



**T-MOBILE SITE NUMBER:**

DN02415A

**T-MOBILE SITE NAME:**

KEEBLER

**CCI SITE#:**

877103

**SITE ADDRESS:**

231 MAIN STREET  
COLORADO SPRINGS, CO 80911

**APPROVAL SIGNATURE BLOCK**

THE FOLLOWING PARTIES HAVE REVIEWED THESE DOCUMENTS:

|                              |  |       |
|------------------------------|--|-------|
| SITE ACQUISITION SPECIALIST: | APPROVED: <input type="checkbox"/><br>REJECTED: <input type="checkbox"/> | DATE: |
| RF ENGINEER:                 | APPROVED: <input type="checkbox"/><br>REJECTED: <input type="checkbox"/> | DATE: |
| CONSTRUCTION MANAGER:        | APPROVED: <input type="checkbox"/><br>REJECTED: <input type="checkbox"/> | DATE: |
| OPERATIONS:                  | APPROVED: <input type="checkbox"/><br>REJECTED: <input type="checkbox"/> | DATE: |
| PROJECT MANAGER:             | APPROVED: <input type="checkbox"/><br>REJECTED: <input type="checkbox"/> | DATE: |

DRAWINGS ARE NO LONGER TO BE "APPROVED WITH COMMENTS" - IF YOU HAVE ANY REDLINES TO THESE DRAWINGS THEN YOU MUST SELECT REJECTED.

# T-Mobile

**T-MOBILE SITE NUMBER:** DN02415A  
**T-MOBILE SITE NAME:** KEEBLER  
**SITE TYPE:** MONOPOLE  
**TOWER HEIGHT:** 60.0 FT

**CROWN CASTLE BU #:** 877103  
**SITE ADDRESS:** 231 MAIN STREET  
 COLORADO SPRINGS, CO 80911  
**COUNTY:** EL PASO  
**JURISDICTION:** COUNTY OF EL PASO,  
 CO / PPRBD

**T-MOBILE 2018 NSD LAT: 38° 45' 6.34", LONG: -104° 44' 31.64"**

T-Mobile  
 18400 E. 22ND AVENUE  
 AURORA, CO 80011

CROWN CASTLE  
 116 INVERNESS DR. EAST STE# 280  
 ENGLEWOOD, CO 80112

T-MOBILE SITE NUMBER:  
 DN02415A

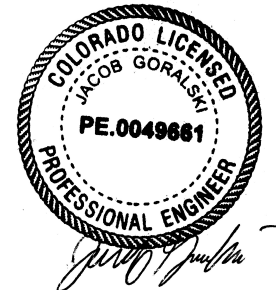
BU #: 877103  
 KEEBLER/COLORADO  
 SPGS/CSP209

231 MAIN STREET  
 COLORADO SPRINGS, CO  
 80911

EXISTING 60.0 FT MONOPOLE

**ISSUED FOR:**

| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
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11/29/2018  
**JACOB GORALSKI, PLLC**  
 CONSULTING ENGINEER  
 JACOB GORALSKI, PLLC  
 CO PE# 0049661  
 1106 COLBI ST.  
 KENNEDALE, TX 76060  
 (817) 456-2621

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SHEET NUMBER: **T-1** REVISION: **1**

**SITE INFORMATION**

**SITE NAME:** KEEBLER/COLORADO SPGS/CSP209  
**SITE ADDRESS:** 231 MAIN STREET  
 COLORADO SPRINGS, CO 80911  
**COUNTY:** EL PASO  
**MAP/PARCEL #:** 65141-03-028  
**AREA OF CONSTRUCTION:** EXISTING  
**LATITUDE:** 38° 45' 6.34"  
**LONGITUDE:** -104° 44' 31.64"  
**LAT/LONG TYPE:** NAD83  
**GROUND ELEVATION:** 5,724 FT  
**CURRENT ZONING:** ----  
**JURISDICTION:** COUNTY OF EL PASO, CO / PPRBD  
**OCCUPANCY CLASSIFICATION:** U  
**TYPE OF CONSTRUCTION:** VB  
**A.D.A. COMPLIANCE:** FACILITY IS UNMANNED AND NOT FOR HUMAN  
 HABITATION  
**PROPERTY OWNER:** GLOBAL SIGNAL ACQUISITIONS IV LLC  
 PO BOX 277455  
 ATLANTA, GA 303384-7455  
**TOWER OPERATOR:** CROWN CASTLE, USA  
 2000 CORPORATE DRIVE  
 CANONSBURG, PA 15317  
**CARRIER/APPLICANT:** T-MOBILE  
 18400 E. 22ND AVENUE  
 AURORA, CO 80011  
**CROWN CASTLE APPLICATION ID:** 443531  
**ELECTRIC PROVIDER:** COLORADO SPRINGS UTILITIES  
 (800) 238-5434  
**TELCO PROVIDER:** CENTURYLINK  
 (800) 244-1111

**DRAWING INDEX**

| SHEET # | SHEET DESCRIPTION                    |
|---------|--------------------------------------|
| T-1     | TITLE SHEET                          |
| T-2     | GENERAL NOTES                        |
| C-1.1   | EQUIPMENT SITE PLAN                  |
| C-1.2   | FINAL SITE PLAN                      |
| C-1.3   | EQUIPMENT PLAN & DIMENSION PLAN      |
| C-2     | TOWER ELEVATION & ANTENNA PLAN       |
| C-3     | EQUIPMENT ELEVATION                  |
| C-4     | PLUMBING & CABLE SPECIFICATIONS      |
| C-5     | EQUIPMENT DETAILS                    |
| C-6     | EQUIPMENT DETAILS                    |
| C-7     | EQUIPMENT DETAILS                    |
| C-8     | MOUNT SPECIFICATION                  |
| E-1     | ELECTRICAL PLAN                      |
| E-2     | ELECTRICAL SPECIFICATIONS            |
| G-1     | EQUIPMENT AND ANTENNA GROUNDING PLAN |
| G-2     | GROUNDING DETAILS                    |
| G-3     | GROUNDING DETAILS                    |

ALL DRAWINGS CONTAINED HEREIN ARE FORMATTED FOR FULL SIZE. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

**PROJECT DESCRIPTION**

THE PURPOSE OF THIS PROJECT IS TO PROPOSE AN ANTENNA MODIFICATION ON AN EXISTING WIRELESS SITE.

**TOWER SCOPE OF WORK:**

- INSTALL (6) PANEL ANTENNAS
- INSTALL (6) RRUs
- INSTALL (2) COVP
- INSTALL (2) HYBRID CABLE LINES
- INSTALL NEW PLATFORM MOUNT

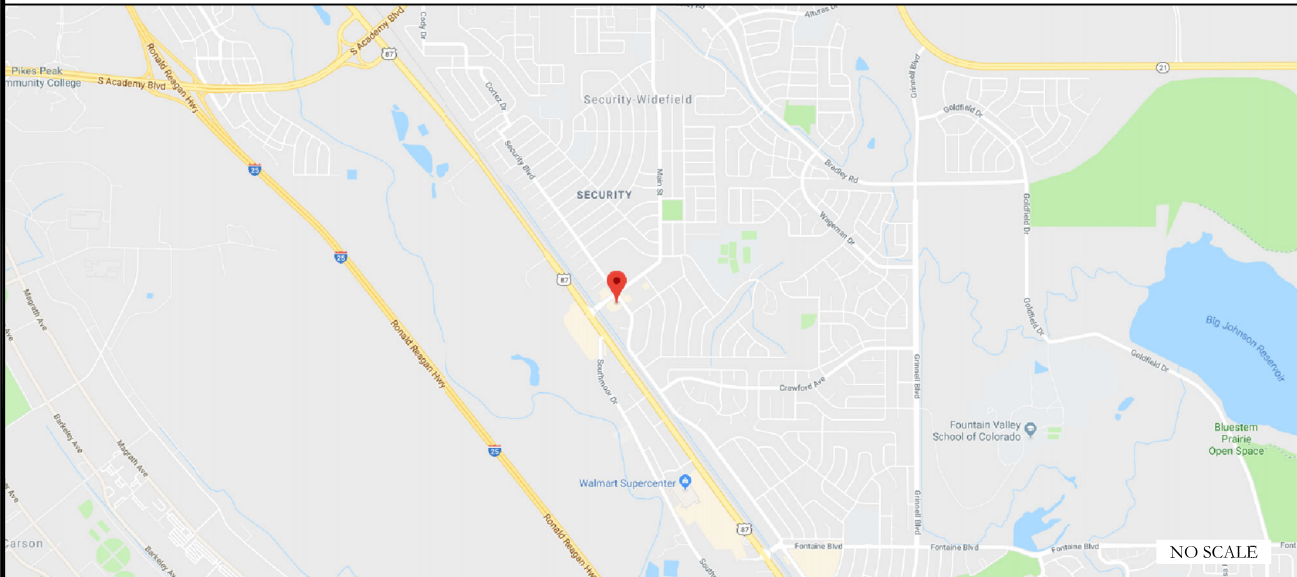
**GROUND SCOPE OF WORK:**

- INSTALLATION OF NEW 8'-0"x8'-0" MODULAR EQUIPMENT PLATFORM WITHIN A NEW 10'-0"x15'-0" LEASE AREA WITHIN THE EXISTING FENCED COMPOUND

DESIGN PACKAGE BASED ON THE RFDS  
 REVISION: R.01  
 DATE: 4/19/2018 1:23:16 PM

DESIGN PACKAGE BASED ON THE APPLICATION  
 ID: 443531  
 REVISION: 2

**LOCATION MAP**



DRIVING DIRECTIONS FROM T-MOBILE LOCAL OFFICE (18400 E. 22ND AVENUE AURORA, CO 80011): HEAD EAST ON E 22ND AVE TOWARD TOWER RD TURN LEFT AT THE 1ST CROSS STREET ONTO TOWER RD TURN RIGHT TO MERGE ONTO I-70 E MERGE ONTO I-70 E TAKE EXIT 289 TOWARD FT COLLINS/COLO SPRINGS USE THE RIGHT 2 LANES TO TURN RIGHT (SIGNS FOR COLO SPRINGS) USE THE RIGHT 3 LANES TO TAKE THE RAMP ONTO E-470 S USE THE RIGHT 2 LANES TO TAKE EXIT 1A FOR INTERSTATE 25 S TOWARD COLO SPRINGS MERGE ONTO I-25 S TAKE EXIT 135 FOR CO-83/ACADEMY BLVD USE THE LEFT 2 LANES TO KEEP LEFT AT THE FORK AND CONTINUE TOWARD S ACADEMY BLVD USE THE LEFT 2 LANES TO TURN LEFT ONTO S ACADEMY BLVD TAKE THE US-85 EXIT TOWARD FOUNTAIN TURN RIGHT ONTO US-85 S/US-87 S (SIGNS FOR FOUNTAIN) TURN LEFT ONTO MAIN ST TURN RIGHT DESTINATION WILL BE ON THE RIGHT

**APPLICABLE CODES/REFERENCE DOCUMENTS**

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 | 2017 NEC |

REFERENCE DOCUMENTS:  
 STRUCTURAL ANALYSIS: BY OTHERS

MOUNT ANALYSIS: BY OTHERS



CALL COLORADO ONE CALL  
 (800) 922-1987  
 CALL 3 WORKING DAYS  
 BEFORE YOU DIG



**SITE PHOTO**



**PROJECT TEAM**

**DESIGNER FIRM:** BROADUS SERVICES  
 4 COUNTRY PLACE CIRCLE  
 DALWORTHINGTON GARDENS, TX 76016  
 PH: (817) 349-3449  
**ENGINEER FIRM:** JACOB GORALSKI, PLLC  
 1106 COLBI ST.  
 KENNEDALE, TX 76060  
 PH: (817) 456-2621  
 CONTACT: JACOB GORALSKI, PLLC  
 116 INVERNESS DR. EAST STE# 280  
 ENGLEWOOD, CO 80112  
 GRANT STEINHAUSER - PROJECT MANAGER  
 GRANT.STEINHAUSER@CROWNCastle.COM  
 (719) 466-9629  
 WALT RAYPOLE - CONSTRUCTION MANAGER  
 WALT.RAYPOLE@CROWNCastle.COM  
 (719) 466-9629  
 BRANDON SAENZ - A&E PROJECT MANAGER  
 BRANDON.SAENZ.CONTRACTOR@CROWNCastle.COM  
 (720) 450-3003  
**T-MOBILE CONTACTS:** MACKENZIE KEYS -  
 MACKENZIE.KEYS2@T-MOBILE.COM





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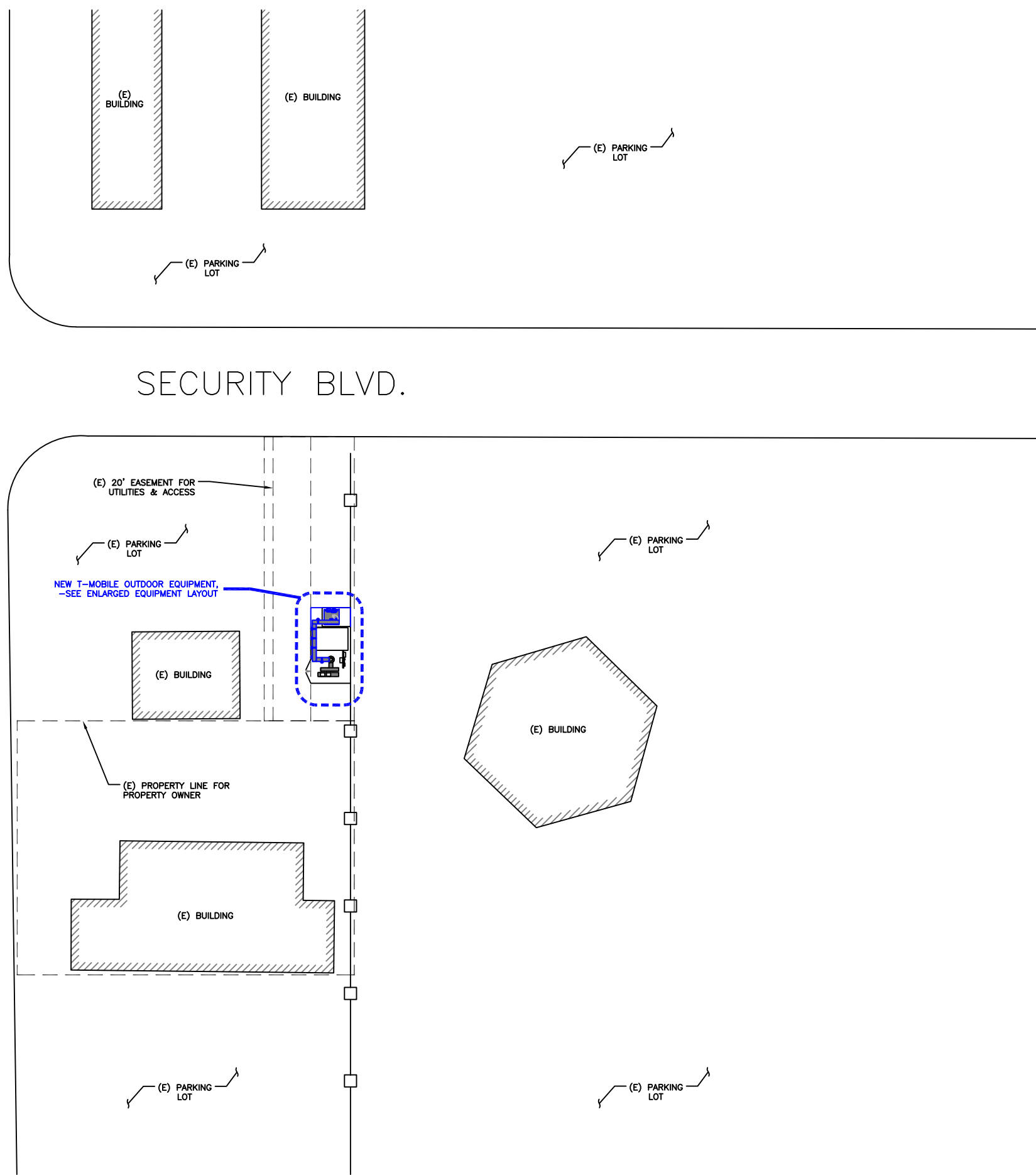


