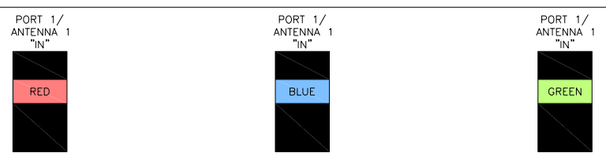



### POWER CABLES TO RRHs

LOW-BAND RRH POWER CABLES HAVE SECTOR STRIPE ONLY



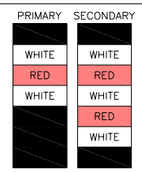

### RET MOTORS AT ANTENNAS




### MICROWAVE RADIO LINKS

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

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




RF CABLE COLOR CODES | NO SCALE | 1

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

AWS
(N65+N70+H-BLOCK)
PURPLE

CBRS TECH
(3 GHz)
YELLOW

NEGATIVE SLANT PORT
ON ANTRRH
WHITE

ALPHA SECTOR
RED

BETA SECTOR
BLUE

GAMMA SECTOR
GREEN

COLOR IDENTIFIER | NO SCALE | 2

THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

NOT USED | NO SCALE | 3

NOT USED | NO SCALE | 4

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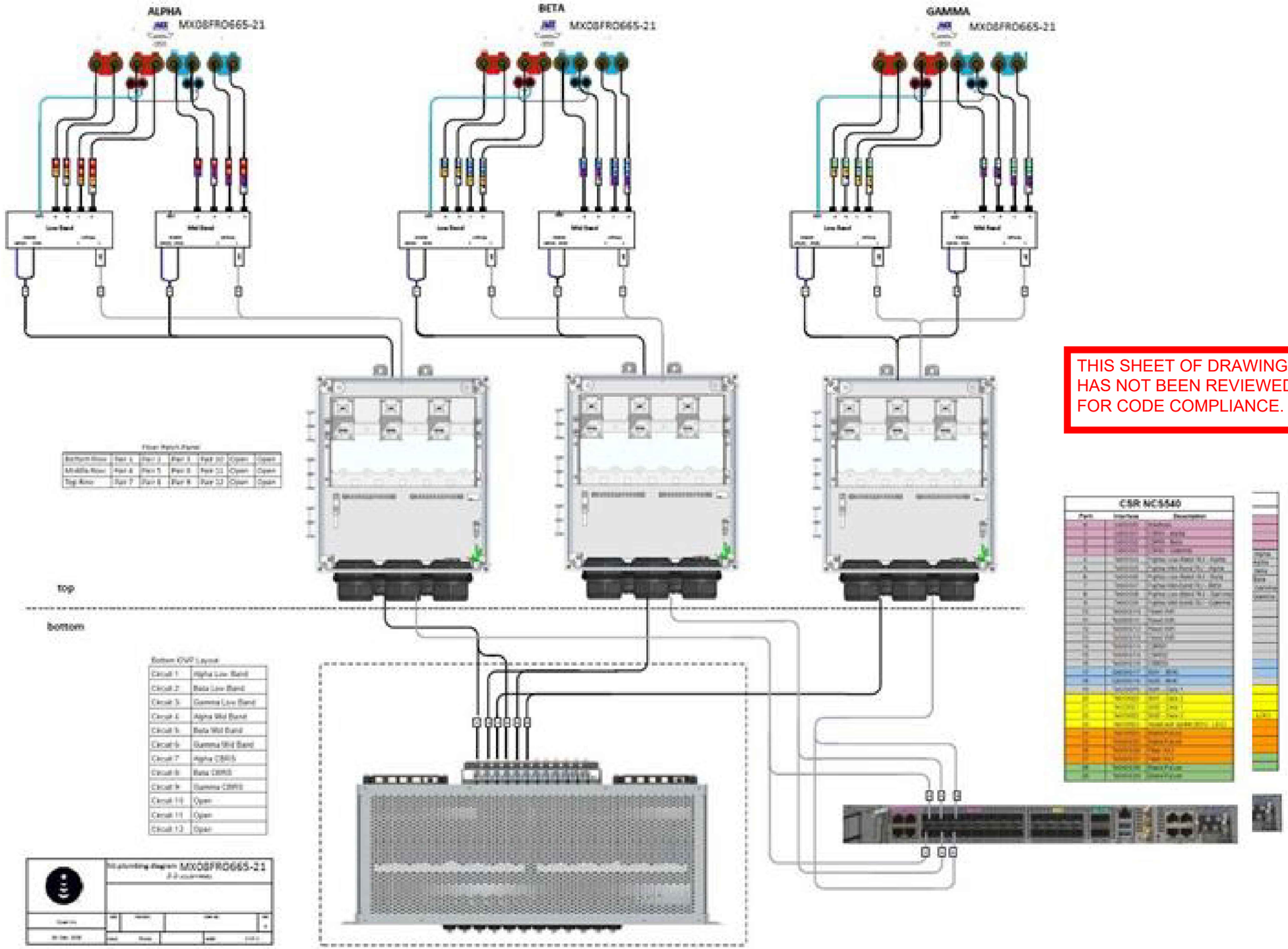
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| 1 | 04/29/2021 | ISSUED FOR CONSTRUCTION |

A&E PROJECT NUMBER
250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
1444 S POTOMAC STREET
AURORA, CO 80012

SHEET TITLE
RF
CABLE COLOR CODE

SHEET NUMBER
**RF-1**




THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

PLUMBING DIAGRAM | NO SCALE | 1

dish wireless.
5701 SOUTH SANTA FE DRIVE
LITTLETON, CO 80120

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-3530
OFFICE: (919) 661-6351
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COLORADO LICENSED
NICHOLAS M. COMBATTA
45607
PROFESSIONAL ENGINEER

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| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| RS | JDS | --- |

RFDS REV #: 001

CONSTRUCTION DOCUMENTS

SUBMITTALS

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SHEET TITLE
RF
PLUMBING DIAGRAM

SHEET NUMBER
**RF-2**

# RF EQUIPMENT INFORMATION

| | | | |
|---|---|---|---|
| **Issue Date/Revision** | 3/28/2021 | **Revision:** 0 | |
| **Site ID** | DNDEN00092B | | |
| **Site Address** | 1444 South Potomac St, Aurora CO 80012 | | |
| **Structure Type** | Rooftop | | |
| ***sectors >20' apart?*** | *Yes* | ***Confirmed RAD?*** Confirmed | 60 |

| | | |
|---|---|---|
| **Latitude** | 39.690671 | **Longitude** -104.8301815143 |
| **Prequal Asset ID** | | |
| **SOW / RF Comments** | Dish proposes to place 3 antennas, 6 RRUs, 3 junction box(s), and 6 cable(s) at the 60 foot RAD. Dish will require a 5x7 lease area for ground equipment. | |

| | Sector 1 (alpha) | | | Sector 2 (beta) | | | Sector 3 (gamma) | | |
|---|---|---|---|---|---|---|---|---|---|
| **ANTENNA** | | | | | | | | | |
| Antenna # | 1 | 4 | 7 | 2 | 5 | 8 | 3 | 6 | 9 |
| Manufacturer | JMA | | | JMA | | | JMA | | |
| Model Number | MX08FRO665-21 | | | MX08FRO665-21 | | | MX08FRO665-21 | | |
| Dimensions H x W x D (in) | 72.0" x 20.0" x 8.0" | | | 72.0" x 20.0" x 8.0" | | | 72.0" x 20.0" x 8.0" | | |
| Weight (lbs.) | 64.5 | | | 64.5 | | | 64.5 | | |
| TX Power Output (watts) | 139.56 | | | 139.56 | | | 139.56 | | |
| ERP (watts) | 14735.10 | | | 14735.10 | | | 14735.10 | | |
| RAD Centerline Height (ft.) | 60 | | | 60 | | | 60 | | |
| Azimuths | 0 | | | 120 | | | 240 | | |
| Mech Down Tilt | 0 | | | 0 | | | 0 | | |
| Elec Down Tilt | 2 | | | 2 | | | 2 | | |
| Default Mount | TRPD-HD | | | TRPD-HD | | | TRPD-HD | | |
| **LOW BAND/RADIO #1** | | | | | | | | | |
| Manufacturer | Fujitsu | | | Fujitsu | | | Fujitsu | | |
| Model Number | TA08025-B605 | | | TA08025-B605 | | | TA08025-B605 | | |
| Dimensions H x W x D (in.) | 15.75" x 14.96" x 9.06" | | | 15.75" x 14.96" x 9.06" | | | 15.75" x 14.96" x 9.06" | | |
| Weight (lbs.) | 74.95 | | | 74.95 | | | 74.95 | | |
| Location | Cabinet | | | Cabinet | | | Cabinet | | |
| Technology | n71 \|n29 \| | | | n71 \|n29 \| | | | n71 \|n29 \| | | |
| Quantity | 1 | | | 1 | | | 1 | | |
| Port Assignment | Port 1-4 | | | Port 1-4 | | | Port 1-4 | | |
| **MID BAND/RADIO #2** | | | | | | | | | |
| Manufacturer | Fujitsu | | | Fujitsu | | | Fujitsu | | |
| Model Number | TA08025-B604 | | | TA08025-B604 | | | TA08025-B604 | | |
| Dimensions H x W x D (in) | 15.75" x 14.96" x 7.87" | | | 15.75" x 14.96" x 7.87" | | | 15.75" x 14.96" x 7.87" | | |
| Weight (lbs.) | 63.93 | | | 63.93 | | | 63.93 | | |
| Location | Cabinet | | | Cabinet | | | Cabinet | | |
| Quantity | 1 | | | 1 | | | 1 | | |
| Technology | n70 \|n66 | | | n70 \|n66 | | | n70 \|n66 | | |
| Port Assignment | Port 5-8 | | | Port 5-8 | | | Port 5-8 | | |
| **OVP (Junction Box)** | | | | | | | | | |
| Manufacturer | Raycap | | | Raycap | | | Raycap | | |
| Model Number | RDIDC-3045-PF-48 | | | RDIDC-3045-PF-48 | | | RDIDC-3045-PF-48 | | |
| Dimensions H x W x D (in.) | 16.58" x 14.58" x 8.46" | | | 16.58" x 14.58" x 8.46" | | | 16.58" x 14.58" x 8.46" | | |
| Weight (lbs.) | 21.85 | | | 21.85 | | | 21.85 | | |
| Quantity | 1 | | | 1 | | | 1 | | |
| **LINE DETAILS** | | | | | | | | | |
| Line Type | Power | Fiber | | Power | Fiber | | Power | Fiber | |
| Manufacturer | NWS | NWS | | NWS | NWS | | NWS | NWS | |
| Model Number | DC-D06C08-XXXFT_8AWG | FT-LCULCU-D8SMA-XXXFT | | DC-D06C08-XXXFT_8AWG | FT-LCULCU-D8SMA-XXXFT | | DC-D06C08-XXXFT_8AWG | FT-LCULCU-D8SMA-XXXFT | |
| Diameter (O.D. in.) | 0.790" | 0.33" | | 0.790" | 0.33" | | 0.790" | 0.33" | |
| Weight (lbs. per ft.) | .375 lbs/ft | TBD | | .375 lbs/ft | TBD | | .375 lbs/ft | TBD | |
| Quantity | 1 | 1 | | 1 | 1 | | 1 | 1 | |
| Approx. Cable Length | 90 | 90 | | 90 | 90 | | 90 | 90 | |
| **OTHER EQUIPMENT** | | | | | | | | | |
| Type of Equipment | | | | | | | | | |
| Manufacturer | | | | | | | | | |
| Model Number | | | | | | | | | |
| Dimensions H x W x D (in) | | | | | | | | | |
| Weight (lbs.) | | | | | | | | | |
| Equipment Location | | | | | | | | | |
| Quantity | | | | | | | | | |

| Frequencies | n29 | n66 | n70 | n71 |
|---|---|---|---|---|
| Downlink (TX) | 722 - 728 | 2180 - 2200 | 1995 - 2020 | 642 - 652 |
| Uplink (RX) | - | - | 1915 - 1920 | 688 - 698 |

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SHEET TITLE
RF
DATA SHEET

SHEET NUMBER
**RF-3**

EXOTHERMIC CONNECTION

MECHANICAL CONNECTION

CHEMICAL ELECTROLYTIC GROUNDING SYSTEM

TEST CHEMICAL ELECTROLYTIC GROUNDING SYSTEM

EXOTHERMIC WITH INSPECTION SLEEVE

GROUNDING BAR

GROUND ROD

TEST GROUND ROD WITH INSPECTION SLEEVE

SINGLE POLE SWITCH

DUPLEX RECEPTACLE

DUPLEX GFCI RECEPTACLE

FLUORESCENT LIGHTING FIXTURE
(2) TWO LAMPS 48–T8

SMOKE DETECTION (DC)

EMERGENCY LIGHTING (DC)

SECURITY LIGHT W/PHOTOCELL LITHONIA ALXW
LED–1–25A400/51K–SR4–120–PE–DDBTXD

CHAIN LINK FENCE

WOOD/WROUGHT IRON FENCE

WALL STRUCTURE

LEASE AREA

PROPERTY LINE (PL)

SETBACKS

ICE BRIDGE

CABLE TRAY

WATER LINE

UNDERGROUND POWER

UNDERGROUND TELCO

OVERHEAD POWER

OVERHEAD TELCO

UNDERGROUND TELCO/POWER

ABOVE GROUND POWER

ABOVE GROUND TELCO

ABOVE GROUND TELCO/POWER

WORKPOINT

SECTION REFERENCE

DETAIL REFERENCE

## LEGEND

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

## ABBREVIATIONS

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dish wireless.

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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 AND TOWER OWNER NOC & THE DISH WIRELESS AND TOWER OWNER CONSTRUCTION MANAGER.

2. "LOOK UP" – DISH WIRELESS 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 AND DISH WIRELESS 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 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 AND TOWER OWNER INSTALLATION STANDARDS FOR CONSTRUCTION ACTIVITIES ON DISH WIRELESS 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 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 AUTILITIES 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 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

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 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.

THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

dish wireless.

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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. VERYIFY 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 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".

30. ALL EMPTY/SPARE CONDUITS THAT ARE INSTALLED ARE TO HAVE A METERED MULE TAPE PULL CORD INSTALLED.

THIS SHEET OF DRAWINGS HAS NOT BEEN REVIEWED FOR CODE COMPLIANCE.

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A&E PROJECT NUMBER

250694.445207

DISH WIRELESS PROJECT INFORMATION
SITE ID:
DNDEN00092B
ADDRESS:
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AURORA, CO 80012

SHEET TITLE

GENERAL NOTES

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**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-POTENTAL 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.

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**GN-4**

# (REVISED)
# STRUCTURAL ANALYSIS REPORT

For

Structural plan review is limited to a general survey for code compliance. No review is implied nor was undertaken to verify structural adequacy.

## DEN00092B
1444 S Potomac
1444 South Potomac Street
Aurora, CO 80012

## Antennas Mounted within FRP Enclosures on Non-Penetrating Tri-Pod Ballast Mounts on Roof; Equipment Steel Platform on Roof



**Prepared for:**

TOWER ENGINEERING PROFESSIONALS

dish WIRELESS

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**Dated: May 12, 2021 (Rev. 1)**
December 21, 2020

**Prepared by:**

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HUDSON Design Group LLC

## SCOPE OF WORK:

Hudson Design Group LLC (HDG) has been authorized by Dish Wireless to conduct a structural evaluation of the structure supporting the proposed equipment located in the areas depicted in the latest HDG construction drawings.

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

The following documents were used for our reference:

- Building Plans prepared by Structural Consultants Incorporated dated October 26, 2004.
- Zoning Drawings prepared by Tower Engineering Professionals dated November 5, 2020.

## CONCLUSION SUMMARY:

Based on our evaluation, we have determined that the existing structure **IS CAPABLE** of supporting the proposed equipment loading.

| | Member | Stress Ratio | Pass/Fail |
|---|---|---|---|
| **Roof (Joist 2)** | 26K7 | 90% | **PASS** |

Based on our evaluation, we have determined that the proposed mounts **ARE CAPABLE** of supporting the proposed equipment loading.

| | Member | Controlling Load Case | Stress Ratio | Pass/Fail |
|---|---|---|---|---|
| **Antenna Mount** | 4" Std. Pipe | Bending | 26% | **PASS** |

Reference the table below for the minimum ballast requirements:

| MINIMUM BALLAST REQUIREMENTS | | | |
|---|---|---|---|
| | **Existing (Per Side)** | **Proposed (Per Side)** | **Total** |
| **Number of Blocks** | 0 | 15 | 45 |
| **Size of Blocks** | - | 4"x8"x16" Solid | 4"x8"x16" Solid |
| **Weight of Blocks** | - | 38 lbs. /each | 38 lbs. /each |
| **Total Ballast Weight** | - | 570 lbs. | 1710 lbs. |

*Reference documents attached.

HUDSON Design Group LLC

**APPURTENANCE CONFIGURATION:**

| Appurtenances | Dimensions | Weight | **Elevation | Mount |
|---|---|---|---|---|
| **(3) MX08FR0665-21 Antennas** | 72.0"x20.0"x8.0" | 65 lbs | 48' | FRP Enclosure |
| **(3) TA08025-B604 RRH's** | 14.9"x15.7"x7.8" | 64 lbs | 48' | FRP Enclosure |
| **(3) TA08025-B605 RRH's** | 14.9"x15.7"x9.0" | 75 lbs | 48' | FRP Enclosure |
| **(3) RDIDC-9181-PF-48 Surge Protectors** | 19.0"x14.4"x8.2" | 22 lbs | 48' | FRP Enclosure |
| **DISH Wireless Platform** | 5'-0"x7'-0" | 2153 lbs | 48' | - |

** Proposed equipment shown in bold.*
*** Elevation to antenna centerline.*

**DESIGN CRITERIA:**

| **International Building Code (IBC) 2018, and ASCE 7-16 (Minimum Design Loads for Buildings and Other Structures).** | | |
|---|---|---|
| **Wind** | | |
| Reference Wind Speed: | 115 mph | (ASCE 7-16 Figure 26.6-1B) |
| Exposure Category: | C | (ASCE 7-16 Chapter 26) |
| Risk Category: | II | (ASCE 7-16 Table 1.5-1) |
| **Snow** | | |
| Ground Snow, $P_g$: | 30 | (ASCE 7-16 Figure 7.2-1) |
| Importance Factor ($I_s$): | 1.0 | (ASCE 7-16 Table 1.5-2) |
| Exposure Factor ($C_e$): | 1.0 | (Partially Exposed, Table 7-2) |
| Thermal Factor ($C_t$): | 1.0 | (ASCE 7-16 Table 7-3) |
| Flat Roof Snow Load: | 21 psf | (ASCE 7-16 Equation 7.3-1) |
| Min. Flat Roof Snow Load: | 30 psf | |
| **EIA/TIA-222-H Structural Standards for Steel Antenna Towers and Antenna Supporting Structures** | | |
| **Wind** | | |
| City/Town: | Aurora | |
| County: | Arapahoe | |
| Wind Load: | 107 mph | (TIA-222-H Figure B-2) |
| **Ice** | | |
| Design Ice Thickness ($t_i$): | 0.25 in | (TIA-222-H Figure B-9) |
| Structure Class: | II | (TIA-222-H Table 2-1) |
| Importance Factor ($I_i$): | 1.0 | (TIA-222-H Table 2-3) |
| Factored Thickness of Radial Ice ($t_{iz}$): | 0.26 in | (TIA-222-H Sec. 2.6.10) |

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**EXISTING ROOF CONSTRUCTION:**

The existing roof construction consists of loose laid ballast stones, roofing membrane over rigid insulation over metal decking supported by steel joists, steel beams, and columns.

This office did not conduct an on-site visual survey. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified immediately.

**ANTENNA/RRH/SURGE PROTECOTRS SUPPORT RECOMMENDATIONS:**

The new antennas, RRH's, and Surge Protectors are proposed to be mounted within new FRP enclosures on new pipe masts installed on new non-penetrating tri-pod ballast mounts located on the roof. Reference the table on page 2 for the minimum ballast requirements.

**EQUIPMENT RECOMMENDATIONS:**

The DISH Wireless equipment is proposed to be installed on a new steel platform located on the roof of the existing building.

Limitations and Assumptions:

1. Reference the latest HDG construction drawings for all the equipment locations and details.
2. All detail requirements will be designed and furnished in the construction drawings.
3. All structural members and their connections are assumed to be in good condition and are free from defects with no deterioration to its member capacities.
4. HDG is not responsible for any modifications completed prior to and hereafter which HDG was not directly involved.
5. All antennas, coax cables and waveguide cables are assumed to be properly installed and supported as per the manufacturer requirements.
6. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified as soon as possible.