11/29/2018

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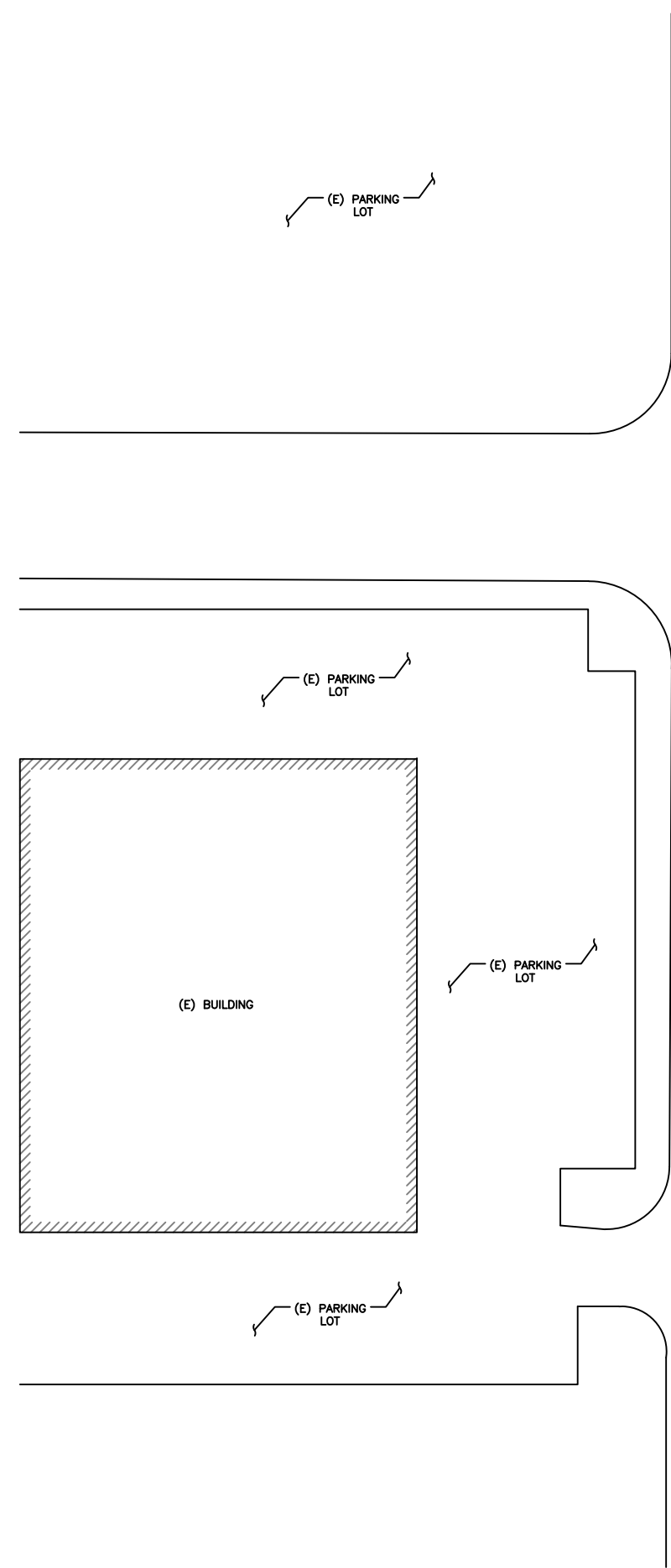
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SHEET NUMBER: **C-1.1** REVISION: **1**



SECURITY BLVD.

MAIN STREET



1 OVERALL SITE PLAN  
 SCALE: NOT TO SCALE





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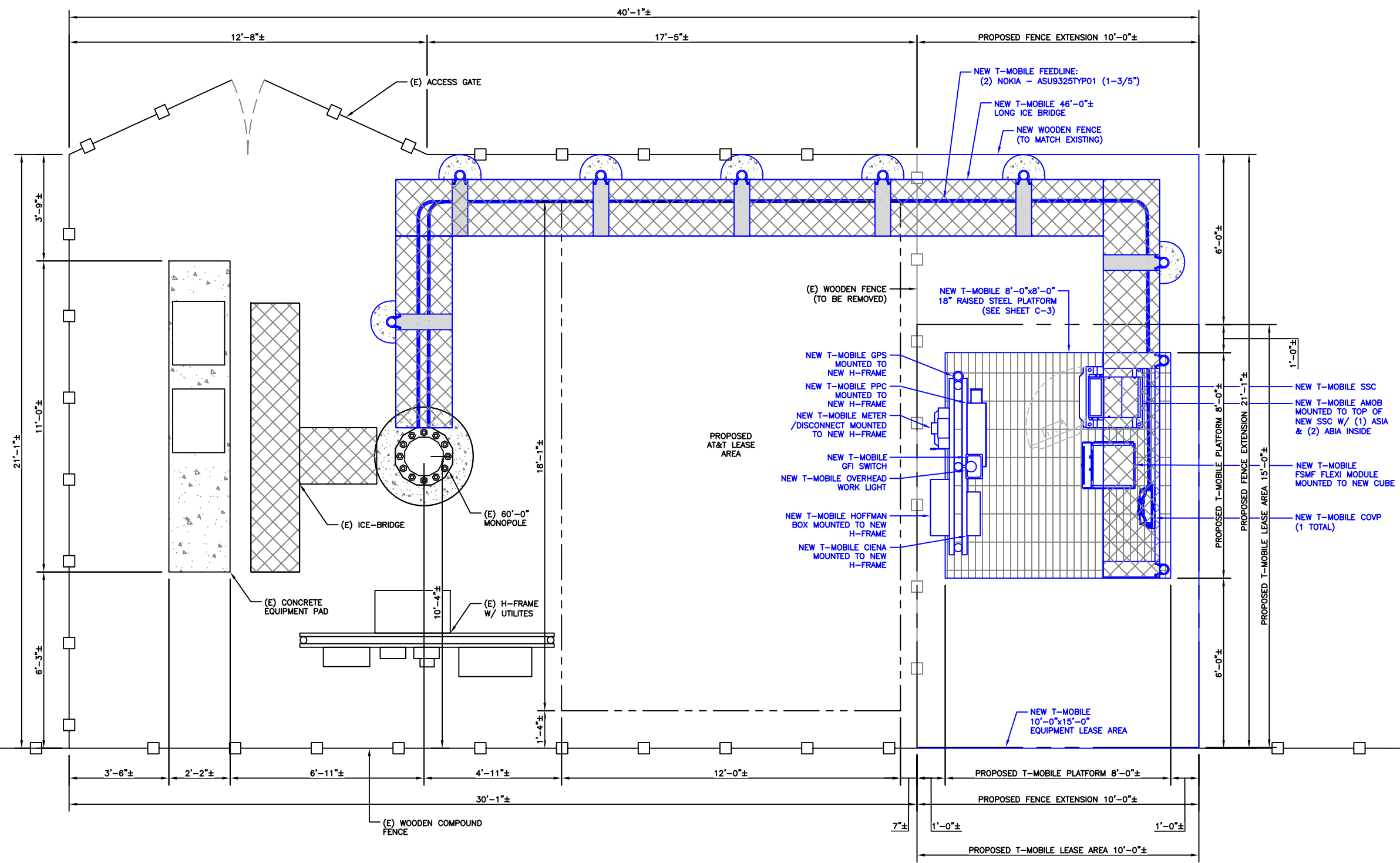
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SHEET NUMBER: **C-1.2** REVISION: **1**



**1 FINAL SITE PLAN**  
 SCALE: 1/2"=1'-0" (FULL SIZE)  
 1/4"=1'-0" (11x17)



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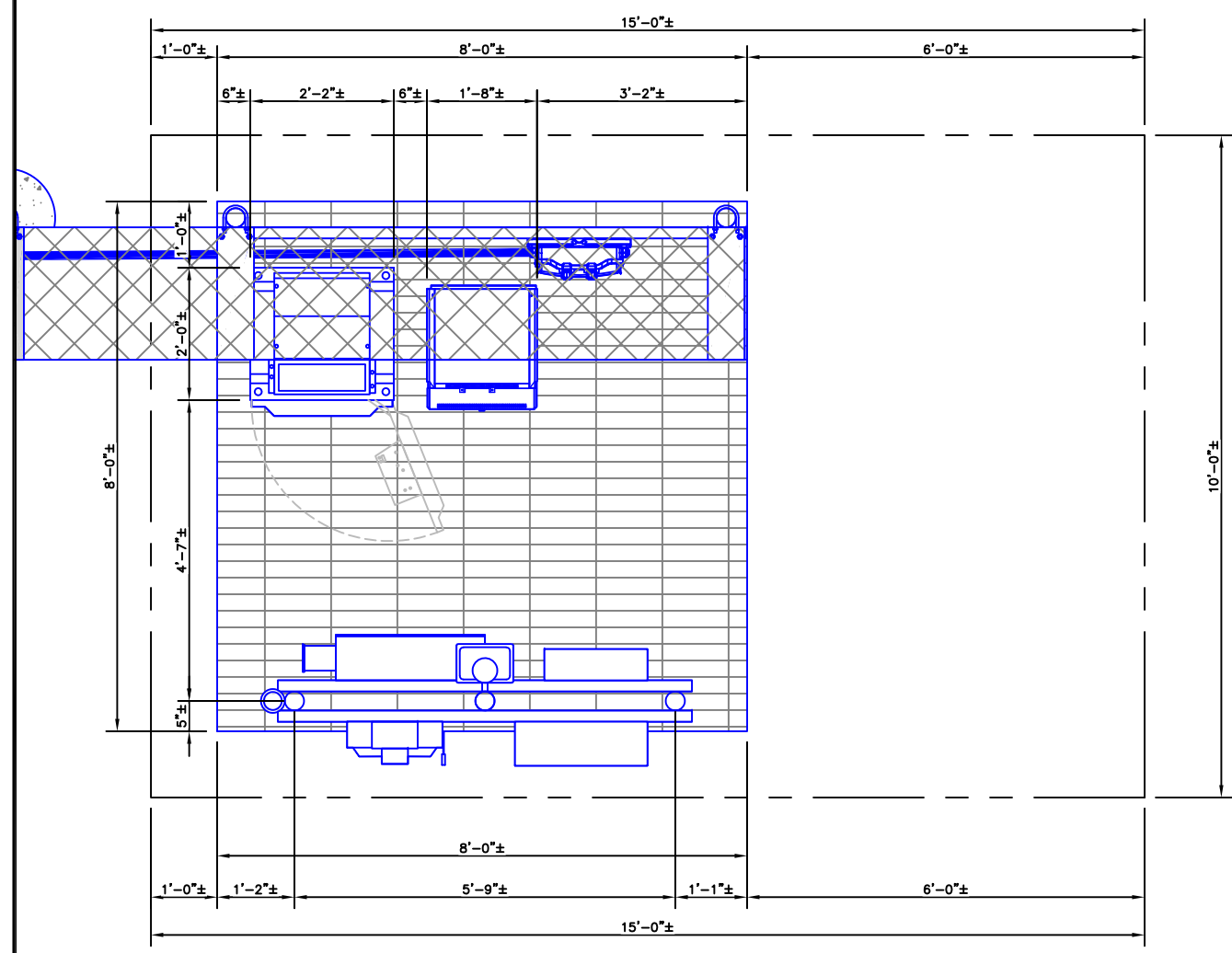
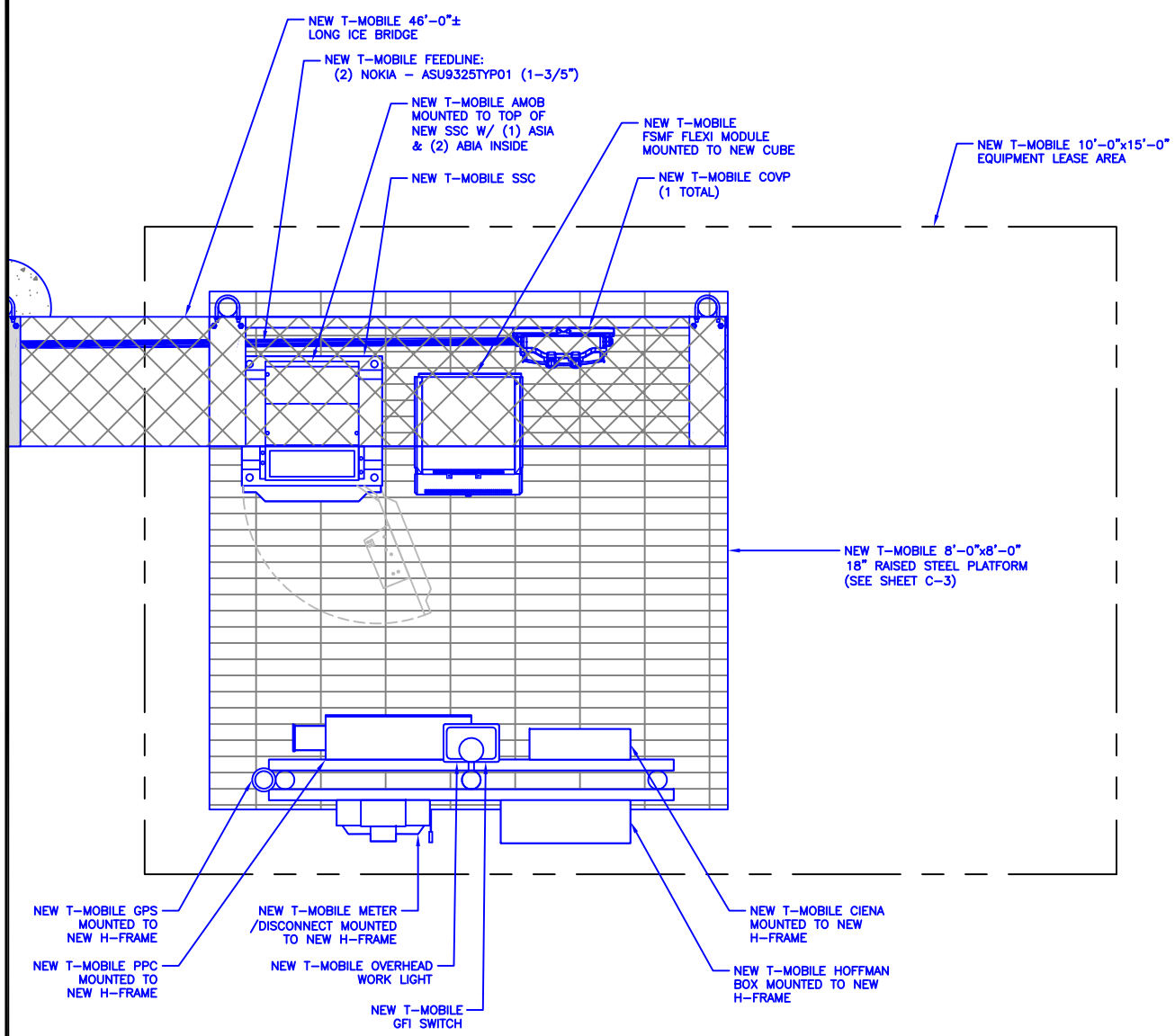
**COLORADO LICENSED  
 JACOB GORALSKI  
 PE.0049661  
 PROFESSIONAL ENGINEER**

*Jacob Goralski*

11/29/2018

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**1** EQUIPMENT PLAN  
 SCALE: 3/4"=1'-0" (FULL SIZE)  
 3/8"=1'-0" (11x17)

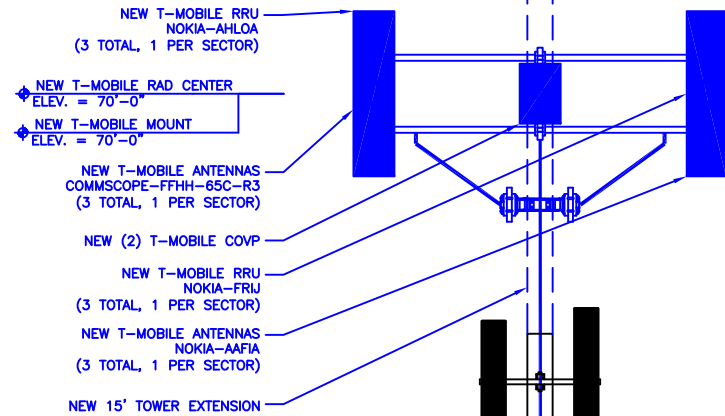


**2** DIMENSION PLAN  
 SCALE: 3/4"=1'-0" (FULL SIZE)  
 3/8"=1'-0" (11x17)





OVERALL HEIGHT OF STRUCTURE  
ELEV. = 75'-0"



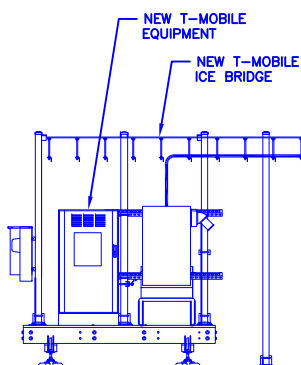
**NOTE:**  
CROWN TO DETERMINE FINAL RAD CENTER AT LATER DATE, APP & RFDS TO MATCH DRAWINGS

**INSTALLER NOTE:**  
DIRECT TOWER MOUNTED EQUIPMENT MUST NOT TRAP OR INTERFERE W/ EXISTING SAFETY CLIMB.

NEW T-MOBILE FEEDLINE:  
(2) NOKIA - ASU9325TYP01 (1-3/5")  
ROUTED INSIDE TOWER

**T-MOBILE EQUIPMENT**

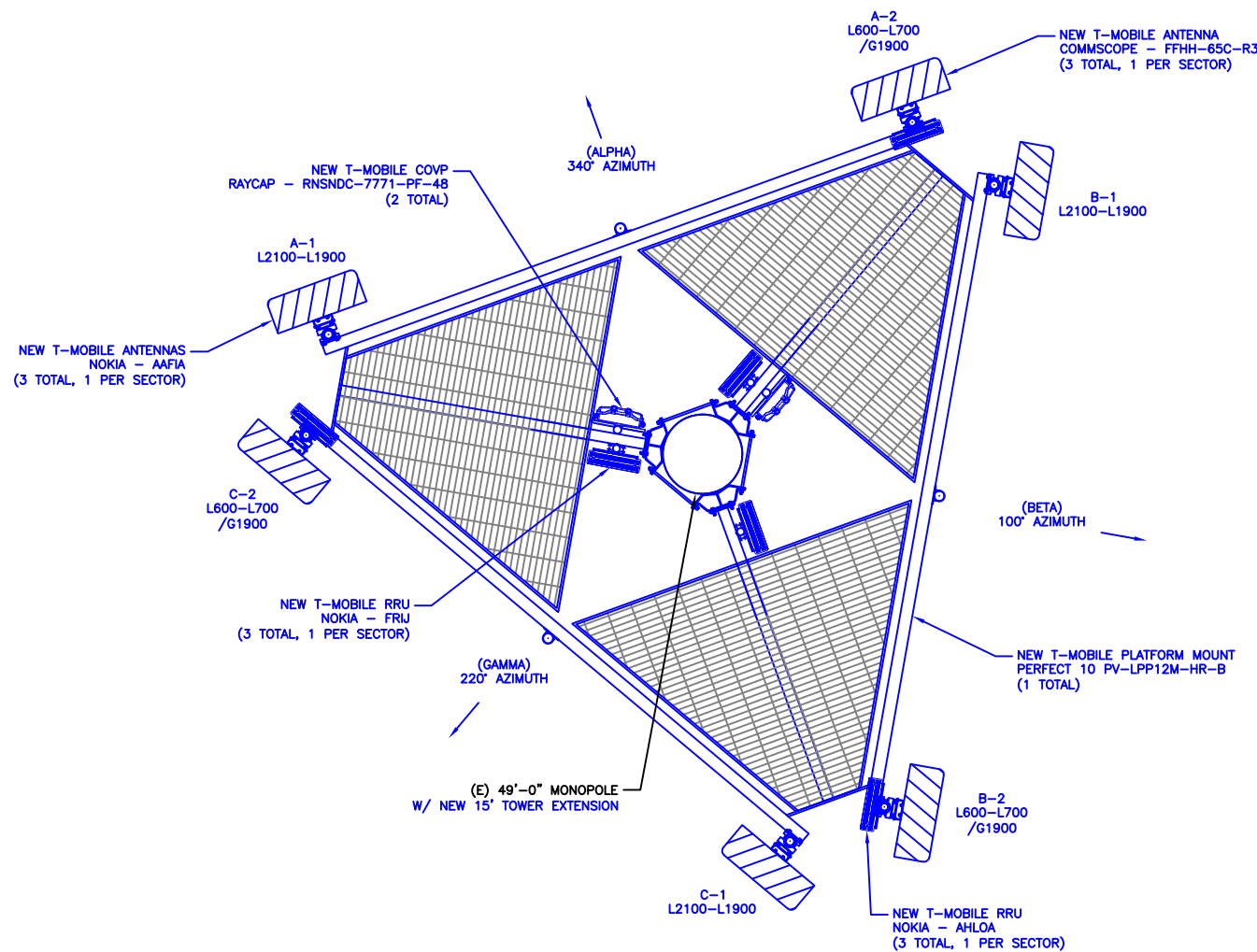
ANTENNA CL: 70'-0"  
MOUNT CL: 70'-0"



1 FINAL ELEVATION  
SCALE: NOT TO SCALE

| ANTENNA SCHEDULE |               |                         |               |                         |               |                         |
|------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|
| SECTOR           | ALPHA         |                         | BETA          |                         | GAMMA         |                         |
| ANTENNA POSITION | A-1           | A-2                     | B-1           | B-2                     | C-1           | C-2                     |
| ANTENNA TYPES    | L2100-L1900   | L700-L600 /U2100        | L2100-L1900   | L700-L600 /U2100        | L2100-L1900   | L700-L600 /U2100        |
| AZIMUTH          | 340°          | 340°                    | 100°          | 100°                    | 220°          | 220°                    |
| RAD CENTER (AGL) | 70'-0"        | 70'-0"                  | 70'-0"        | 70'-0"                  | 70'-0"        | 70'-0"                  |
| MODEL            | NOKIA - AAFIA | COMMSCOPE - FFHH-65C-R3 | NOKIA - AAFIA | COMMSCOPE - FFHH-65C-R3 | NOKIA - AAFIA | COMMSCOPE - FFHH-65C-R3 |
| FEEDER LENGTH    | ±125'-0"      | ±125'-0"                | ±125'-0"      | ±125'-0"                | ±125'-0"      | ±125'-0"                |
| FEEDER TYPE      | HYBRID CABLE  | HYBRID CABLE            | HYBRID CABLE  | HYBRID CABLE            | HYBRID CABLE  | HYBRID CABLE            |

2 ANTENNA SCHEDULE  
SCALE: NOT TO SCALE



3 FINAL ANTENNA LAYOUT  
SCALE: NOT TO SCALE



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SHEET NUMBER:

**C-2**

REVISION:

**1**

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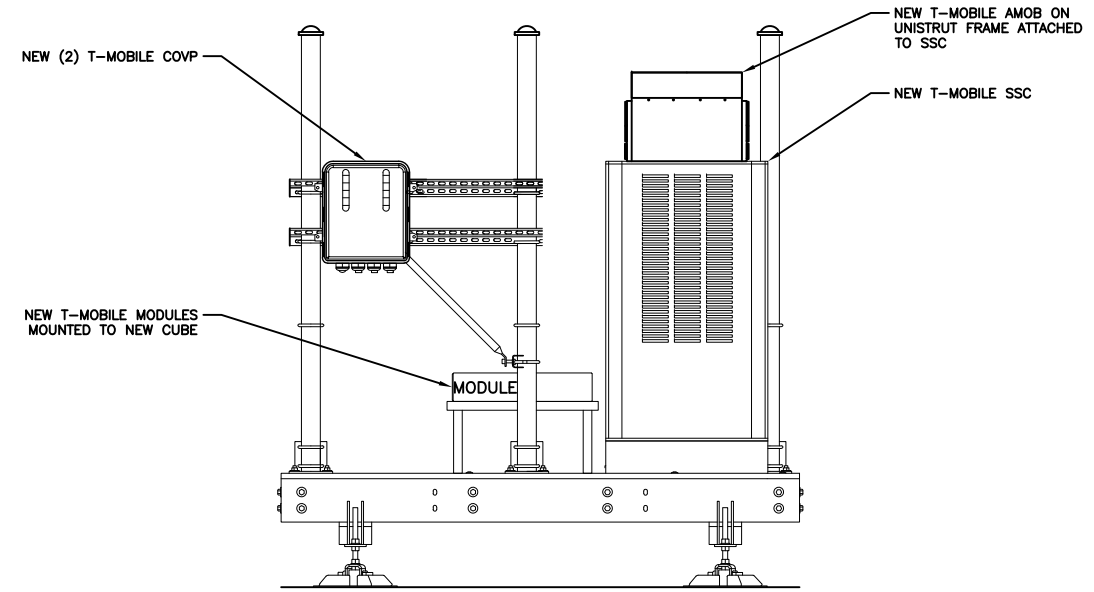
**COLORADO LICENSED**  
 JACOB GORALSKI  
**PE.0049661**  
 PROFESSIONAL ENGINEER

*Jacob Goralski*

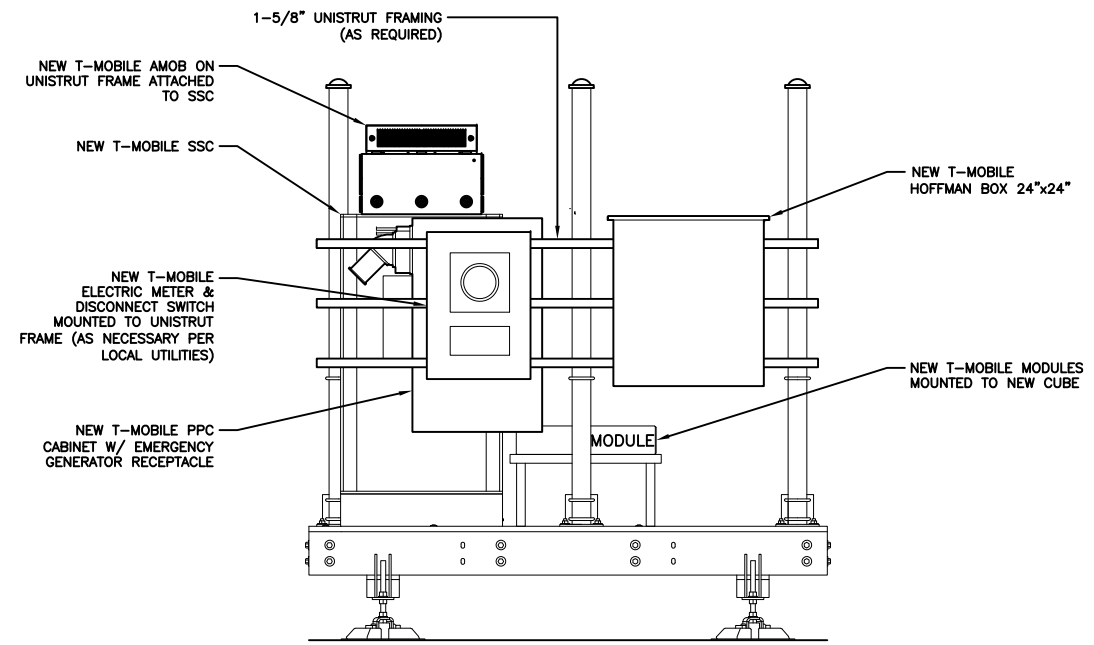
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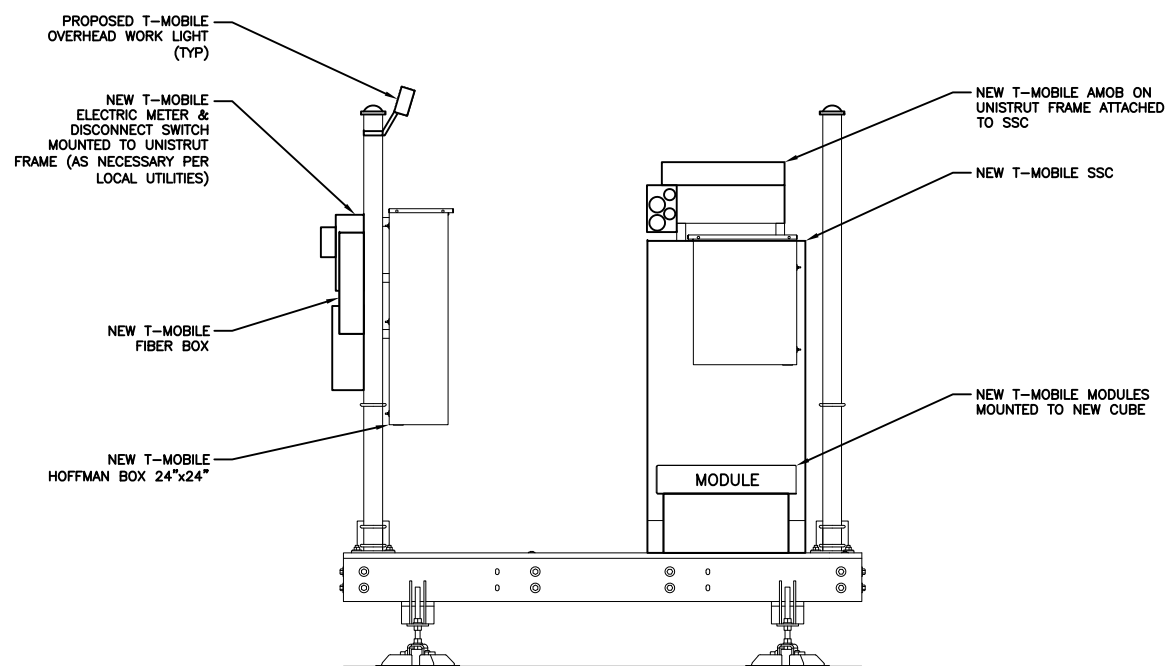
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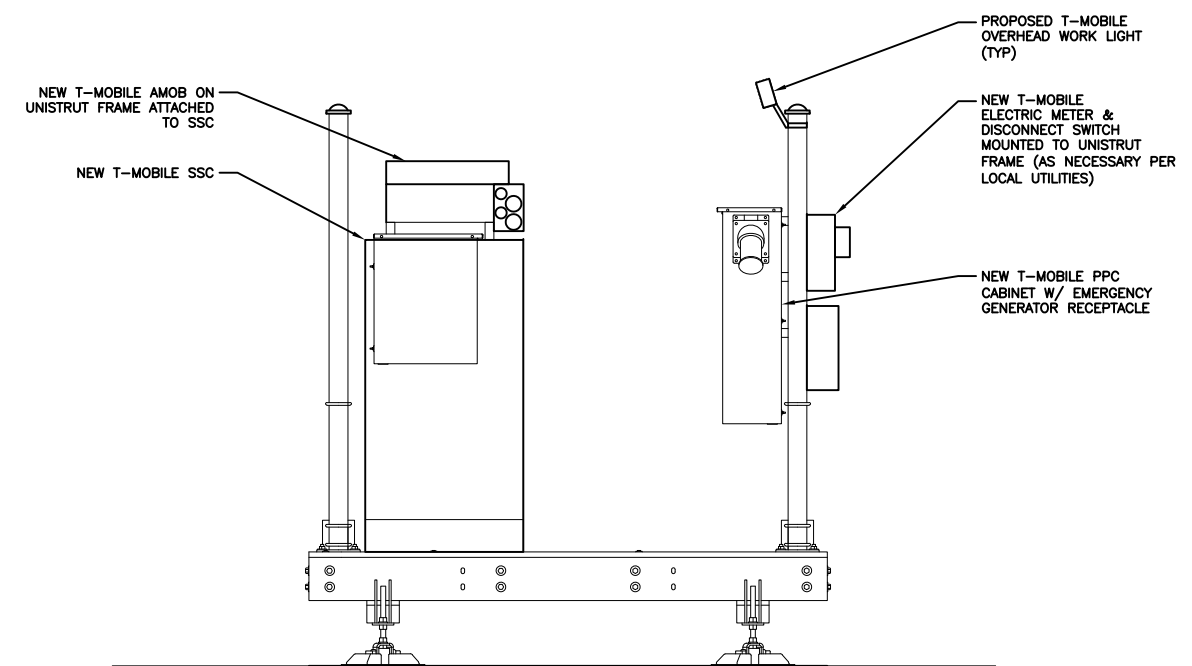
1 EQUIPMENT ELEVATION-NORTH  
 SCALE: NOT TO SCALE