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**FIELD PHOTOS:**



**Photo 1:** Sample photo illustrating the proposed location of the Alpha sector.



**Photo 2:** Sample photo illustrating the proposed location of the Beta sector.

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**FIELD PHOTOS (CONT.):**



**Photo 3:** Sample photo illustrating the proposed location of the Gamma sector.



**Photo 4:** Sample photo illustrating the proposed location of equipment platform.

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# Wind
# Calculations

**Date:** 5/12/2021
**Project Name:** 1444 S Potomac
**Project No.:** DEN00092B
**Designed By:** LBW **Checked By:** MSC

HUDSON Design Group LLC

# Wind Analysis → FRP Enclosure

Reference Codes:

*-International Building Code 2018 (IBC 2018)*

*-Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)*

| | | | | |
|---|---|---|---|---|
| Structure Classification | | II | | (ASCE 7-16 Table 1.5-1) |
| Basic Wind Speed, V | | 115 | mph | (ASCE 7-16 Figure 26.5-1B) |
| Importance Factor, I | | 1 | | (ASCE 7-16 Table 1.5-2) |
| Exposure Category | | C | | (ASCE 7-16 Section 26.7) |
| Height Above Ground Level, z | | 51 | ft | (Top of Enclosure) |
| Exposure Coefficient, $K_z$ | | 1.09 | | (ASCE 7-16 Table 26.10-1) |
| Wind Directionality Coef., $K_d$ | | 0.90 | | (ASCE 7-16 Section 26.8.2) |
| Topographic Factor, $K_{zt}$ | | 1.00 | | (ASCE 7-16 Table 26.6-1) |
| Ground Elevation Factor, $K_e$ | | 0.83 | | (ASCE 7-16 Table 26.9-1) |
| **Velocity Pressure, $q_z$** | $= 0.00256K_zK_{zt}K_dK_eV^2$ | | | (ASCE 7-16 Equation 26.10-1) |
| | = **27.67** psf | | | |
| Gust and Net Force Coefficient, (GCR) | | 1.90 | | (ASCE 7-16 Section 29.4.1) |
| Projected Area Normal to Wind, $A_f$ | | 18 | $ft^2$ | (6.0 ft x 3.0 ft W) |
| **Area Wind Force, F** | $= q_zGC_fA_f$ | | | (ASCE 7-16 Equation 29.4-2) |
| | = **946.24** psf | | | |

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Design Group LLC

# Non-Penetrating Tri-Pod
# Ballast Mount Calculations

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
Lic. # : KW-06013026
Hudson Design Group LLC

**DESCRIPTION:** New Pipe Mast

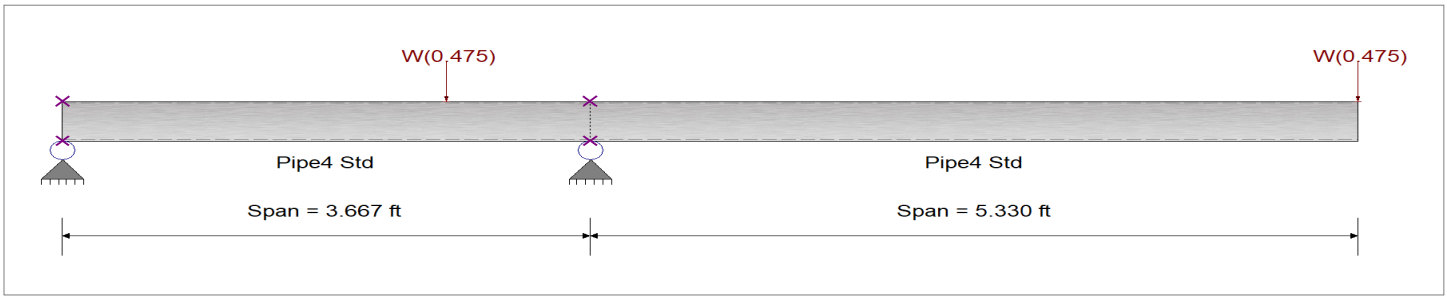
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Load Resistance Factor Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 35.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : W = 0.4750 k @ 2.667 ft, (FRP Enclosure)

Load(s) for Span Number 2
Point Load : W = 0.4750 k @ 5.330 ft, (FRP Enclosure)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.256 : 1 | Maximum Shear Stress Ratio = | 0.040 : 1 |
| Section used for this span | Pipe4 Std | Section used for this span | Pipe4 Std |
| Mu : Applied | 2.717 k-ft | Vu : Applied | 1.110 k |
| Mn * Phi : Allowable | 10.631 k-ft | Vn * Phi : Allowable | 28.067 k |
| Load Combination | +1.20D+0.50Lr+L+W+1.60H | Load Combination | +1.20D+0.50Lr+L+W+1.60H |
| Location of maximum on span | 3.667 ft | Location of maximum on span | 3.667 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

**Maximum Deflection**

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.336 in | Ratio = | 380 >=360. |
| Max Upward Transient Deflection | -0.016 in | Ratio = | 2,752 >=360. |
| Max Downward Total Deflection | 0.219 in | Ratio = | 584 >=180 |
| Max Upward Total Deflection | -0.011 in | Ratio = | 4174 >=180 |

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | Max Stress Ratios V | Summary of Moment Values max Mu + | max Mu - | Mu Max | Mnx | Phi*Mnx | Cb | Rm | Summary of Shear Values VuMax | Vnx | Phi*Vnx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +1.40D+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.020 | 0.003 | | -0.22 | 0.22 | 11.81 | 10.63 | 1.92 | 1.00 | 0.09 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.020 | 0.003 | | -0.22 | 0.22 | 11.81 | 10.63 | 1.00 | 1.00 | 0.08 | 31.19 | 28.07 |
| +1.20D+0.50Lr+1.60L+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.017 | 0.003 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.92 | 1.00 | 0.07 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.017 | 0.002 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.00 | 1.00 | 0.07 | 31.19 | 28.07 |
| +1.20D+1.60L+0.50S+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.017 | 0.003 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.92 | 1.00 | 0.07 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.017 | 0.002 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.00 | 1.00 | 0.07 | 31.19 | 28.07 |
| +1.20D+1.60Lr+L+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.017 | 0.003 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.92 | 1.00 | 0.07 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.017 | 0.002 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.00 | 1.00 | 0.07 | 31.19 | 28.07 |
| +1.20D+1.60Lr+0.50W+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.136 | 0.021 | | -1.45 | 1.45 | 11.81 | 10.63 | 1.89 | 1.00 | 0.59 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.136 | 0.011 | | -1.45 | 1.45 | 11.81 | 10.63 | 1.00 | 1.00 | 0.31 | 31.19 | 28.07 |
| +1.20D+L+1.60S+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.017 | 0.003 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.92 | 1.00 | 0.07 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.017 | 0.002 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.00 | 1.00 | 0.07 | 31.19 | 28.07 |
| +1.20D+1.60S+0.50W+1.60H | | | | | | | | | | | | | |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** New Pipe Mast

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values max Mu + | max Mu - | Mu Max | Mnx | Phi*Mnx | Cb | Rm | Summary of Shear Values VuMax | Vnx | Phi*Vnx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dsgn. L = 3.67 ft | 1 | 0.136 | 0.021 | | -1.45 | 1.45 | 11.81 | 10.63 | 1.89 | 1.00 | 0.59 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.136 | 0.011 | | -1.45 | 1.45 | 11.81 | 10.63 | 1.00 | 1.00 | 0.31 | 31.19 | 28.07 |
| +1.20D+0.50Lr+L+W+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.256 | 0.040 | | -2.72 | 2.72 | 11.81 | 10.63 | 1.89 | 1.00 | 1.11 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.256 | 0.019 | | -2.72 | 2.72 | 11.81 | 10.63 | 1.00 | 1.00 | 0.54 | 31.19 | 28.07 |
| +1.20D+L+0.50S+W+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.256 | 0.040 | | -2.72 | 2.72 | 11.81 | 10.63 | 1.89 | 1.00 | 1.11 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.256 | 0.019 | | -2.72 | 2.72 | 11.81 | 10.63 | 1.00 | 1.00 | 0.54 | 31.19 | 28.07 |
| +0.90D+W+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.251 | 0.039 | | -2.67 | 2.67 | 11.81 | 10.63 | 1.89 | 1.00 | 1.09 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.251 | 0.019 | | -2.67 | 2.67 | 11.81 | 10.63 | 1.00 | 1.00 | 0.53 | 31.19 | 28.07 |
| +1.20D+L+0.20S+E+1.60H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.017 | 0.003 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.92 | 1.00 | 0.07 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.017 | 0.002 | | -0.19 | 0.19 | 11.81 | 10.63 | 1.00 | 1.00 | 0.07 | 31.19 | 28.07 |
| +0.90D+E+0.90H | | | | | | | | | | | | | |
| Dsgn. L = 3.67 ft | 1 | 0.013 | 0.002 | | -0.14 | 0.14 | 11.81 | 10.63 | 1.92 | 1.00 | 0.06 | 31.19 | 28.07 |
| Dsgn. L = 5.33 ft | 2 | 0.013 | 0.002 | | -0.14 | 0.14 | 11.81 | 10.63 | 1.00 | 1.00 | 0.05 | 31.19 | 28.07 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| | 1 | 0.0000 | 0.000 | W Only | -0.0160 | 2.142 |
| W Only | 2 | 0.3360 | 5.330 | | 0.0000 | 2.142 |

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 | Support 3 |
|---|---|---|---|
| Overall MAXimum | -0.561 | 1.511 | |
| Overall MINimum | -0.013 | 0.072 | |
| +D+H | -0.022 | 0.120 | |
| +D+L+H | -0.022 | 0.120 | |
| +D+Lr+H | -0.022 | 0.120 | |
| +D+S+H | -0.022 | 0.120 | |
| +D+0.750Lr+0.750L+H | -0.022 | 0.120 | |
| +D+0.750L+0.750S+H | -0.022 | 0.120 | |
| +D+0.60W+H | -0.359 | 1.026 | |
| +D+0.750Lr+0.750L+0.450W+H | -0.275 | 0.800 | |
| +D+0.750L+0.750S+0.450W+H | -0.275 | 0.800 | |
| +0.60D+0.60W+0.60H | -0.350 | 0.978 | |
| +D+0.70E+0.60H | -0.022 | 0.120 | |
| +D+0.750L+0.750S+0.5250E+H | -0.022 | 0.120 | |
| +0.60D+0.70E+H | -0.013 | 0.072 | |
| D Only | -0.022 | 0.120 | |
| W Only | -0.561 | 1.511 | |
| H Only | | | |