2 EQUIPMENT ELEVATION-SOUTH  
 SCALE: NOT TO SCALE



3 EQUIPMENT ELEVATION-WEST  
 SCALE: NOT TO SCALE



4 EQUIPMENT ELEVATION-EAST  
 SCALE: NOT TO SCALE



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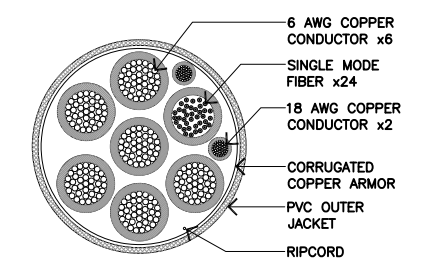
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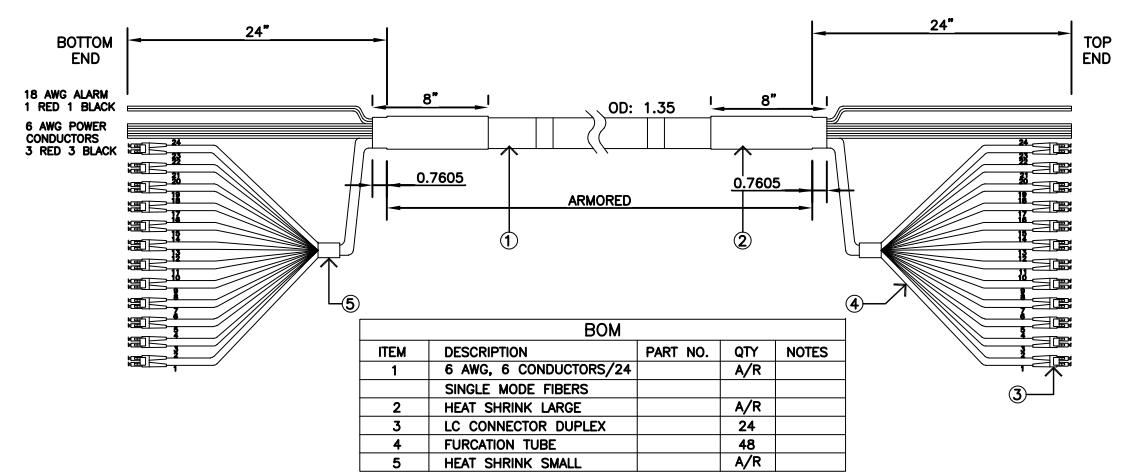
|                                  |  |   |
|----------------------------------|--|---|
| CABLE TYPE                       | NUMBER, SIZE (AWG)<br>VOLTAGE<br>OUTER JACKET<br>SHIELDING<br>MAX SHIELD RESISTANCE (ohm/ft @ 20 c)<br>DRAIN<br>RIPCORD<br>DC CONDUCTOR MATERIAL<br>DC CONDUCTOR SIZE (AWG)<br>MAX DC RESISTANCE (ohm/1000 ft)<br>COLOR CODE<br>ALARM CONDUCTOR MATERIAL<br>ALARM CONDUCTOR SIZE (AWG)<br>MAX DC RESISTANCE (ohm/1000 ft)<br>COLOR CODE<br>FIBER CABLES<br>OUTER DIAMETER (in) - NOMINAL<br>WEIGHT (lb/ft)<br>MINIMUM BEND RADIUS (in)<br>BEND MOMENT (lb/ft)<br>TENSILE STRENGTH (lb)<br>CRUSH RESISTANCE, FOTP-41 (N/mm)<br>STRENGTH MEMBER<br>OPERATING TEMPERATURE RANGE (LOW)<br>OPERATING TEMPERATURE RANGE (HIGH) +80°C | 6/C #6 + 2/C #18<br>600<br>PVC<br>CORRUGATED COPPER<br>0.0035<br>N/A<br>KEVLAR<br>COPPER<br>6<br>0.411 @ 20°C<br>BLACK/RED<br>COPPER<br>18<br>6.7<br>TBD<br>SM<br>1.24<br>1.05<br>15<br>TBD<br>325<br>22<br>NO<br>-40°C |
| FIBER TYPE                       |  | LOW WATER PEAK, SINGLE MODE, LOOSE TUBE   |
| FIBER STANDARD COMPLIANCE        |  | ITU-T REC. G.652.D, G657.A2<br>IEC 60793-2-50<br>TYPE B.1.3 & TYPE B.6 A&B  |
| FIBER COATING DIAMETER (um)      |  | .242 +/- 0.007mm<br>0.9 +/- 0.0005mm  |
| FIBER COUNT                      |  | 24  |
| NUMBER OF FIBER SUBUNITS         |  | 1   |
| FIBER COUNT EACH UNITS           |  | 24  |
| FIBER OUTER JACKETS              |  | FR JACKET   |
| MAX ATTENUATION, 1310 mm (dB/Km) |  | LESS THAN EQUA 0.5  |
| MAX ATTENUATION, 1550 MM (dB/Km) |  | LESS THAN EQUA 0.5  |



NOTE: CABLE CROSS SECTION NOT DRAWN TO SCALE

CABLE TYPE: 6/#6, 2/#18, 24 FIBER

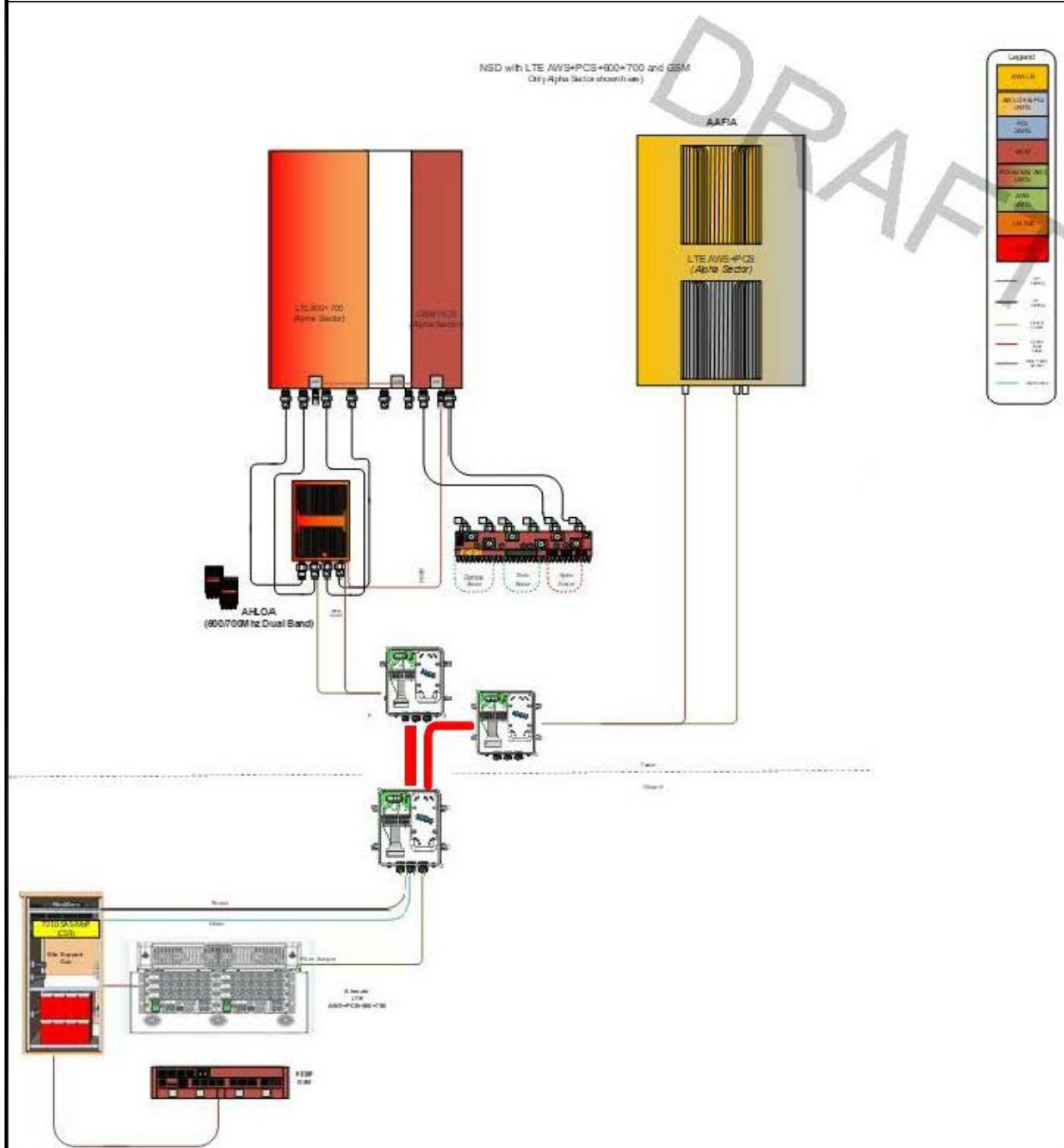
| CABLE ASSY LENGTH (L) | TOLERANCE (FT) | PACKAGING METHOD |
|-----------------------|----------------|------------------|
| 50                    | +0.50 / -0.50  | COIL             |
| 100                   | +1.00 / -1.00  | REEL             |
| 125                   | +1.25 / -1.25  | REEL             |
| 150                   | +1.50 / -1.50  | REEL             |
| 175                   | +1.75 / -1.75  | REEL             |



- NOTES:
- DIMENSIONS ARE IN INCHES.
  - 12 DUPLEX LC CONNECTORS PER END, 4 DUPLEX LC CONNECTORS PER GROUP, TOTAL OF 3 GROUPS.
  - TOTAL OF 12 PAIRS OF SINGLE MODE FIBERS.
  - TOTAL OF 6 AC CABLES 3 RED & 3 BLACK.
  - TOP END AND BOTTOM END ARE IDENTICAL.
  - EACH AND EVERY FIBERS MUST BE LABELED FROM #1 TO #24 AT BOTH ENDS.
  - LABEL BOTH ENDS WITH: SERIAL NUMBER, PART NUMBER AND CUSTOMER NAME.
  - INSERTION LOSS AND RETURN LOSS SHALL BE MEASURED 100% SAMPLING FOR ALL PRODUCTION.
  - TEST AND MEASUREMENT REPORT SHALL BE FURNISHED WITH CABLE ASSEMBLY.
  - ALL CONNECTORS SHALL BE SHIPPED WITH FURRULES PROTECTED WITH REMOVABLE CAPS.
  - ALL FIBER BREAKOUT WILL BE PROTECTED FROM WATER PENETRATION.

COLORS IDENTIFIED AT THE BASE OF EACH BOOT IDENTICAL AT BOTH ENDS

| FIBER | COLOR  | FIBER | COLOR  |
|-------|--------|-------|--------|
| 1     | BLUE   | 13    | RED    |
| 2     | BLUE   | 14    | RED    |
| 3     | ORANGE | 15    | BLACK  |
| 4     | ORANGE | 16    | BLACK  |
| 5     | GREEN  | 17    | YELLOW |
| 6     | GREEN  | 18    | YELLOW |
| 7     | BROWN  | 19    | PURPLE |
| 8     | BROWN  | 20    | PURPLE |
| 9     | GREY   | 21    | TAN    |
| 10    | GREY   | 22    | TAN    |
| 11    | WHITE  | 23    | PINK   |
| 12    | WHITE  | 24    | PINK   |



AAFIA Prototype - Specifications



| Dimension                            | Nokia 16TRX Dual                                    |
|--------------------------------------|---|
| Band                                 | 806 - 825 (B1)                                      |
| Antenna Config (col x row x pol)     | XX XX XX XX (B6)<br>XX XX XX XX (B5)<br>XX XX XX XX |
| Power                                | 16x1.25W* (20W)                                     |
| Instantaneous Bandwidth              | 90MHz DL / 70MHz UL (B6)                            |
| Realistic Use Case                   | 25MHz per band                                      |
| Diversity Range (all beams affected) | 2-12 degrees  |
| HTW/SW Availability                  | 3Q18 (L1837)  |
| Size (HxWxD) in                      | 71 x 20 x 4"  |
| Weight / Wind Sail                   | 34.2lbs / 1.84 m <sup>2</sup>                       |

AAFIA is a dual band Massive MIMO with 16 TRX per band

Antenna Mounting Details

1 NOKIA - AAFIA  
SCALE: NOT TO SCALE

FFHH-65C-R3  
8-port sector antenna, 4x 617-698 and 4x 1695-2360 MHz, 65° HPBW, 3x RET, 600 MHz-Ready Antenna Technology