**Date:** 5/12/2021
**Project Name:** 1444 S Potomac
**Project No.:** DEN00092B
**Designed By:** LBW **Checked By:** MSC

HUDSON Design Group LLC

## Ballast Requirements:

***Use SitePro Equation (includes a 1.5 factor of safety for overturning)***

| | | |
|---|---|---|
| Horizontal FRP Enclosure Load, $A_{L1}$ | 950 | lbs. |
| Horizontal Antenna/RRH/Junc.Box Load, $A_{L2}$ | 0 | lbs. |
| Antenna, RRH, $A_W$ | 226 | lbs. |
| Height from roof to center of Antenna, H1 | 5.75 | ft. |
| Height from roof to center of RRH/Junc.Box, H2 | 5.33 | ft. |
| Horizontal Mast Load, $M_L$ | 0 | lbs. |
| Length of Mast, L | 9 | ft. |
| Estimated Tripod Weight, $T_W$ | 570.6 | lbs. |

$W = [(A_{L1} * H1) + (A_{L2} * H2) + (M_L * L/2) - (T_W * 2.92) - (A_W * 2.92)] * 0.515$

| | | |
|---|---|---|
| Total Ballast Required, W | 1615 | lbs. |
| Required Ballast per Tray, W/3 | 538.4 | lbs. |
| ***Total Weight of Tripod & Equipment*** | 796.6 | lbs. |
| ****Ballast is Required*** | | |
| ***No. of Block per side*** | 15 | |
| ***Weight per Block (4x8x16" Solid)*** | 38 | lbs. |
| ***Total Ballast per Side*** | 570 | |

| | | | | |
|---|---|---|---|---|
| = | **538 lbs.** | < | **570 lbs.** | **O.K!** |

***Total Weight of Tripod, Equipment & Ballast*** 2507 lbs.

***Check Sliding***

| | |
|---|---|
| Friction Factor | 0.7 |
| Safety Factor | 1.5 |

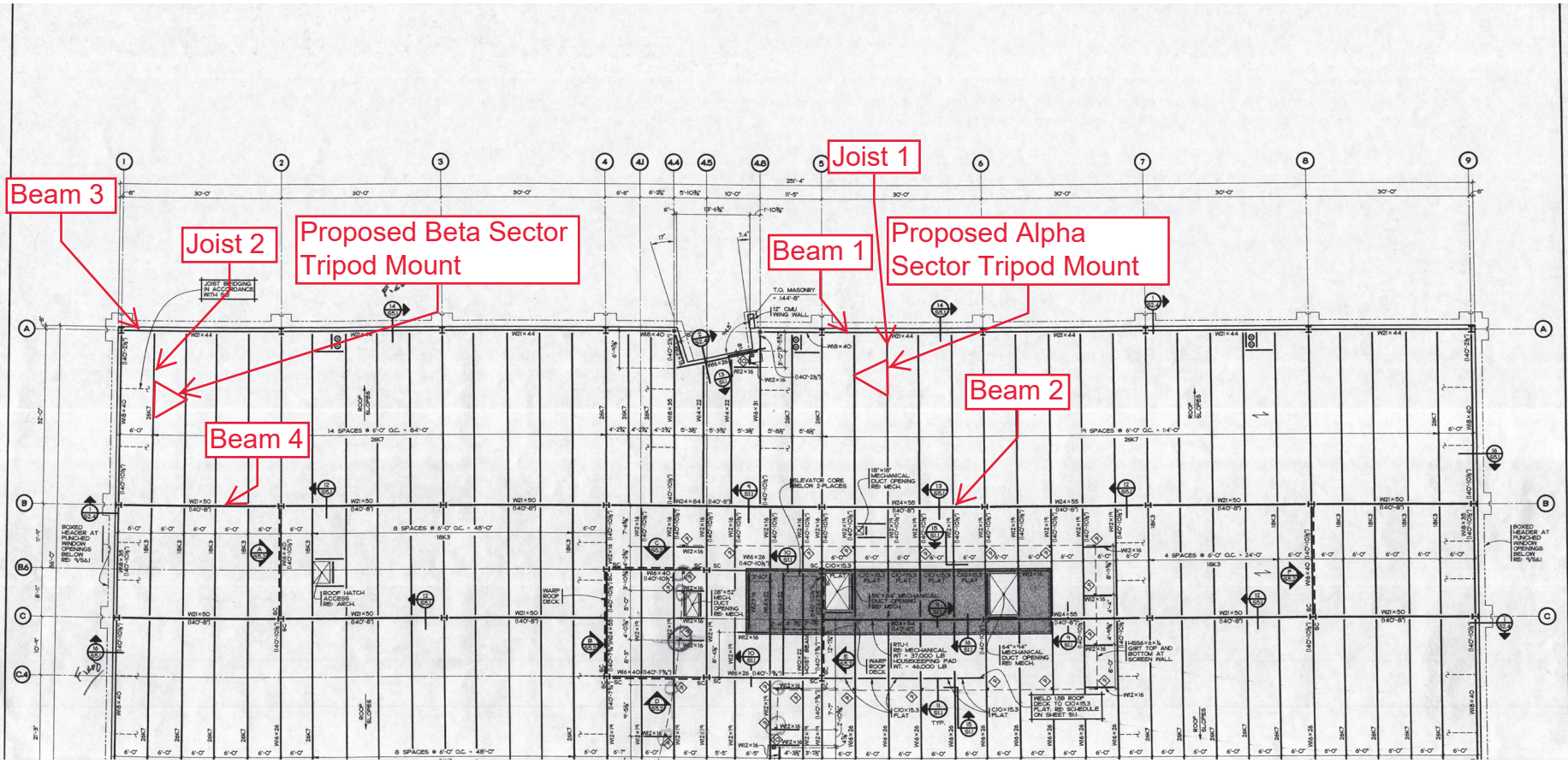
***Sliding =*** $(A_L + M_L)$* SF / Friction Factor

| | | | | |
|---|---|---|---|---|
| = | **2036 lbs.** | < | **2506.6 lbs.** | **O.K!** |

| | | |
|---|---|---|
| ***Total weight of frame and equipment=*** | 2507 | lbs. |
| ***Footprint area under ballast frame=*** | 55.25 | sq. ft. |
| ***Area Load=*** | 45.37 | psf |

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# Roof Framing Calculations




Partnership Architects

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DENVER, COLORADO 80205
303.861.8555 F.303.861.3027

0137 MAIN STREET, UNIT C106
POST OFFICE BOX 2711
EDWARDS, COLORADO 81632
970.926.8960 F.970.926.8961

weyland enterprises, inc.

MedCap PROPERTIES

Structural Consultants Incorporated
3400 E. Bryant Avenue #300
Denver, Colorado 80209
(303) 399-5154, FAX (303) 333-9501
SCI Job Number: 03-333

| ISSUE/REVISION | DATE | NO. |
|---|---|---|
| 50% CD'S | 9/21/04 | |
| 95% CD'S | 10/8/04 | |
| 100% CD'S | 10/26/04 | |

CENTER
RA SOUTH
COLORADO

E BUILDING

**Date:** 5/12/2021
**Project Name:** 1444 S Potomac
**Project No.:** DEN00092B
**Designed By:** LBW **Checked By:** MSC

HUDSON Design Group LLC

## CHECK ROOF JOIST CAPACITY (ALPHA SECTOR ANTENNAS ROOF JOIST 1)

### 26K7

| | | |
|---|---|---|
| Length | 32 | ft.+/- |
| Spacing | 6 | ft.+/- |
| Allowable Distributed on Joist | 432 | plf |
| Max Allowable Moment: | 55296 | ft-lb |

### Load Breakdown

| | | |
|---|---|---|
| Flat Roof Snow Load | 30 | psf |
| | **180** | **plf** |
| Roof Dead Load (Assumed) | | |
| Ballasted Roof System | 20 | psf |
| | **120** | **plf** |
| Joist | **9** | **plf** |
| Total = | **129** | **plf** |

***Antenna mount is assumed to be supported by (2) roof joists***

Point Load 1 = $\frac{2507}{2}$ lbs.

= 1253.5 lbs.

**Date:** 5/12/2021
**Project Name:** 1444 S Potomac
**Project No.:** DEN00092B
**Designed By:** LBW **Checked By:** MSC

HUDSON Design Group LLC

**Calculate Resistant Moment**

Moment = $wl^2/8 + Pab/l$

= 48169.81 ft-lb < 55296 ft-lb **OK!**

**Conclusion**

The roof is capable of supporting the proposed and the existing loads. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified as soon as possible.

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 1

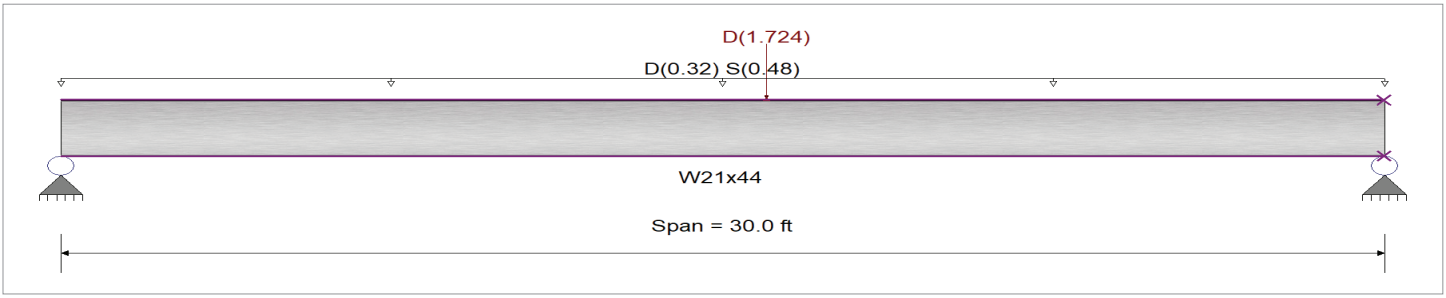
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.724 k @ 16.0 ft, (Roof Joist 1)

Point Load = Tw*D/L = (2507 lbs*22') / 32'

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 16.0 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.451 : 1 | Maximum Shear Stress Ratio = | 0.094 : 1 |
| Section used for this span | W21x44 | Section used for this span | W21x44 |
| Ma : Applied | 107.401 k-ft | Va : Applied | 13.579 k |
| Mn / Omega : Allowable | 238.024 k-ft | Vn/Omega : Allowable | 144.90 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 15.943ft | Location of maximum on span | 30.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

**Maximum Deflection**

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.359 in | Ratio = | 1,001 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.700 in | Ratio = | 514 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.225 | 0.044 | 53.61 | | 53.61 | 397.50 | 238.02 | 1.00 | 1.00 | 6.38 | 217.35 | 144.90 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.451 | 0.094 | 107.40 | | 107.40 | 397.50 | 238.02 | 1.00 | 1.00 | 13.58 | 217.35 | 144.90 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.395 | 0.081 | 93.95 | | 93.95 | 397.50 | 238.02 | 1.00 | 1.00 | 11.78 | 217.35 | 144.90 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.135 | 0.026 | 32.17 | | 32.17 | 397.50 | 238.02 | 1.00 | 1.00 | 3.83 | 217.35 | 144.90 |

### Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.7005 | 15.086 | | 0.0000 | 0.000 |

### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 13.465 | 13.579 |
| Overall MINimum | 3.759 | 3.828 |
| D Only | 6.265 | 6.379 |
| +D+S | 13.465 | 13.579 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 1

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+0.750S | 11.665 | 11.779 |
| +0.60D | 3.759 | 3.828 |
| S Only | 7.200 | 7.200 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 2

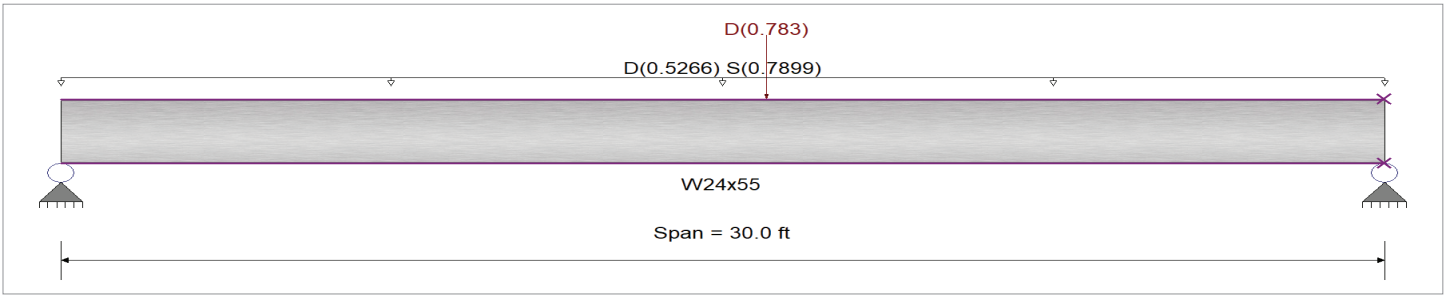
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 0.7830 k @ 16.0 ft, (Roof Joist 1)

Point Load = Tw*D/L = (2507 lbs*10') / 32'

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 26.330 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.478 : 1 | Maximum Shear Stress Ratio = | 0.125 : 1 |
| Section used for this span | W24x55 | Section used for this span | W24x55 |
| Ma : Applied | 159.823 k-ft | Va : Applied | 20.990 k |
| Mn / Omega : Allowable | 334.331 k-ft | Vn/Omega : Allowable | 167.461 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 15.257 ft | Location of maximum on span | 30.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

**Maximum Deflection**

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.369 in | Ratio = | 974 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.661 in | Ratio = | 545 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.212 | 0.055 | 71.03 | | 71.03 | 558.33 | 334.33 | 1.00 | 1.00 | 9.14 | 279.66 | 167.46 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.478 | 0.125 | 159.82 | | 159.82 | 558.33 | 334.33 | 1.00 | 1.00 | 20.99 | 279.66 | 167.46 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.412 | 0.108 | 137.62 | | 137.62 | 558.33 | 334.33 | 1.00 | 1.00 | 18.03 | 279.66 | 167.46 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.127 | 0.033 | 42.62 | | 42.62 | 558.33 | 334.33 | 1.00 | 1.00 | 5.48 | 279.66 | 167.46 |

### Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.6608 | 15.086 | | 0.0000 | 0.000 |

### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 20.938 | 20.990 |
| Overall MINimum | 5.454 | 5.485 |
| D Only | 9.089 | 9.142 |
| +D+S | 20.938 | 20.990 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 2

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+0.750S | 17.976 | 18.028 |
| +0.60D | 5.454 | 5.485 |
| S Only | 11.849 | 11.849 |

**Date:** 5/12/2021
**Project Name:** 1444 S Potomac
**Project No.:** DEN00092B
**Designed By:** LBW **Checked By:** MSC

HUDSON Design Group LLC

## CHECK ROOF JOIST CAPACITY (BETA SECTOR ANTENNAS ROOF JOIST 2)

### 26K7

| | | |
|---|---|---|
| Length | 32 | ft.+/- |
| Spacing | 6 | ft.+/- |
| Allowable Distributed on Joist | 432 | plf |
| Max Allowable Moment: | 55296 | ft-lb |

### Load Breakdown

| | | |
|---|---|---|
| Flat Roof Snow Load | 30 | psf |
| | **180** | **plf** |
| Roof Dead Load (Assumed) | | |
| Ballasted Roof System | 20 | psf |
| | **120** | **plf** |
| Joist | **9** | **plf** |
| Total = | **129** | **plf** |

***Antenna mount is assumed to be supported by (2) roof joists***

Point Load 1 = $\frac{2507}{2}$ lbs.

= 1253.5 lbs.

**Date:** 5/12/2021
**Project Name:** 1444 S Potomac
**Project No.:** DEN00092B
**Designed By:** LBW **Checked By:** MSC

HUDSON Design Group LLC

**Calculate Resistant Moment**

Moment = $wl^2/8 + Pab/l$

= 49423.31 ft-lb < 55296 ft-lb **OK!**

**Conclusion**

The roof is capable of supporting the proposed and the existing loads. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified as soon as possible.

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 3

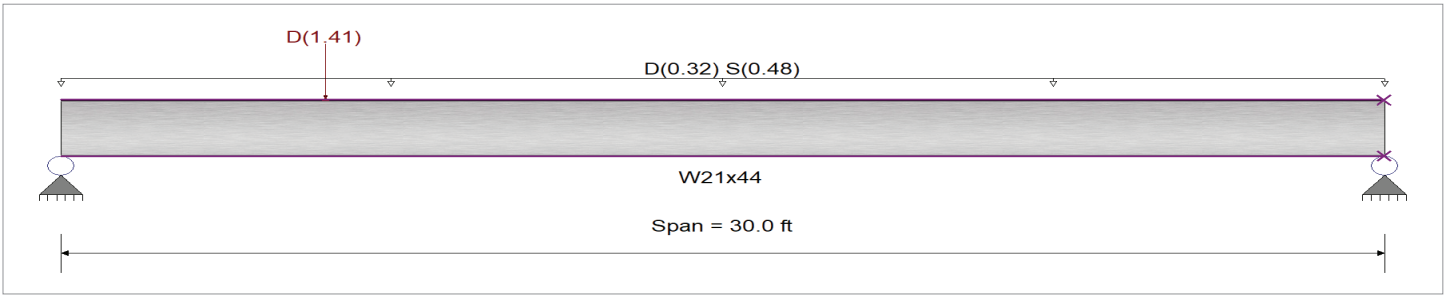
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.410 k @ 6.0 ft, (Roof Joist 2)

Point Load = Tw*D/L = (2507 lbs*18') / 32'

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 16.0 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.417 : 1 | Maximum Shear Stress Ratio = | 0.095 : 1 |
| Section used for this span | W21x44 | Section used for this span | W21x44 |
| Ma : Applied | 99.227 k-ft | Va : Applied | 13.788 k |
| Mn / Omega : Allowable | 238.024 k-ft | Vn/Omega : Allowable | 144.90 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 14.657 ft | Location of maximum on span | 0.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

**Maximum Deflection**

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.359 in | Ratio = | 1,001 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.664 in | Ratio = | 542 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.190 | 0.045 | 45.29 | | 45.29 | 397.50 | 238.02 | 1.00 | 1.00 | 6.59 | 217.35 | 144.90 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.417 | 0.095 | 99.23 | | 99.23 | 397.50 | 238.02 | 1.00 | 1.00 | 13.79 | 217.35 | 144.90 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.360 | 0.083 | 85.73 | | 85.73 | 397.50 | 238.02 | 1.00 | 1.00 | 11.99 | 217.35 | 144.90 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.114 | 0.027 | 27.17 | | 27.17 | 397.50 | 238.02 | 1.00 | 1.00 | 3.95 | 217.35 | 144.90 |

### Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.6641 | 14.914 | | 0.0000 | 0.000 |

### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 13.788 | 12.942 |
| Overall MINimum | 3.953 | 3.445 |
| D Only | 6.588 | 5.742 |
| +D+S | 13.788 | 12.942 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 3

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+0.750S | 11.988 | 11.142 |
| +0.60D | 3.953 | 3.445 |
| S Only | 7.200 | 7.200 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 4

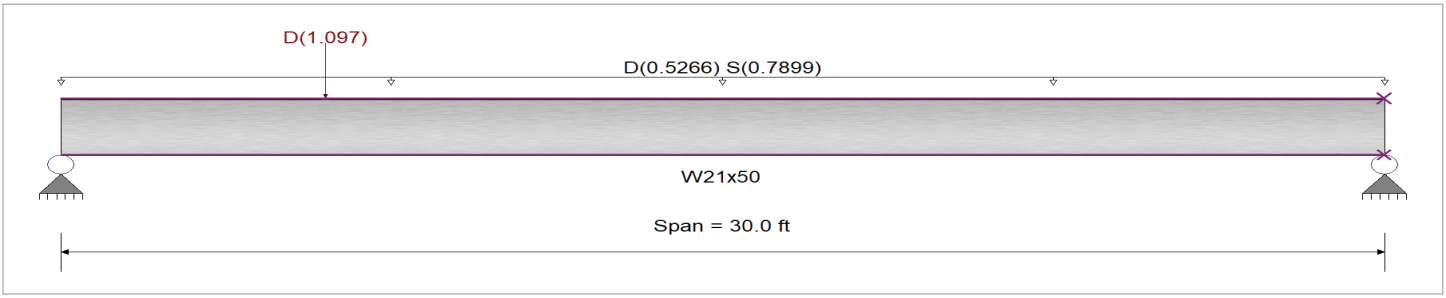
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.097 k @ 6.0 ft, (Roof Joist 2)

Point Load = Tw*D/L = (2507 lbs*14') / 32'

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 26.330 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.572 : 1 | Maximum Shear Stress Ratio = | 0.135 : 1 |
| Section used for this span | W21x50 | Section used for this span | W21x50 |
| Ma : Applied | 157.040 k-ft | Va : Applied | 21.375 k |
| Mn / Omega : Allowable | 274.451 k-ft | Vn/Omega : Allowable | 158.080 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 14.829ft | Location of maximum on span | 0.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