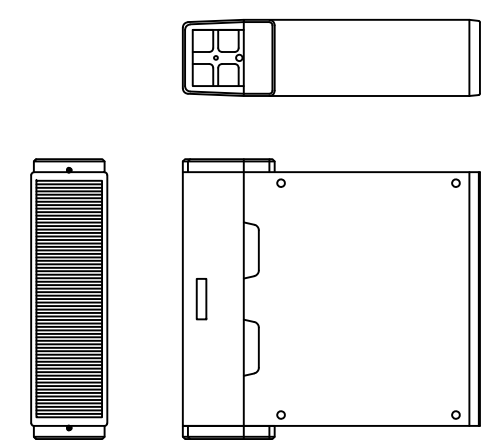
Electrical Specifications

| Frequency Band, MHz                          | 617-698    | 698-806    | 1695-1880  | 1850-1990  | 1920-2200  | 2300-2360  |
|--|------------|------------|------------|------------|------------|------------|
| Gain, dBi                                    | 15.3       | 15.5       | 17.8       | 18.2       | 18.5       | 19.6       |
| Beamwidth, Horizontal, degrees               | 67         | 63         | 65         | 66         | 64         | 55         |
| Beamwidth, Vertical, degrees                 | 10.2       | 9.1        | 5.7        | 5.3        | 4.9        | 4.4        |
| Beam Tilt, degrees                           | 2-13       | 2-13       | 2-12       | 2-12       | 2-12       | 2-12       |
| USLS (First Lobe), dB                        | 19         | 17         | 20         | 19         | 19         | 21         |
| Front-to-Back Ratio at 180°, dB              | 32         | 29         | 35         | 40         | 40         | 41         |
| Isolation, dB                                | 28         | 28         | 28         | 28         | 28         | 28         |
| Isolation, Intersystem, dB                   | 28         | 28         | 28         | 28         | 28         | 28         |
| VSWR   Return Loss, dB                       | 1.5   14.0 | 1.5   14.0 | 1.5   14.0 | 1.5   14.0 | 1.5   14.0 | 1.5   14.0 |
| PIM, 3rd Order, 2 x 20 W, dBC                | -153       | -153       | -153       | -153       | -153       | -153       |
| Input Power per Port at 50°C, maximum, watts | 250        | 250        | 250        | 250        | 250        | 200        |
| Polarization                                 | ±45°       | ±45°       | ±45°       | ±45°       | ±45°       | ±45°       |
| Impedance                                    | 50 ohm     | 50 ohm     | 50 ohm     | 50 ohm     | 50 ohm     | 50 ohm     |

Electrical Specifications, BASTA\*

| Frequency Band, MHz                         | 617-698     | 698-806     | 1695-1880   | 1850-1990   | 1920-2200   | 2300-2360   |
|---|-------------|-------------|-------------|-------------|-------------|-------------|
| Gain by all Beam Tilts, average, dBi        | 15.0        | 15.2        | 17.4        | 17.9        | 18.5        | 19.3        |
| Gain by all Beam Tilts Tolerance, dB        | ±0.6        | ±0.5        | ±0.4        | ±0.5        | ±0.6        | ±0.5        |
| Gain by Beam Tilt, average, dBi             | 2 *   14.8  | 2 *   15.0  | 2 *   17.2  | 2 *   17.6  | 2 *   18.1  | 2 *   18.8  |
| Beamwidth, Horizontal Tolerance, degrees    | 8 *   15.1  | 8 *   15.3  | 7 *   17.5  | 7 *   18.0  | 7 *   18.6  | 7 *   19.4  |
| Beamwidth, Vertical Tolerance, degrees      | 13 *   15.0 | 13 *   15.1 | 12 *   17.4 | 12 *   17.8 | 12 *   18.4 | 12 *   19.2 |
| USLS, beampeak to 20° above beampeak, dB    | 17          | 12          | 15          | 16          | 16          | 18          |
| Front-to-Back Total Power at 180° ± 30°, dB | 23          | 21          | 29          | 31          | 31          | 31          |
| CPR at Boresight, dB                        | 24          | 23          | 21          | 20          | 21          | 22          |
| CPR at Sector, dB                           | 6           | 10          | 9           | 9           | 9           | 8           |

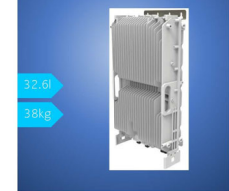
2 COMMSCOPE - FFHH-65C-R3  
SCALE: NOT TO SCALE



NOKIA - FXFB  
WEIGHT: 55.1 LBS  
SIZE (LxWxH): 5.2x19.3x22.0 IN.

3 NOKIA - FXFB  
SCALE: NOT TO SCALE

AirScale Dual RRH 4T4R B12/71 240W AHLOA



**DRAFT**

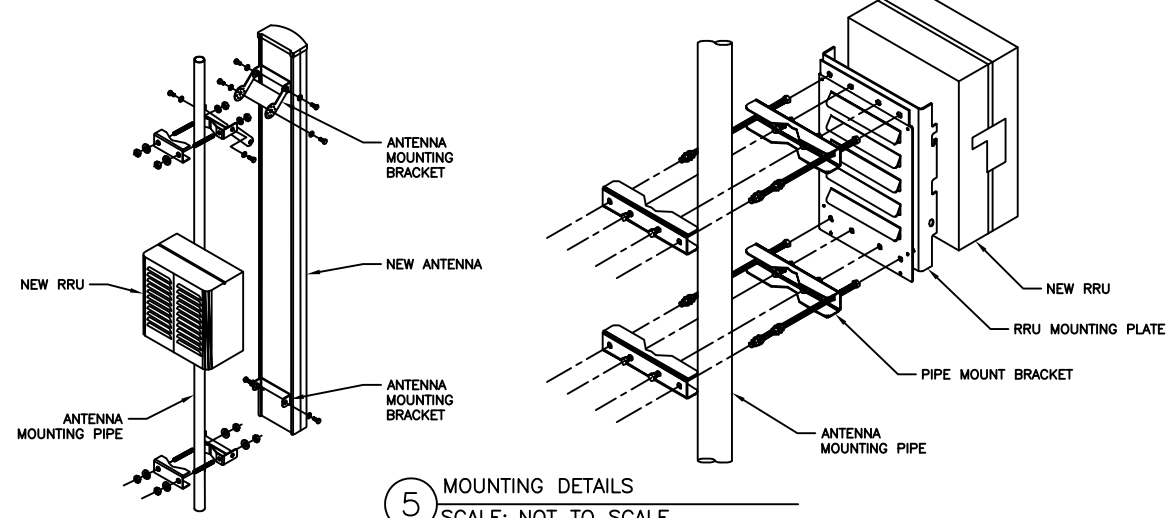
| Parameter                   | Value   |
|-----------------------------|---|
| Product Code                | 0143314   |
| Supported Frequency Bands   | 2000 Band 12/71   |
| Frequencies                 | Band 12: adjusted UL 698 - 716 MHz, DL 728 - 746 MHz<br>Band 71: UL 698 MHz - 698 MHz, DL 817 MHz - 817 MHz |
| Number of TX/RX paths/ports | 4 ports, 2 TX, 2 RX, 4 TX for both bands  |
| Instantaneous Bandwidth     | 17 MHz for B12 and 33 MHz for B71<br>17 MHz before B12 180° future use                                      |
| Occupied Bandwidth (99%)    | DL B12: 17 MHz<br>DL B71: 33 MHz  |
| Output Power                | 240W per TR shared between bands  |
| Supply Voltage Range        | DC: 48V, 54V, 60V   |
| Typical Power Consumption   | 240W (E70) Base Power Load at 47x@20W<br>450W (E70) Base Power Load at 47x@20W                              |
| Antenna Ports               | 4 ports, 4 x 10-  |
| Optical Ports               | 2 x SFP+ 10 Gbps  |
| ALD Control Interface       | 2000 3-wire RS-485 (DC on AW1 & AW2)  |
| Other Interfaces            | External Alarm NGR-2514 inputs, 1 Output<br>DC Circular Power Connector                                     |
| Physical                    | 260mm x 320mm x 100mm<br>Approximately 28kg with no covers or brackets                                      |
| Operating Temperature Range | -40°C to 55°C (with no solar load)  |
| Surge Protection            | Class II SA   |
| Installation Options        | Flare, NGR, Stack Mount   |

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4 NOKIA - AHLOA  
SCALE: NOT TO SCALE

**INSTALLER NOTES:**

1. COMPLY WITH MANUFACTURERS INSTRUCTIONS TO ENSURE THAT ALL RRUs RECEIVE ELECTRICAL POWER WITHIN 24 HOURS OF BEING REMOVED FROM THE MANUFACTURER'S PACKAGING.
2. DO NOT OPEN RRU PACKAGES IN THE RAIN.
3. ALL PIPES, BRACKETS, AND MISCELLANEOUS HARDWARE TO BE GALVANIZED UNLESS NOTED OTHERWISE.

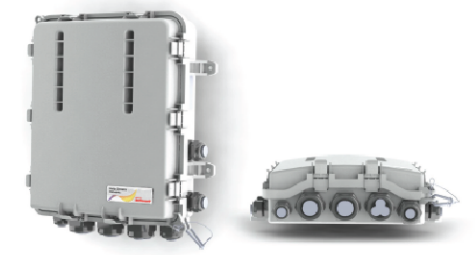


5 MOUNTING DETAILS  
SCALE: NOT TO SCALE

**NOTE:**  
ANTENNA NOT SHOWN FOR CLARITY

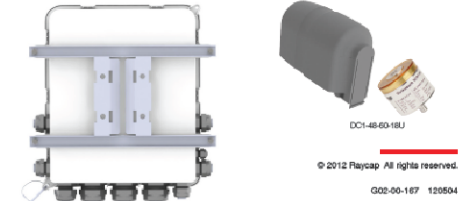
DATA SHEET DC Surge Protection for RRH/RFM (High-Capacity Junction Box)  
ASU9338TYP01 (RNSNDC-7771-PF-48)  
Overtoltage Protection & Fiber Management Junction Box

The deployment of Remote Radio Head (RRH) and Remote Flexi Modules (RFM) architecture poses unique challenges to the mobile telecom industry. Raycap's innovative RRH protection solutions mitigate the risk of damage due to lightning and provide high levels of availability and reliability to radio equipment.



- Features**
- Employs the Strikescorb® 30-V1-HV Surge Protective Device (SPD) specifically designed for the Remote Radio Head (RRH) and Remote Flexi Modules (RFM) installation environment and certified for use in DC applications and at low DC operating voltages (48V).
  - The Strikescorb 30-V1-HV is a Class I SPD, certified by VDE per the IEC 61643-1 standard as suitable for installation in areas where direct lightning exposure is expected. Strikescorb 30-V1-HV is able to withstand direct lightning currents of up to 5kA (10/350) and induced surge currents of up to 60kA (8/20).
  - Provides very low let through / clamping voltage - unique for a Class I product - as it does not employ spark gaps or other switching elements. Strikescorb offers unique protection levels to the RRH equipment as well as the Base Band Units.
  - Stock unit ships with all grounds necessary for use with hybrid cable. This includes the top and base of towers, and the central unit on roof top applications.
  - Fully recognized to the UL 1449 3rd Edition Safety Standard.
  - Patent pending design.

- Benefits**
- Offers unique maintenance-free protection against direct lightning currents.
  - Protects up to 9 RRHs/RFMs and connects up to 18 fiber pairs.
  - Utilizes an IP 67 rated enclosure, allowing for indoor or outdoor installation on a roof or tower top.
  - Configurable cable ports are designed to accommodate NSN high-capacity/low-capacity hybrid trunk cables (combined power and fiber optic), Coax Reuse, and NSN hybrid jumper cables.
  - Lightweight aerodynamic design provides maximum flexibility for tower top installation.



6 RAYCAP - RNSDC-7771-PF-48  
SCALE: NOT TO SCALE

**T-Mobile**  
18400 E. 22ND AVENUE  
AURORA, CO 80011

**CROWN CASTLE**  
116 INVERNESS DR. EAST STE# 280  
ENGLEWOOD, CO 80112

T-MOBILE SITE NUMBER:  
**DN02415A**

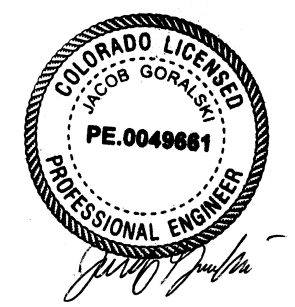
BU #: 877103  
**KEEBLER/COLORADO  
SPGS/CSP209**

231 MAIN STREET  
COLORADO SPRINGS, CO  
80911

EXISTING 60.0 FT MONOPOLE

**ISSUED FOR:**

| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
|-----|------------|------|-------------|---------|
| A   | 07-10-2018 | JAS  | PRELIMINARY | ELG     |
| B   | 08-17-2018 | JAS  | PRELIMINARY | ELG     |
| 0   | 08-29-2018 | JAS  | FINAL       | ELG     |
| 1   | 11-20-2018 | JAS  | FINAL       | ELG     |

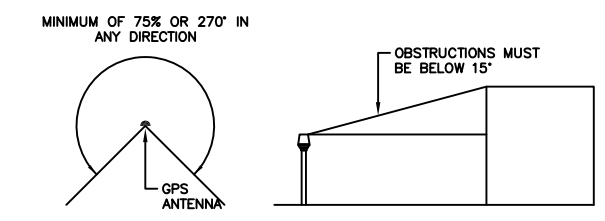
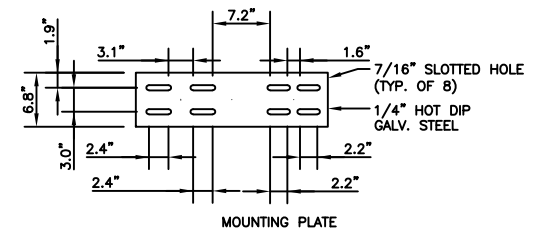
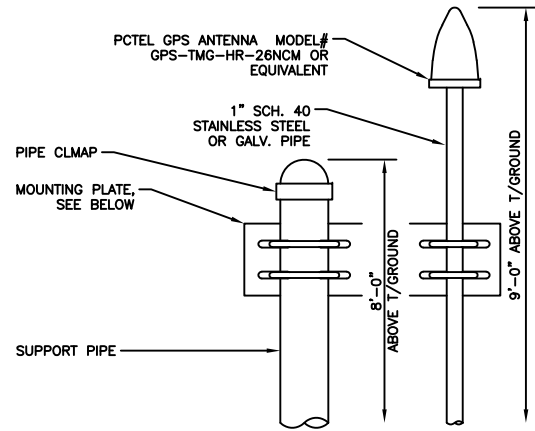


11/29/2018  
**JACOB GORALSKI, PLLC**  
CONSULTING ENGINEER  
JACOB GORALSKI, PLLC  
CO PE# 0049661  
1106 COLBI ST.  
KENNEDALE, TX 76060  
(817) 456-2621

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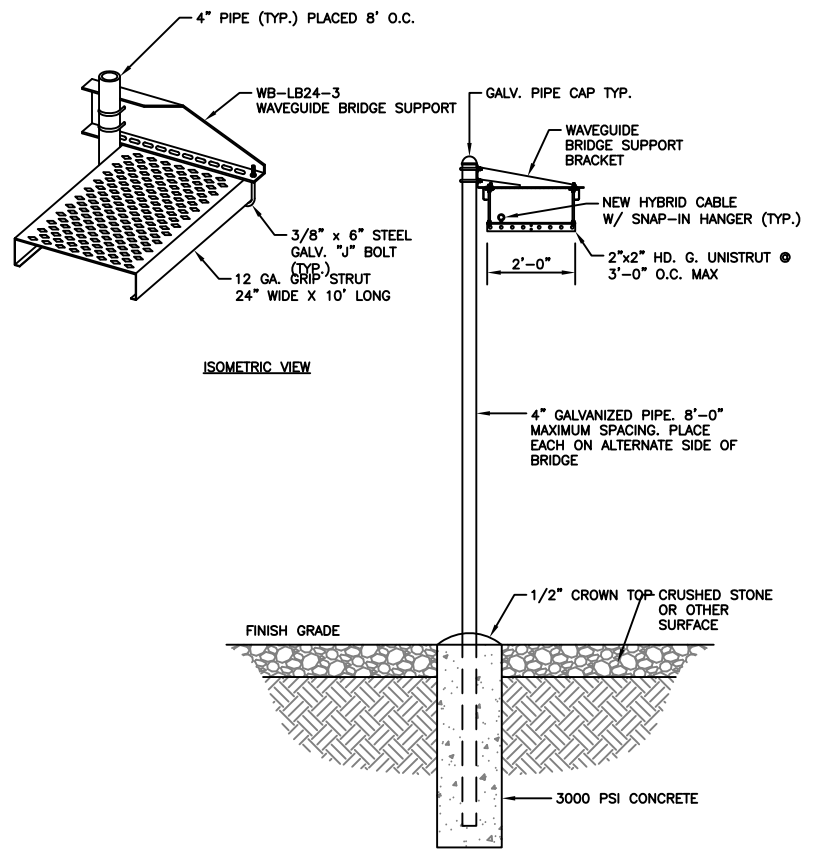
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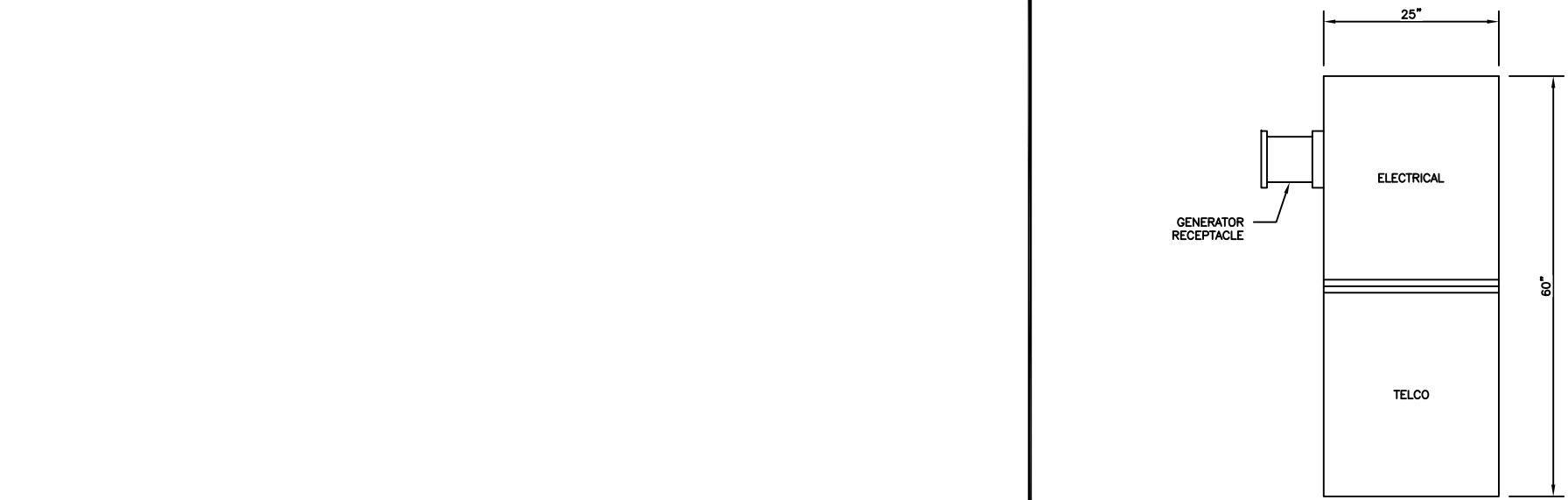
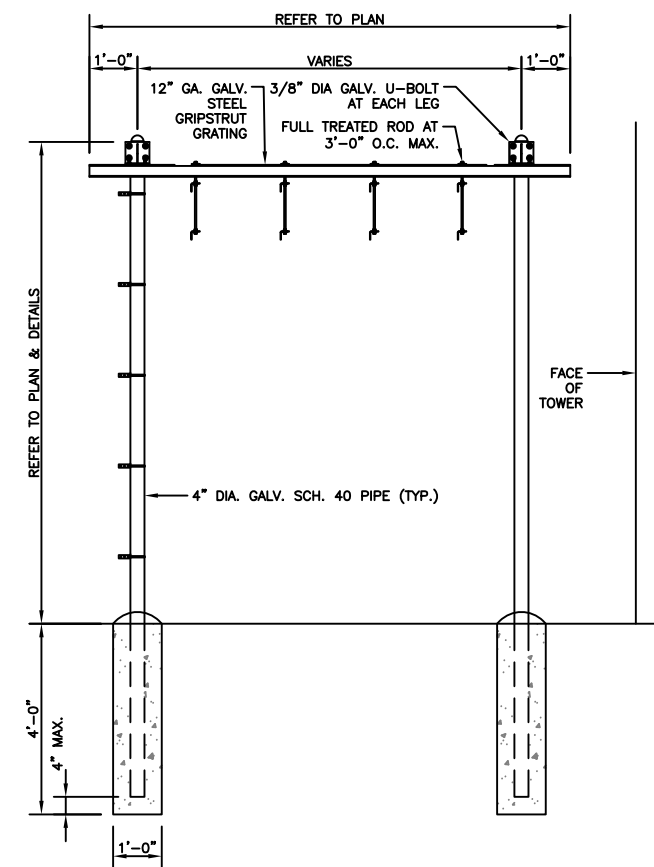


- NOTES:**
1. THE ELEVATION AND LOCATION OF THE GPS ANTENNA SHALL BE IN ACCORDANCE WITH THE FINAL RF REPORT.
  2. THE GPS ANTENNA MOUNT IS DESIGNED TO FASTEN TO A STANDARD 1-1/4" O.D. SCHEDULE 40, GALVANIZED STEEL OR STAINLESS STEEL PIPE. THE PIPE MUST NOT BE THREADED AT THE ANTENNA MOUNT END. THE PIPE SHALL BE CUT TO THE REQUIRED LENGTH (MINIMUM OF 18 INCHES) USING A HAND OR ROTARY PIPE CUTTER TO ASSURE A SMOOTH AND PERPENDICULAR CUT. A HACK SAW SHALL NOT BE USED. THE CUT PIPE END SHALL BE DEBARRED AND SMOOTH IN ORDER TO SEAL AGAINST THE NEOPRENE GASKET ATTACHED TO THE ANTENNA MOUNT.
  3. IT IS CRITICAL THAT THE GPS ANTENNA IS MOUNTED SUCH THAT IT IS WITHIN 2 DEGREES OF VERTICAL AND THE BASE OF THE ANTENNA IS WITHIN 2 DEGREES OF LEVEL.
  4. DO NOT SWEEP TEST GPS ANTENNA.

1 GPS ANTENNA DETAIL  
SCALE: NOT TO SCALE



2 ICE BRIDGE DETAIL  
SCALE: NOT TO SCALE



POWER PEDESTAL CABINET  
200 A POWER TRANSFER  
CABINET W/O TELCO

3 NOT USED  
SCALE: NOT TO SCALE

**GENERAL**  
CONSTRUCTION: SINGLE LAYER AL. ENCLOSURE, TYPE 3R  
DIMENSIONS (WxHxD): 20 x 40 x 10 INCH  
WEIGHT: APPROX. 75 LBS (WITHOUT PACKAGING)  
FINISH: POLYESTER POWDER PAINT  
DOOR LATCH: 3-POINT LATCHING, PAD LOCKABLE  
SAFETY: UL50 (CABINET)

**ENVIRONMENT**  
OPERATING TEMPERATURE: -40°C TO +46°C (-40°F TO 115°F)  
HUMIDITY (RELATIVE): 95%, NON-CONDENSING (MAX.)  
PROTECTION CLASS: TYPE 3R

**AC SECTION**  
VOLTAGE: 240/120V SINGLE PHASE (3 WIRE + GROUND)  
CURRENT: 200A  
AIC RATING: UTILITY 65,000 AMPS, PANLOC 10,000 AMPS  
GENERATOR INTERFACE: PANLOC™ (LEFT MOUNT)  
SERVICE DISCONNECT: SQUARE D 200 AMP  
MANUAL TRANSFER SWITCH

**OTHER FEATURES**  
LOAD CENTER: SQUARE D 200 AMP, QO SERIES, 24 POSITION  
SURGE PROTECTION DEVICE (SPD) - 1 EA. AC DATA 2080  
SQUARE D 30 AMP, 2 POLE BREAKER FOR SPD  
GROUND BAR  
SILKSCREENED DEAD-FRONT  
CAPTIVE DEAD-FRONT FASTENERS

**NOTE:**  
1. WEIGHT OF CABINET IS 150 LBS.  
2. NORTHERN TECHNOLOGIES, INC.  
PPC#CS7S2-WB36-R OR APPROVAL  
EQUAL. SEE PPC CABINET DIAGRAM  
(1/E-2) FOR BREAKER REQUIREMENTS.

**NOTE:**  
1. WEIGHT OF CABINET IS 150 LBS.  
2. NORTHERN TECHNOLOGIES, INC.  
PPC#CS7S2-WB36-R OR APPROVAL  
EQUAL. SEE AC PANEL FOR BREAKER  
REQUIREMENTS.

4 PPC UNIT  
SCALE: NOT TO SCALE

**T-Mobile**  
18400 E. 22ND AVENUE  
AURORA, CO 80011

**CROWN CASTLE**  
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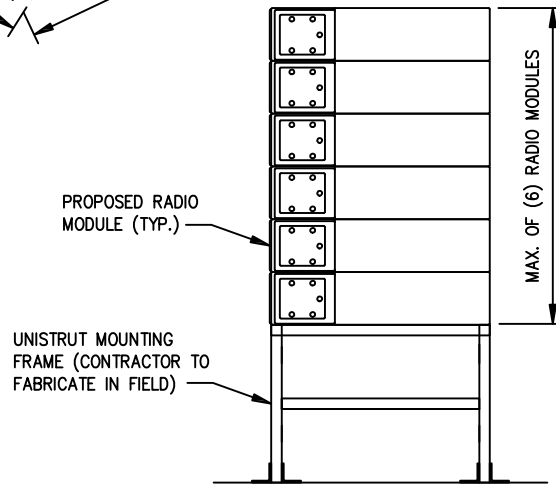
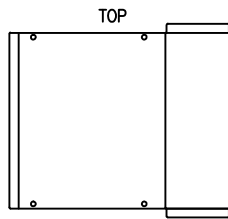
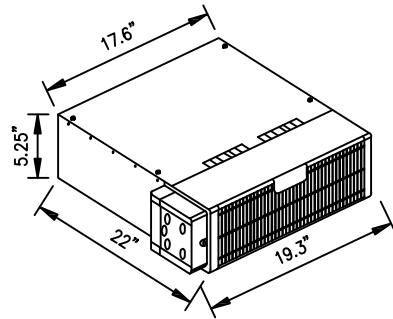
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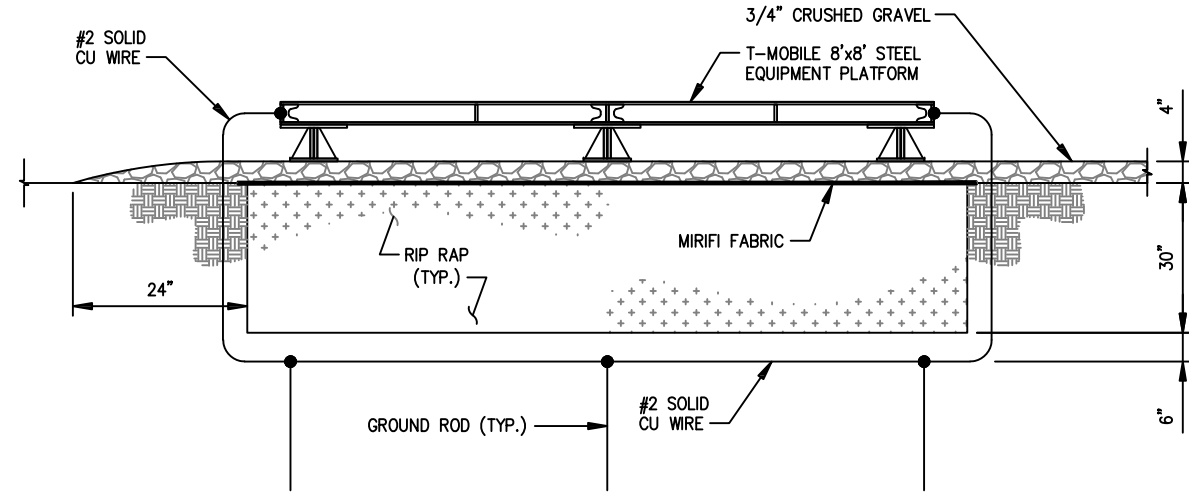
SHEET NUMBER: **C-6** REVISION: **1**

**NOKIA FLEXI SYSTEM RADIO MODULES:**  
FBBC, FRIA, FRIE, FSME, FSMF, FXFB, FXFC

**CLEARANCES:** FRONT: 23.6"  
BACK: 8"  
TOP: 1.2"  
SIDES: 4"  
**WEIGHT:** 44 lbs.  
**NOTE:** MODULE CAN BE INSTALLED VERTICALLY AND HORIZONTALLY



1 NOKIA FLEXI SYSTEM / RADIO MODULE STACKED SLEEVE DETAIL  
SCALE: NOT TO SCALE



NOTE:  
ROAD BASE BACKFILL  
COMPACTED ±95%

2 STEEL EQUIPMENT PLATFORM GROUND DETAIL  
SCALE: NOT TO SCALE

**T-Mobile**  
18400 E. 22ND AVENUE  
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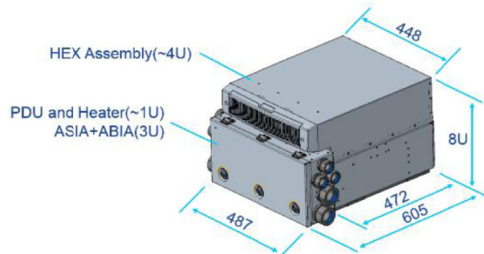
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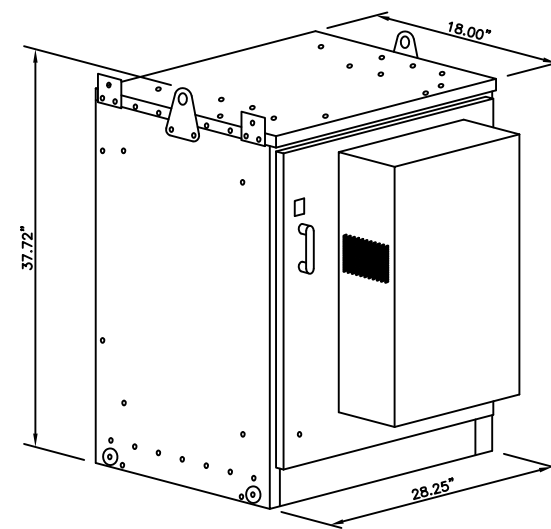
**AirScale Subrack Outdoor AMOB datasheet**

| Datasheet  |  |
|--|--|
| Environmental protection   | IP55   |
| <b>Feature description:</b>  |  |
| <ul style="list-style-type: none"> <li>Outdoor Subrack for AirScale System Module Indoor plug-in units</li> <li>High performance Heat Exchanger "HEX"</li> <li>Compatible with Flexi BTS mechanics stack/plinth/wall/pole/rack installation</li> <li>Compatible with the 3rd part 19" racks and cabinets if it follows clearances and airflow requirements</li> <li>Possible to install AMOB inside FCOA cabinet</li> <li>Service doors on front and rear sides</li> </ul> |  |
| Height   | 8U (354 mm)  |
| Width (front cover)  | 487mm  |
| Width (cabinet)  | 448mm (fits into 19 inch rack)<br>487mm (without conduit plugs or fittings)  |
| Depth  | Total 605mm (472mm from rack mounting surface)   |
| Weights  | 23 kg AMOB enclosure<br>3 kg ASIA (Core Module)<br>2 kg ABIA (Expansion Module)<br>32 kg 1/2 Capacity (1 Core + 3 Expansion)<br>41 kg Full Capacity (2 Core + 6 Expansion)   |
| Ingress Protection   | IP55   |
| Operating Temperature  | -40°C up to +35°C (without solar radiation)  |
| Installation Temperature   | -20°C - +55°C  |
| Airflow Direction  | Back to front airflow direction supported for Horizontal(FCOA, 19" rack, Flexi stack)<br>Front to back airflow direction supported for Vertical(wall and pole mounting case) |
| Clearances for cooling   | 40 mm Minimum on the back and front side   |
| Cold start   | ~2h from -40°C to -5°C<br>*Optional 2nd heater can be added to meet NAM requirement, cold start from -40°C to -5°C in 1 hour instead of 2 hours                              |
| Nominal supply voltage   | -40.5 ... -57 VDC  |
| Input voltage range  | Extended Service Voltage Range supported -36Vdc ... -60Vdc Floating  |
| Volume   | 104.5L   |
| Mass capacity  | Support Max 18Kg inside  |
| Power consumption  | Typical max ~265W (all fans at highest speed)<br>Cold start ~60W (heater On 55W + fans at low speed)   |
| Conduit cable entry  | 2x1.5" + 3x 1" on each left and right side   |



3 © Nokia 2016 Confidential

3 AMOB SPECIFICATIONS  
SCALE: NOT TO SCALE



NOTES:  
1. WEIGHT OF CABINET (WITHOUT BATTERIES) IS 232 LBS.  
2. BASE FRAME NOT SHOWN.