**Maximum Deflection**

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.506 in | Ratio = | 710 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.898 in | Ratio = | 401 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.248 | 0.060 | 68.20 | | 68.20 | 458.33 | 274.45 | 1.00 | 1.00 | 9.53 | 237.12 | 158.08 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.572 | 0.135 | 157.04 | | 157.04 | 458.33 | 274.45 | 1.00 | 1.00 | 21.38 | 237.12 | 158.08 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.491 | 0.116 | 134.83 | | 134.83 | 458.33 | 274.45 | 1.00 | 1.00 | 18.41 | 237.12 | 158.08 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.149 | 0.036 | 40.92 | | 40.92 | 458.33 | 274.45 | 1.00 | 1.00 | 5.72 | 237.12 | 158.08 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.8981 | 15.000 | | 0.0000 | 0.000 |

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 21.375 | 20.717 |
| Overall MINimum | 5.716 | 5.321 |
| D Only | 9.527 | 8.868 |
| +D+S | 21.375 | 20.717 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

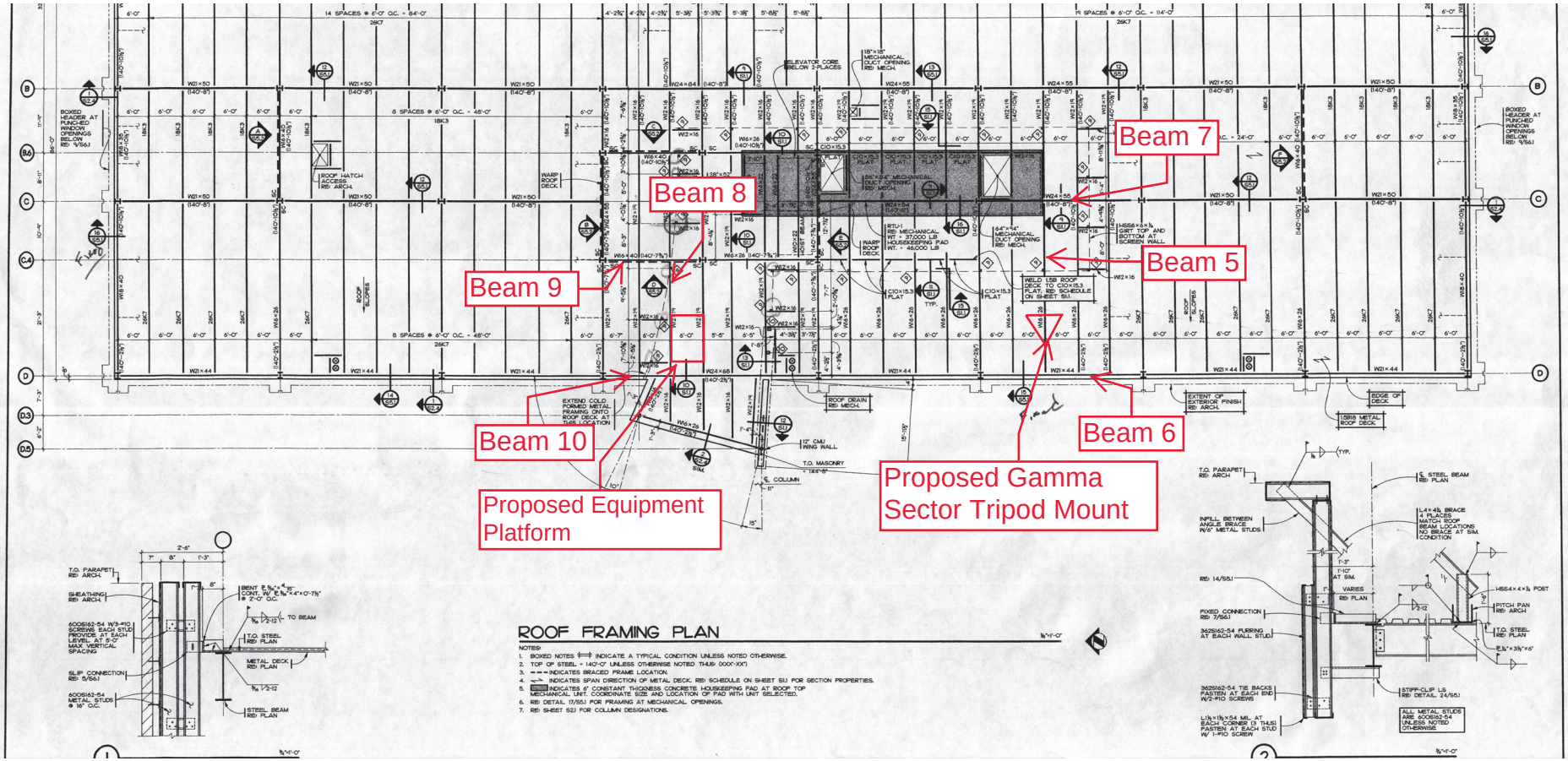
Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 4

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+0.750S | 18.413 | 17.755 |
| +0.60D | 5.716 | 5.321 |
| S Only | 11.849 | 11.849 |




ROOF FRAMING PLAN

NOTES:
1. BOXED NOTES ⟦ INDICATE A TYPICAL CONDITION UNLESS NOTED OTHERWISE.
2. TOP OF STEEL = 140'-0" UNLESS OTHERWISE NOTED THUS (XXX'-XX")
3. - - - INDICATES BRACED FRAME LOCATION.
4. ⇌ INDICATES SPAN DIRECTION OF METAL DECK. REF SCHEDULE ON SHEET S1.1 FOR SECTION PROPERTIES.
5. ▭ INDICATES 6" CONSTANT THICKNESS CONCRETE HOUSEKEEPING PAD AT ROOF TOP MECHANICAL UNIT. COORDINATE SIZE AND LOCATION OF PAD WITH UNIT SELECTED.
6. REF DETAIL 17/S5.1 FOR FRAMING AT MECHANICAL OPENINGS.
7. REF SHEET S2.1 FOR COLUMN DESIGNATIONS.

MEDICAL CENTER OF AURORA SOUTH
AURORA, COLORADO

MEDICAL OFFICE BUILDING

PROGRESS RECORD DOCUMENTS

ROOF FRAMING PLAN

| | |
|---|---|
| DATE | 23 FEB 05 |
| DRAWN BY | JEM |
| CHK'D BY | FEB |
| X-REF FILE | 02-333_S24 |

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SHEET NUMBER: S2.4

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 5

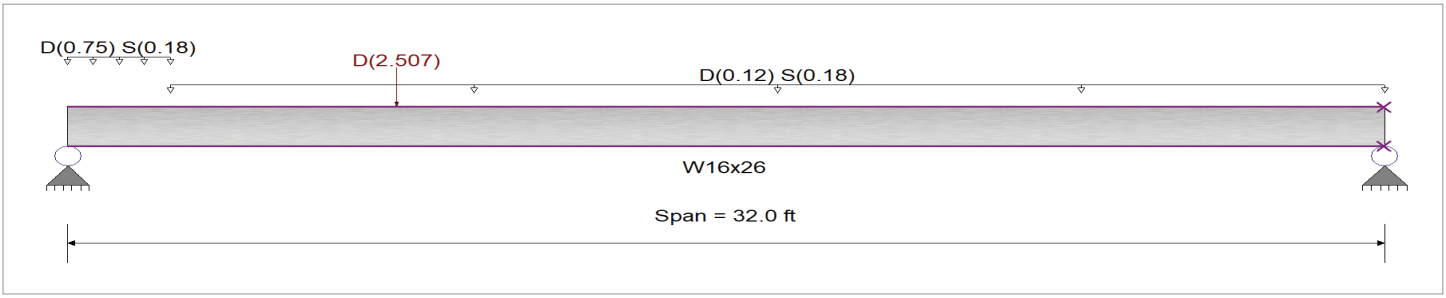
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 2.507 k @ 8.0 ft, (Gamma Sector Tri-Pod Ballast Mount)

Uniform Load : D = 0.020, S = 0.030 ksf, Extent = 2.50 -->> 32.0 ft, Tributary Width = 6.0 ft, (Uniform Loads)

Uniform Load : D = 0.1250, S = 0.030 ksf, Extent = 0.0 -->> 2.50 ft, Tributary Width = 6.0 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.485 : 1 | Maximum Shear Stress Ratio = | 0.122 : 1 |
| Section used for this span | W16x26 | Section used for this span | W16x26 |
| Ma : Applied | 53.467 k-ft | Va : Applied | 8.610 k |
| Mn / Omega : Allowable | 110.279 k-ft | Vn/Omega : Allowable | 70.509 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 13.897 ft | Location of maximum on span | 0.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.489 in | Ratio = | 785 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 1.145 in | Ratio = | 335 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 32.00 ft | 1 | 0.284 | 0.081 | 31.32 | | 31.32 | 184.17 | 110.28 | 1.00 | 1.00 | 5.73 | 117.75 | 70.51 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 32.00 ft | 1 | 0.485 | 0.122 | 53.47 | | 53.47 | 184.17 | 110.28 | 1.00 | 1.00 | 8.61 | 117.75 | 70.51 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 32.00 ft | 1 | 0.434 | 0.112 | 47.82 | | 47.82 | 184.17 | 110.28 | 1.00 | 1.00 | 7.89 | 117.75 | 70.51 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 32.00 ft | 1 | 0.170 | 0.049 | 18.79 | | 18.79 | 184.17 | 110.28 | 1.00 | 1.00 | 3.44 | 117.75 | 70.51 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 1.1453 | 15.634 | | 0.0000 | 0.000 |

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 8.610 | 5.904 |
| Overall MINimum | 2.880 | 1.815 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 5

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| D Only | 5.730 | 3.024 |
| +D+S | 8.610 | 5.904 |
| +D+0.750S | 7.890 | 5.184 |
| +0.60D | 3.438 | 1.815 |
| S Only | 2.880 | 2.880 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 6

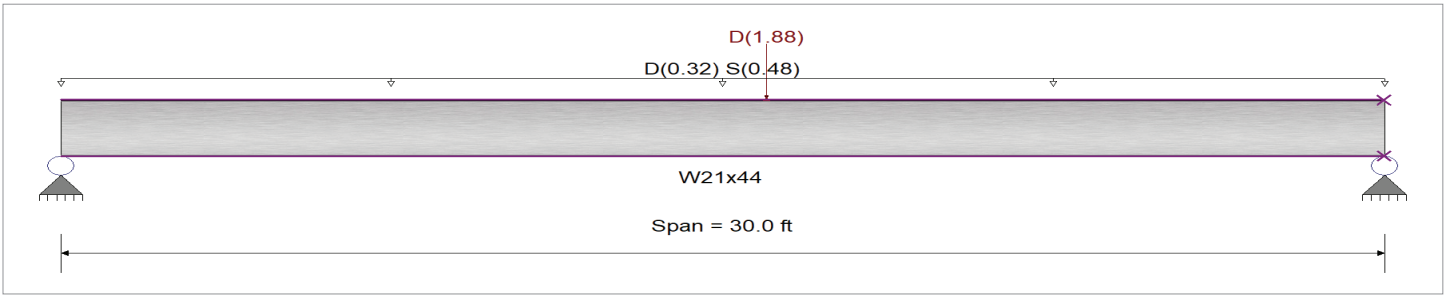
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.880 k @ 16.0 ft, (Beam 5)

Point Load = Tw*D/L = (2507 lbs*24') / 32'

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 16.0 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.456 : 1 | Maximum Shear Stress Ratio = | 0.094 : 1 |
| Section used for this span | W21x44 | Section used for this span | W21x44 |
| Ma : Applied | 108.562 k-ft | Va : Applied | 13.663 k |
| Mn / Omega : Allowable | 238.024 k-ft | Vn/Omega : Allowable | 144.90 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 15.943ft | Location of maximum on span | 30.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.359 in | Ratio = | 1,001 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.707 in | Ratio = | 509 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.230 | 0.045 | 54.78 | | 54.78 | 397.50 | 238.02 | 1.00 | 1.00 | 6.46 | 217.35 | 144.90 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.456 | 0.094 | 108.56 | | 108.56 | 397.50 | 238.02 | 1.00 | 1.00 | 13.66 | 217.35 | 144.90 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.400 | 0.082 | 95.12 | | 95.12 | 397.50 | 238.02 | 1.00 | 1.00 | 11.86 | 217.35 | 144.90 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.138 | 0.027 | 32.87 | | 32.87 | 397.50 | 238.02 | 1.00 | 1.00 | 3.88 | 217.35 | 144.90 |

### Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.7067 | 15.086 | | 0.0000 | 0.000 |

### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 13.537 | 13.663 |
| Overall MINimum | 3.802 | 3.878 |
| D Only | 6.337 | 6.463 |
| +D+S | 13.537 | 13.663 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 6

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+0.750S | 11.737 | 11.863 |
| +0.60D | 3.802 | 3.878 |
| S Only | 7.200 | 7.200 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 7

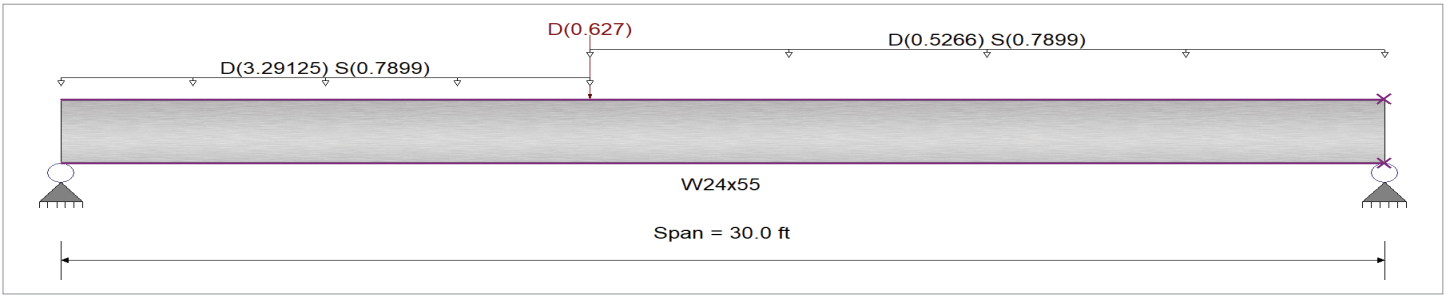
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 0.6270 k @ 12.0 ft, (Beam 5)

Point Load = Tw*D/L = (2507 lbs*8') / 32'

Uniform Load : D = 0.1250, S = 0.030 ksf, Extent = 0.0 -->> 12.0 ft, Tributary Width = 26.330 ft, (Uniform Loads)

Uniform Load : D = 0.020, S = 0.030 ksf, Extent = 12.0 -->> 30.0 ft, Tributary Width = 26.330 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.815 : 1 | Maximum Shear Stress Ratio = | 0.284 : 1 |
| Section used for this span | W24x55 | Section used for this span | W24x55 |
| Ma : Applied | 272.625 k-ft | Va : Applied | 47.489 k |
| Mn / Omega : Allowable | 334.331 k-ft | Vn/Omega : Allowable | 167.461 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 11.486 ft | Location of maximum on span | 0.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.369 in | Ratio = | 974 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 1.103 in | Ratio = | 327 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.568 | 0.213 | 189.80 | | 189.80 | 558.33 | 334.33 | 1.00 | 1.00 | 35.64 | 279.66 | 167.46 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.815 | 0.284 | 272.63 | | 272.63 | 558.33 | 334.33 | 1.00 | 1.00 | 47.49 | 279.66 | 167.46 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.753 | 0.266 | 251.69 | | 251.69 | 558.33 | 334.33 | 1.00 | 1.00 | 44.53 | 279.66 | 167.46 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 30.00 ft | 1 | 0.341 | 0.128 | 113.88 | | 113.88 | 558.33 | 334.33 | 1.00 | 1.00 | 21.38 | 279.66 | 167.46 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 1.1026 | 14.400 | | 0.0000 | 0.000 |

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 47.489 | 27.458 |
| Overall MINimum | 11.849 | 9.366 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 7

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| D Only | 35.641 | 15.610 |
| +D+S | 47.489 | 27.458 |
| +D+0.750S | 44.527 | 24.496 |
| +0.60D | 21.385 | 9.366 |
| S Only | 11.849 | 11.849 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 8

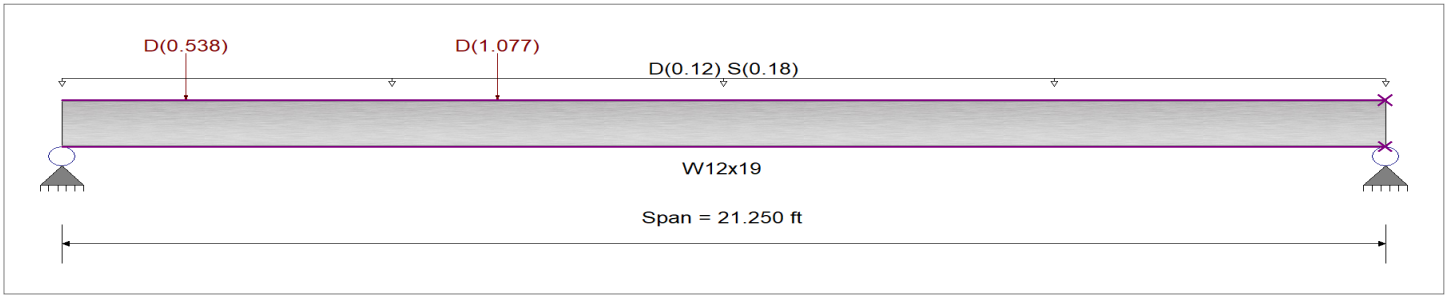
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 6.0 ft, (Uniform Load)

Point Load : D = 1.077 k @ 7.0 ft, (Equipment Platform)

Point Load : D = 0.5380 k @ 2.0 ft, (Equipment Platform)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.366 : 1 | Maximum Shear Stress Ratio = | 0.080 : 1 |
| Section used for this span | W12x19 | Section used for this span | W12x19 |
| Ma : Applied | 22.571 k-ft | Va : Applied | 4.599 k |
| Mn / Omega : Allowable | 61.627 k-ft | Vn/Omega : Allowable | 57.340 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 9.350 ft | Location of maximum on span | 0.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.220 in | Ratio = | 1,158 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.488 in | Ratio = | 523 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

## Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 21.25 ft | 1 | 0.207 | 0.047 | 12.74 | | 12.74 | 102.92 | 61.63 | 1.00 | 1.00 | 2.69 | 86.01 | 57.34 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 21.25 ft | 1 | 0.366 | 0.080 | 22.57 | | 22.57 | 102.92 | 61.63 | 1.00 | 1.00 | 4.60 | 86.01 | 57.34 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 21.25 ft | 1 | 0.326 | 0.072 | 20.07 | | 20.07 | 102.92 | 61.63 | 1.00 | 1.00 | 4.12 | 86.01 | 57.34 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 21.25 ft | 1 | 0.124 | 0.028 | 7.65 | | 7.65 | 102.92 | 61.63 | 1.00 | 1.00 | 1.61 | 86.01 | 57.34 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.4879 | 10.443 | | 0.0000 | 0.000 |

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 4.599 | 3.795 |
| Overall MINimum | 1.612 | 1.129 |
| D Only | 2.686 | 1.882 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 8

## Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+S | 4.599 | 3.795 |
| +D+0.750S | 4.121 | 3.317 |
| +0.60D | 1.612 | 1.129 |
| S Only | 1.913 | 1.913 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 9

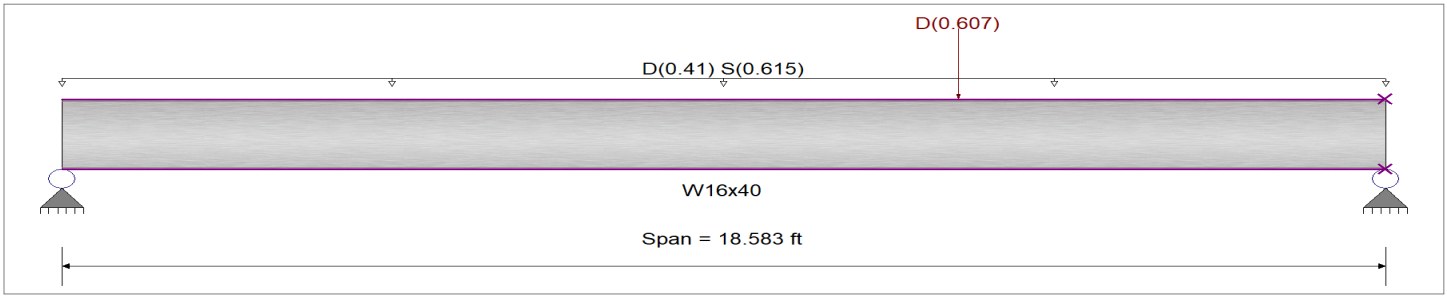
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 0.6070 k @ 12.60 ft, (Beam 8)