4 200AMP SITE SUPPORT CABINET  
SCALE: NOT TO SCALE



11/29/2018  
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SHEET NUMBER: **C-7** REVISION: **1**



**PV-LPP  
L.I.F.E. MOUNT™ LOW PROFILE PLATFORM**

TABLE 1: PLATFORM CONFIGURATIONS

| PART NUMBER    | DESCRIPTION                                 | MIN POLE OD | MAX POLE OD | WEIGHT (LBS) | INCLUDED PARTS |              |              |           |           |           |           |           |   |   |
|----------------|---|-------------|-------------|--------------|----------------|--------------|--------------|-----------|-----------|-----------|-----------|-----------|---|---|
|                |   |             |             |              | PIPE-312X150   | PIPE-238X174 | PIPE-238X174 | PV-RM1045 | PV-RM3060 | PV-LPP12M | PV-LPP14M | PV-PHK12B |   |   |
| PV-LPP12M-B    | 12'6" FACE PLATFORM                         | 10"         | 34"         | 1267         | 3              | -            | -            | -         | -         | -         | -         | -         | - | - |
| PV-LPP14M-B    | 14'6" FACE PLATFORM                         | 10"         | 35"         | 1365         | -              | 3            | -            | -         | -         | -         | -         | -         | - | - |
| PV-LPP14L-B    | 14'6" FACE PLATFORM, LARGE POLE             | 33"         | 60"         | 1370         | -              | 3            | -            | -         | -         | -         | -         | -         | - | - |
| PV-LPP12M-HR-B | 12'6" FACE PLATFORM W/ HANDRAIL             | 10"         | 34"         | 1522         | 3              | -            | 3            | -         | -         | -         | -         | -         | - | - |
| PV-LPP14M-HR-B | 14'6" FACE PLATFORM W/ HANDRAIL             | 10"         | 35"         | 1641         | -              | 3            | -            | 3         | -         | -         | -         | -         | - | - |
| PV-LPP14L-HR-B | 14'6" FACE PLATFORM W/ HANDRAIL, LARGE POLE | 33"         | 60"         | 1647         | -              | 3            | -            | 3         | -         | -         | -         | -         | - | - |

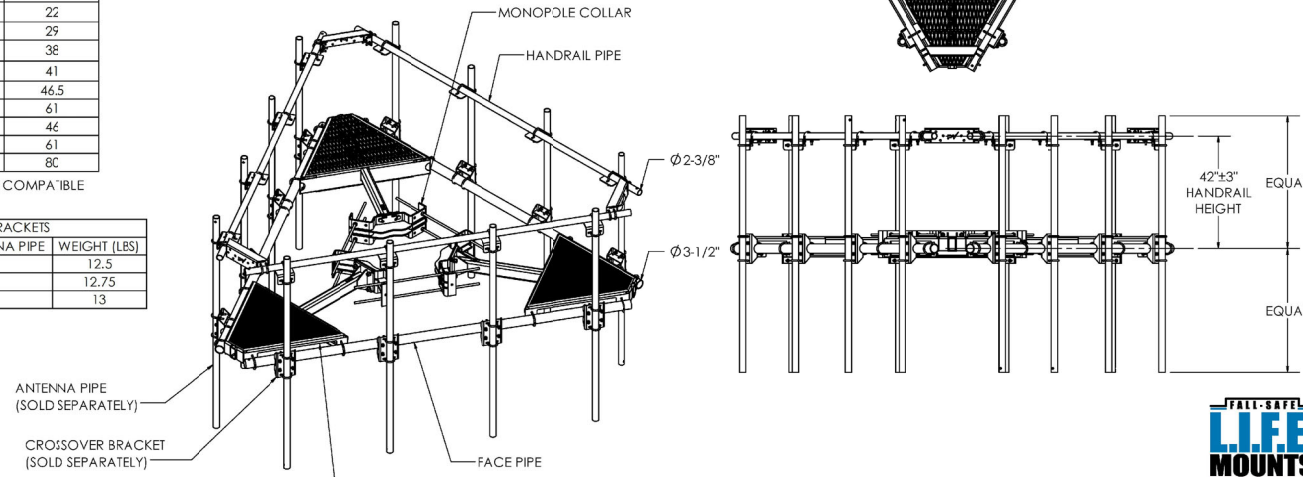
TABLE 2: ANTENNA PIPE OPTIONS\*\*\*

| OD     | LENGTH | ANTENNA PIPE | WEIGHT (LBS) |
|--------|--------|--------------|--------------|
| 2-3/8" | 72"    | PIPE-238X72  | 22           |
|        | 96"    | PIPE-238X96  | 29           |
|        | 126"   | PIPE-238X126 | 36           |
| 2-7/8" | 84"    | PIPE-278X84  | 41           |
|        | 96"    | PIPE-278X96  | 46.5         |
|        | 126"   | PIPE-278X126 | 61           |
| 3-1/2" | 72"    | PIPE-312X72  | 46           |
|        | 96"    | PIPE-312X96  | 61           |
|        | 126"   | PIPE-312X126 | 80           |

\*\*\*PLATFORM WITH HANDRAIL KITS ARE COMPATIBLE WITH 2-3/8" OD HANDRAIL PIPE ONLY

TABLE 3: CROSSOVER BRACKETS

| PART NUMBER   | COMPATIBLE ANTENNA PIPE | WEIGHT (LBS) |
|---------------|-------------------------|--------------|
| PV-XP-2030-HD | 2-3/8" OD               | 12.5         |
| PV-XP-2530-HD | 2-7/8" OD               | 12.75        |
| PV-XP-3030-HD | 3-1/2" OD               | 13           |



| REV | DESCRIPTION               | DATE     |
|-----|---------------------------|----------|
| 1   | UPDATED LOADING, TEMPLATE | 1/16/18  |
| 2   | VIEW LOADING              | 1/19/17  |
| 3   | HEAVY-S LOADING           | 4/13/15  |
| 4   | L.I.F.E. MOUNT™ UPDATE    | 2/22/16  |
| 5   | REDESIGNED COLLAR         | 12/30/15 |

1 OF 4  
5/4/2018  
SCALE: 1:36  
DIMENSIONS ARE IN INCHES  
TOLERANCES UNLESS NOTED:  
HOLES: +1/16" -1/32"  
ANGULAR: PROFILE ±1/4", BEND ±2"  
ALL OTHERS: ±1/16"

PERFECT VISION MANUFACTURING  
LPP-ENG-01-R7  
7

**MOUNT CLASSIFICATIONS:**

REFERENCE STRUCTURAL LETTER (LPP-STL-01-R1) FOR ADDITIONAL LOADING REQUIREMENTS

**MOUNT CLASSIFICATION INFORMATION:**

- MAX STRUCTURE HEIGHT: 400ft
- STRUCTURE CLASS: I OR II
- EXPOSURE CATEGORY: B OR C
- TOPOGRAPHIC CATEGORY: 1
- DESIGN WIND PRESSURE (NO ICE): 135psf
- DESIGN WIND PRESSURE (ICED): 15psf
- DESIGN ICE THICKNESS: 2.75in Radial

**APPROVED MOUNT CLASSIFICATIONS\***

APPROVED MOUNT CLASSIFICATIONS (4 PIPE)

| REQUIRED EXTREME ICE LOAD (LBS) | REQUIRED EXTREME WIND LOAD (LBS) |                  |                   |                   |                   |
|---------------------------------|----------------------------------|------------------|-------------------|-------------------|-------------------|
|                                 | 700                              | 750              | 1150              | 1550              | 1800              |
| 0                               | M750R(0)-4(6)                    | M750R(0)-4(6)    | M1150R(0)-4(6)    | M1550R(0)-4(6)    | M1800R(0)-4(6)    |
| 600                             | M750R(600)-4(6)                  | M750R(600)-4(6)  | M1150R(600)-4(6)  | M1550R(600)-4(6)  | M1800R(600)-4(6)  |
| 800                             | M750R(800)-4(6)                  | M750R(800)-4(6)  | M1150R(800)-4(6)  | M1550R(800)-4(6)  | M1800R(800)-4(6)  |
| 1100                            | M750R(1100)-4(6)                 | M750R(1100)-4(6) | M1150R(1100)-4(6) | M1550R(1100)-4(6) | M1800R(1100)-4(6) |
| 1250                            | M750R(1250)-4(6)                 | M750R(1250)-4(6) | M1150R(1250)-4(6) | M1550R(1250)-4(6) | M1800R(1250)-4(6) |

- HEAVY-S

APPLIES TO ALL PV-LPP12M, PV-LPP14M, AND PV-LPP14L SERIES PLATFORMS WITH ANTENNAS AND APPURTENANCES SYMMETRICALLY MOUNTED ABOUT THE PLATFORM CENTERLINE.

**POLE THICKNESS LIMITATIONS:**

ON POLES WITH WALL THICKNESS EQUAL TO OR GREATER THAN THE VALUES LISTED BELOW, THE PERFECT VISION PV-LPP MOUNT SERIES IS STRUCTURALLY CAPABLE OF SUPPORTING THE ABOVE LOADING SCENARIOS WITHOUT THE NEED FOR AN ADDITIONAL KICKER BRACE.

FOR THIN WALL POLES, USE PV-PKBK PLATFORM KICKER BRACE TO AVOID POLE CRIMPING FAILURES. KICKER BRACE CAN BE INSTALLED ABOVE OR BELOW PLATFORM.

POLE THICKNESS LIMITATIONS

| MOUNT CLASSIFICATION | MINIMUM POLE THICKNESS |
|----------------------|------------------------|
| M750R-4(6)           | 1/4"                   |
| M800R-4(6)           | 1/4"                   |
| M900R-4(6)           | 1/4"                   |
| M950R-4(6)           | 1/4"                   |
| M1000R-4(6)          | 5/16"                  |
| M1400R-4(6)          | 5/16"                  |
| M1000R(i)-4(6)       | 5/16"                  |
| M1500R(i)-4(6)       | 5/16"                  |

**PLATFORM EPA:**

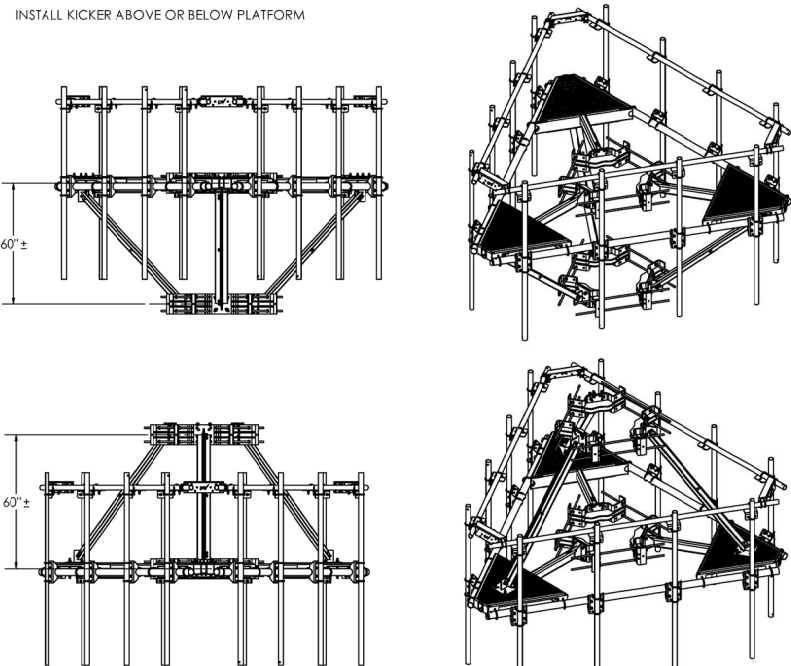
| PLATFORM TYPE            | PLATFORM EPA              |                                    |
|--------------------------|---------------------------|------------------------------------|
|                          | NO ICE (FT <sup>2</sup> ) | 1/2" RADIAL ICE (FT <sup>2</sup> ) |
| 12'6" FACE               | 20.3*                     | 25.8*                              |
| 12'6" FACE WITH HANDRAIL | 34.4**                    | 43.0**                             |
| 14'6" FACE               | 22.1*                     | 28.1*                              |
| 14'6" FACE WITH HANDRAIL | 36.8**                    | 46.2**                             |

\*DOES NOT INCLUDE CROSSOVER PLATES OR ANTENNA PIPES  
\*\*DOES NOT INCLUDE ANTENNA PIPES

**KICKER ATTACHMENT:**

SEE CLASSIFICATIONS SECTION FOR KICKER REQUIREMENT DETAILS.