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 20.50 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.262 : 1 | Maximum Shear Stress Ratio = | 0.106 : 1 |
| Section used for this span | W16x40 | Section used for this span | W16x40 |
| Ma : Applied | 47.805 k-ft | Va : Applied | 10.307 k |
| Mn / Omega : Allowable | 182.136 k-ft | Vn/Omega : Allowable | 97.60 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 9.451ft | Location of maximum on span | 18.583 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.110 in | Ratio = | 2,020 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 0.199 in | Ratio = | 1121 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 18.58 ft | 1 | 0.117 | 0.047 | 21.28 | | 21.28 | 304.17 | 182.14 | 1.00 | 1.00 | 4.59 | 146.40 | 97.60 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 18.58 ft | 1 | 0.262 | 0.106 | 47.81 | | 47.81 | 304.17 | 182.14 | 1.00 | 1.00 | 10.31 | 146.40 | 97.60 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 18.58 ft | 1 | 0.226 | 0.091 | 41.17 | | 41.17 | 304.17 | 182.14 | 1.00 | 1.00 | 8.88 | 146.40 | 97.60 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 18.58 ft | 1 | 0.070 | 0.028 | 12.77 | | 12.77 | 304.17 | 182.14 | 1.00 | 1.00 | 2.76 | 146.40 | 97.60 |

### Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 0.1989 | 9.345 | | 0.0000 | 0.000 |

### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 10.091 | 10.307 |
| Overall MINimum | 2.626 | 2.756 |
| D Only | 4.377 | 4.593 |
| +D+S | 10.091 | 10.307 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

## Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 9

### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| +D+0.750S | 8.662 | 8.878 |
| +0.60D | 2.626 | 2.756 |
| S Only | 5.714 | 5.714 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

# Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 10

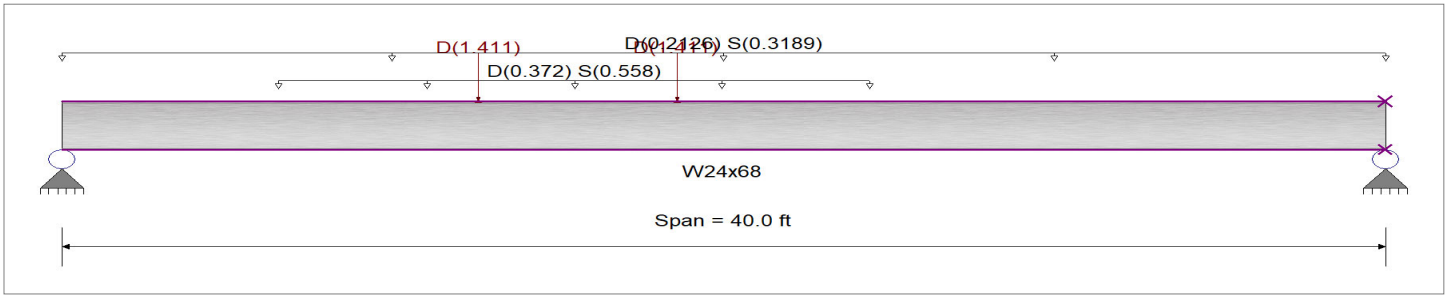
## CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi




### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.411 k @ 12.60 ft, (Beam 8)

Uniform Load : D = 0.020, S = 0.030 ksf, Extent = 6.580 -->> 24.420 ft, Tributary Width = 18.60 ft, (Uniform Loads)

Point Load : D = 1.411 k @ 18.60 ft, (Beam 8)

Uniform Load : D = 0.020, S = 0.030 ksf, Tributary Width = 10.630 ft, (Uniform Loads)

## DESIGN SUMMARY

**Design OK**

| | | | |
|---|---|---|---|
| Maximum Bending Stress Ratio = | 0.599 : 1 | Maximum Shear Stress Ratio = | 0.121 : 1 |
| Section used for this span | W24x68 | Section used for this span | W24x68 |
| Ma : Applied | 264.680 k-ft | Va : Applied | 23.874 k |
| Mn / Omega : Allowable | 441.617 k-ft | Vn/Omega : Allowable | 196.710 k |
| Load Combination | +D+S | Load Combination | +D+S |
| Location of maximum on span | 18.514ft | Location of maximum on span | 0.000 ft |
| Span # where maximum occurs | Span # 1 | Span # where maximum occurs | Span # 1 |

Maximum Deflection

| | | | |
|---|---|---|---|
| Max Downward Transient Deflection | 0.719 in | Ratio = | 667 >=360 |
| Max Upward Transient Deflection | 0.000 in | Ratio = | 0 <360 |
| Max Downward Total Deflection | 1.384 in | Ratio = | 347 >=240. |
| Max Upward Total Deflection | 0.000 in | Ratio = | 0 <240.0 |

### Maximum Forces & Stresses for Load Combinations

| Load Combination / Segment Length | Span # | Max Stress Ratios M | V | Summary of Moment Values Mmax + | Mmax - | Ma Max | Mnx | Mnx/Omega | Cb | Rm | Summary of Shear Values Va Max | Vnx | Vnx/Omega |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D Only | | | | | | | | | | | | | |
| Dsgn. L = 40.00 ft | 1 | 0.290 | 0.058 | 128.10 | | 128.10 | 737.50 | 441.62 | 1.00 | 1.00 | 11.40 | 295.07 | 196.71 |
| +D+S | | | | | | | | | | | | | |
| Dsgn. L = 40.00 ft | 1 | 0.599 | 0.121 | 264.68 | | 264.68 | 737.50 | 441.62 | 1.00 | 1.00 | 23.87 | 295.07 | 196.71 |
| +D+0.750S | | | | | | | | | | | | | |
| Dsgn. L = 40.00 ft | 1 | 0.522 | 0.106 | 230.54 | | 230.54 | 737.50 | 441.62 | 1.00 | 1.00 | 20.75 | 295.07 | 196.71 |
| +0.60D | | | | | | | | | | | | | |
| Dsgn. L = 40.00 ft | 1 | 0.174 | 0.035 | 76.86 | | 76.86 | 737.50 | 441.62 | 1.00 | 1.00 | 6.84 | 295.07 | 196.71 |

### Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|---|---|---|---|---|---|---|
| +D+S | 1 | 1.3837 | 19.543 | | 0.0000 | 0.000 |

Project Title: 1444 S Potomac
Engineer: LBW
Project ID: DEN00092B
Project Descr: NSB

## Steel Beam

File: DEN00092B.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06013026 Hudson Design Group LLC

**DESCRIPTION:** Beam 10

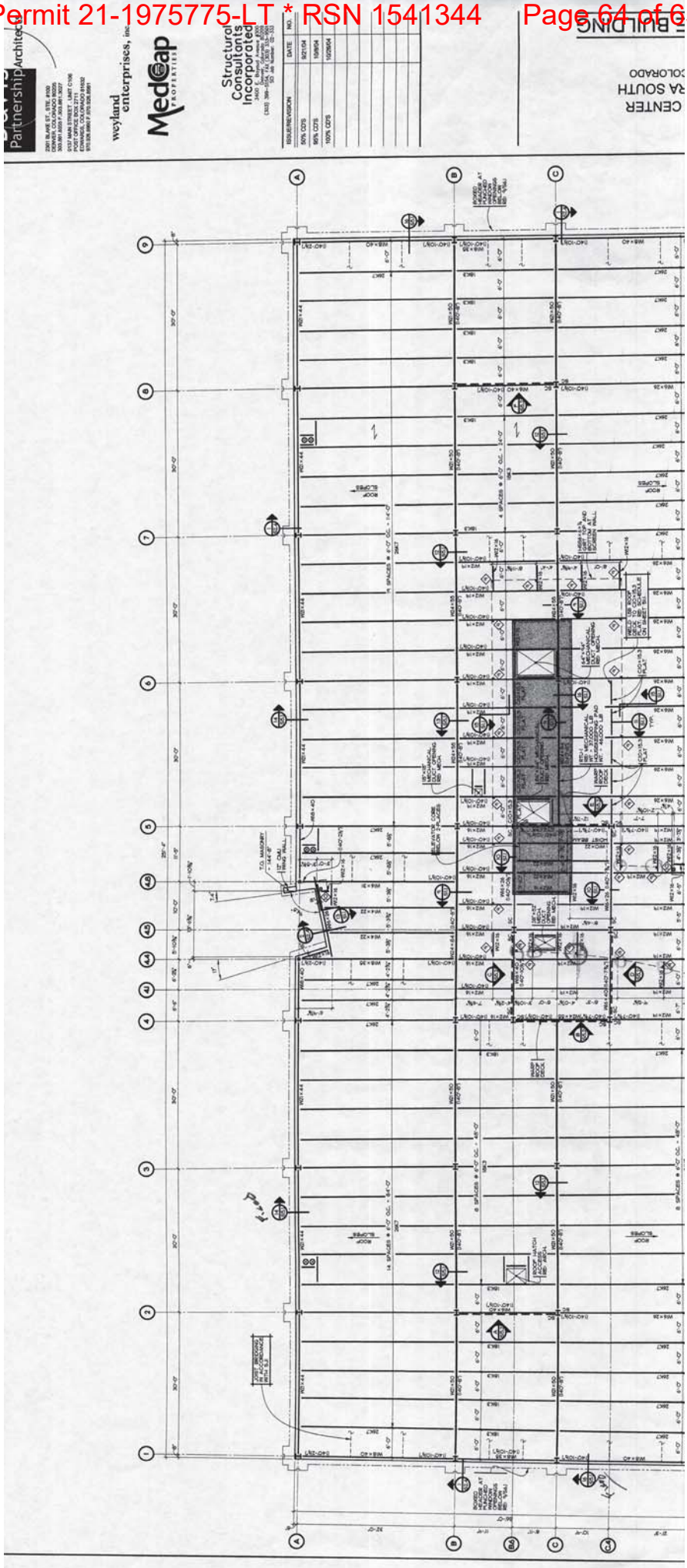
### Vertical Reactions

Support notation : Far left is #1 Values in KIPS

| Load Combination | Support 1 | Support 2 |
|---|---|---|
| Overall MAXimum | 23.874 | 19.520 |
| Overall MINimum | 6.839 | 5.571 |
| D Only | 11.398 | 9.284 |
| +D+S | 23.874 | 19.520 |
| +D+0.750S | 20.755 | 16.961 |
| +0.60D | 6.839 | 5.571 |
| S Only | 12.475 | 10.235 |

HUDSON Design Group LLC

# Reference Documents


Partnership Architects
weyland enterprises, inc.
MedCap PROPERTIES
Structural Consultants Incorporated
ISSUE/REVISION
DATE
NO.
50% CDS
95% CDS
100% CDS
CENTER
SOUTH
COLORADO

MEDICAL OFFICE BUILDING

MEDICAL CENTER
OF AURORA SOUTH
AURORA, COLORADO

PROGRESS
RECORD DOCUMENTS

ROOF FRAMING PLAN

S2.4