INSTALL KICKER ABOVE OR BELOW PLATFORM



| REV | DESCRIPTION               | DATE     |
|-----|---------------------------|----------|
| 1   | UPDATED LOADING, TEMPLATE | 1/16/18  |
| 2   | VIEW LOADING              | 1/19/17  |
| 3   | HEAVY-S LOADING           | 4/13/15  |
| 4   | L.I.F.E. MOUNT™ UPDATE    | 2/22/16  |
| 5   | REDESIGNED COLLAR         | 12/30/15 |

2 OF 4  
5/4/2018  
SCALE: 1:48  
DIMENSIONS ARE IN INCHES  
TOLERANCES UNLESS NOTED:  
HOLES: +1/16" -1/32"  
ANGULAR: PROFILE ±1/4", BEND ±2"  
ALL OTHERS: ±1/16"

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**T-Mobile**  
18400 E. 22ND AVENUE  
AURORA, CO 80011

**CROWN CASTLE**  
116 INVERNESS DR. EAST STE# 280  
ENGLEWOOD, CO 80112

T-MOBILE SITE NUMBER:  
**DN02415A**

BU #: 877103  
**KEEBLER/COLORADO  
SPGS/CSP209**

231 MAIN STREET  
COLORADO SPRINGS, CO  
80911

EXISTING 60.0 FT MONOPOLE

**ISSUED FOR:**

| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
|-----|------------|------|-------------|---------|
| A   | 07-10-2018 | JAS  | PRELIMINARY | ELG     |
| B   | 08-17-2018 | JAS  | PRELIMINARY | ELG     |
| 0   | 08-29-2018 | JAS  | FINAL       | ELG     |
| 1   | 11-20-2018 | JAS  | FINAL       | ELG     |

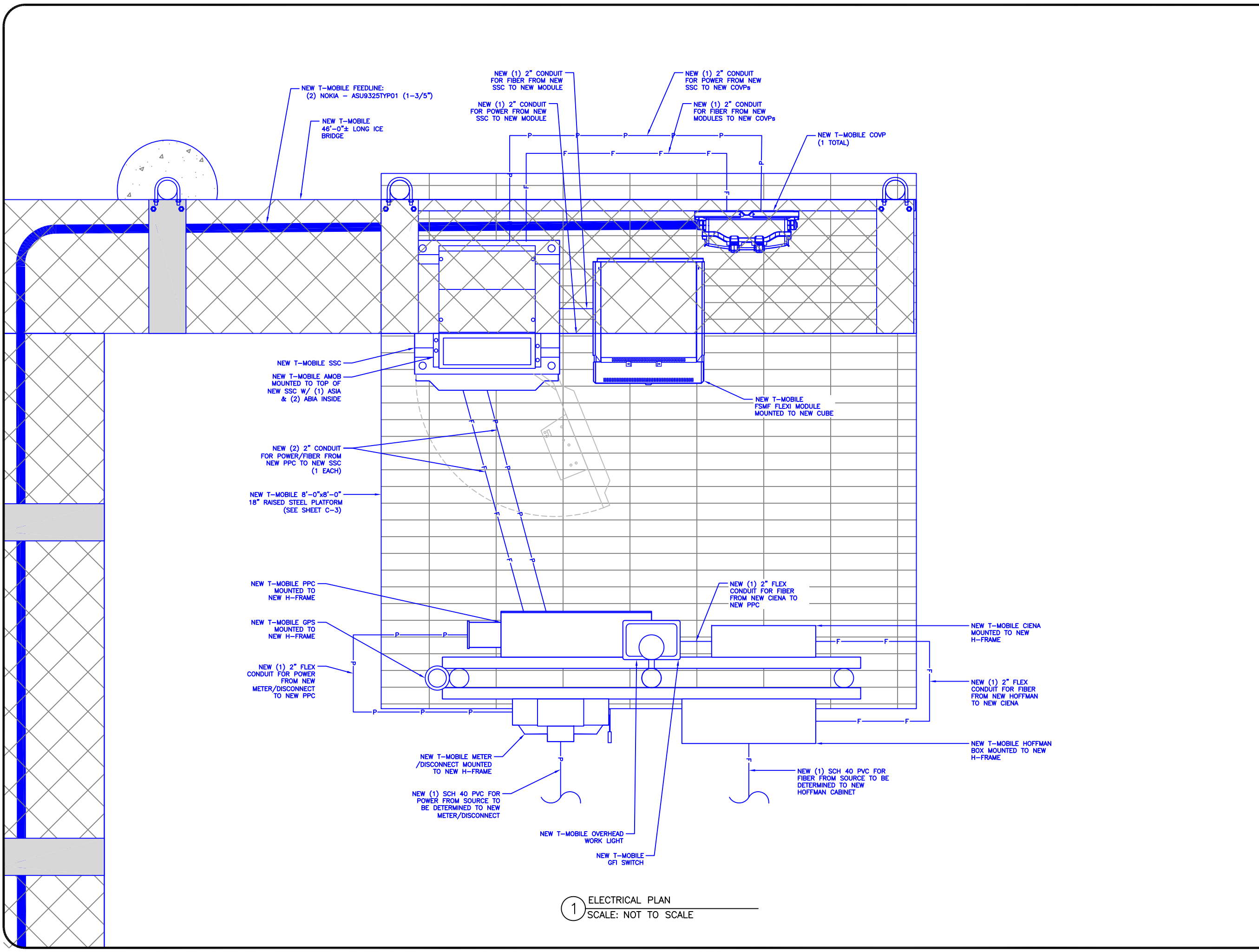
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JACOB GORALSKI  
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PROFESSIONAL ENGINEER**

11/29/2018  
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SHEET NUMBER: **C-8** REVISION: **1**

1 PERFECT 10 PV-LPP12M-HR-B  
SCALE: NOT TO SCALE



1 ELECTRICAL PLAN  
SCALE: NOT TO SCALE

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AURORA, CO 80011

**CROWN CASTLE**  
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ENGLEWOOD, CO 80112

T-MOBILE SITE NUMBER:  
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BU #: 877103  
**KEEBLER/COLORADO  
SPGS/CSP209**

231 MAIN STREET  
COLORADO SPRINGS, CO  
80911

EXISTING 60.0 FT MONOPOLE

ISSUED FOR:

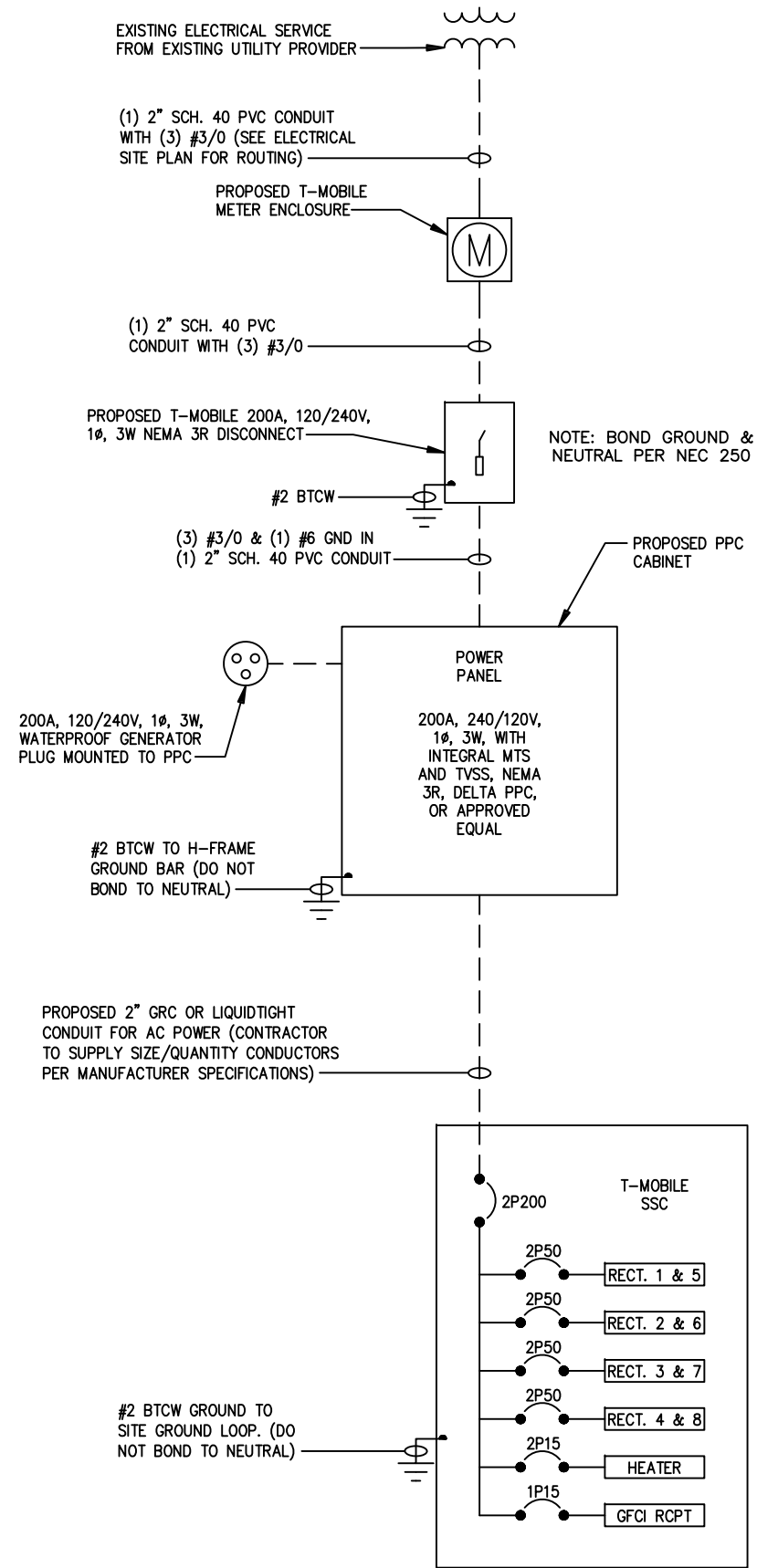
| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
|-----|------------|------|-------------|---------|
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**COLORADO LICENSED  
JACOB GORALSKI  
PE.0049661  
PROFESSIONAL ENGINEER**

11/29/2018  
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SHEET NUMBER: **E-1** REVISION: **1**



NOTE:  
CONTRACTOR TO COORDINATE WITH LOCAL UTILITY PROVIDER PRIOR TO CONSTRUCTION

1 ELECTRICAL ONE LINE DIAGRAM  
SCALE: NOT TO SCALE

PANEL: PPC

120/240 VOLTS, 1 PHASE, 3 WIRE, S/N, 200A AMP MCB NEMA 3R ENCL  
MINIMUM AIC RATING - 22,000A

| DESCRIPTION       | BKR | POLE | CKT | VA  | φ | VA     | CKT | POLE | BKR | DESCRIPTION               |
|-------------------|-----|------|-----|-----|---|--------|-----|------|-----|---------------------------|
| SURGE PROTECTOR   | 30  | 2    | 1   | --  | A | 50     | 2   | 1    | 10  | FAN                       |
| 2P BRANCH         | --  | --   | 3   | --  | B |        | 4   |      |     | SPACE                     |
| RECEPTACLE/LIGHTS | 15  | 1    | 5   | 230 | A |        | 6   |      |     | SPACE                     |
| SPACE             | 20  | 1    | 7   |     | B | 1000   | 8   | 2    | 20  | HEATER                    |
| SPACE             |     |      | 9   |     | A | 1000   | 10  | --   | --  | 2P BRANCH                 |
| SPACE             |     |      | 11  |     | B | 15,000 | 12  | 2    | 200 | (N) DELTA SUPPORT CABINET |
| SPACE             |     |      | 13  |     | A | 15,000 | 14  | --   | --  | --                        |
| SPACE             |     |      | 15  |     | B | --     | 16  | --   | --  | 2P BRANCH                 |
| SPACE             |     |      | 17  |     | A | --     | 18  | --   | --  | --                        |
| SPACE             |     |      | 19  |     | B | --     | 20  | --   | --  | --                        |
| SPACE             |     |      | 21  |     | A | --     | 22  | --   | --  | --                        |
| SPACE             |     |      | 23  |     | B | --     | 24  | --   | --  | --                        |

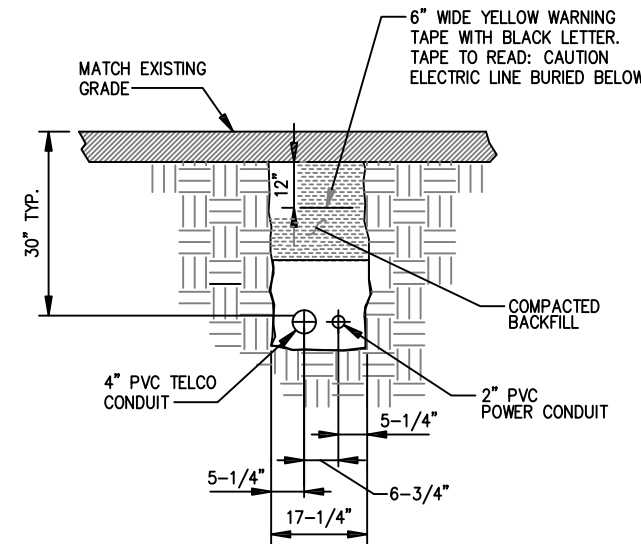
PANEL LOAD CALCULATIONS:

LIGHTS: 50 VOLTAMPS x 1.25 = 63 VA  
 RECEPTACLE: 180 VOLTAMPS x 1.00 = 180 VA  
 MISC. EQUIPMENT: 32050 VOLTAMPS x 1.00 = 32,050 VA

TOTAL CALCULATED CONNECTED LOAD: 32,280 VA  
 TOTAL CALCULATED DEMAND LOAD: 32,293 VA

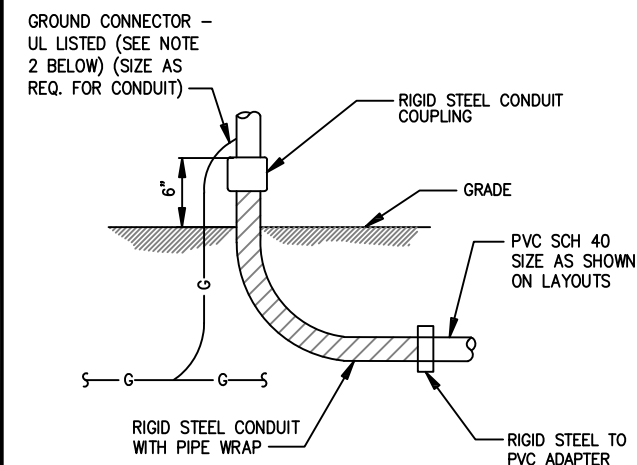
TOTAL CALCULATED DEMAND LOAD: 135A 120/240V 1PH 3W

2 BREAKER PANEL SCHEDULE  
SCALE: NOT TO SCALE



NOTE:  
NUMBER AND SIZE OF CONDUITS MAY VARY. SEE DWG E-1 FOR CONDUIT SIZE AND LOCATION. CONFIRM DIMENSIONS SHOWN WITH UTILITY COMPANY

3 CONDUIT TRENCH DETAIL  
SCALE: NOT TO SCALE



NOTES:  
 1. ALL CONDUIT ABOVE GRADE MUST BE RIGID STEEL OR LIQUIDTIGHT.  
 2. ALL NEW STRUCTURAL STEEL SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 G90 AFTER FABRICATION.  
 3. FIELD ABRASIONS SHALL BE TOUCH UP PAINTED WITH ZINC RICH GALVANIZING REPAIR PAINT IN ACCORDANCE WITH ASTM A780.  
 4. ALL EXPOSED ENDS OF CONDUITS SHALL HAVE WEATHER PROOF CAPS. DO NOT USE DUCT TAPE.  
 5. PROVIDE 200LB. TEST PULL WIRES IN EACH TELEPHONE AND POWER CONDUIT. STUB CONDUITS INTO ENCLOSURE AND LABEL.

4 UNDERGROUND CONDUIT STUB-UP  
SCALE: NOT TO SCALE

T-Mobile  
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AURORA, CO 80011

CROWN CASTLE  
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ENGLEWOOD, CO 80112

T-MOBILE SITE NUMBER:  
DN02415A

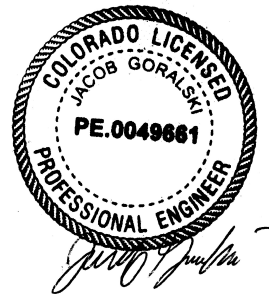
BU #: 877103  
KEEBLER/COLORADO  
SPGS/CSP209

231 MAIN STREET  
COLORADO SPRINGS, CO  
80911

EXISTING 60.0 FT MONOPOLE

ISSUED FOR:

| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
|-----|------------|------|-------------|---------|
| A   | 07-10-2018 | JAS  | PRELIMINARY | ELG     |
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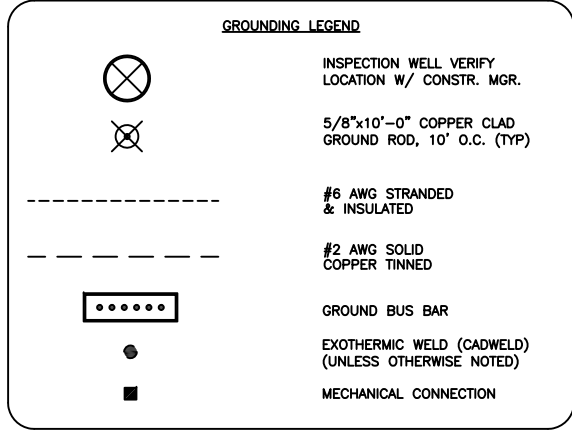
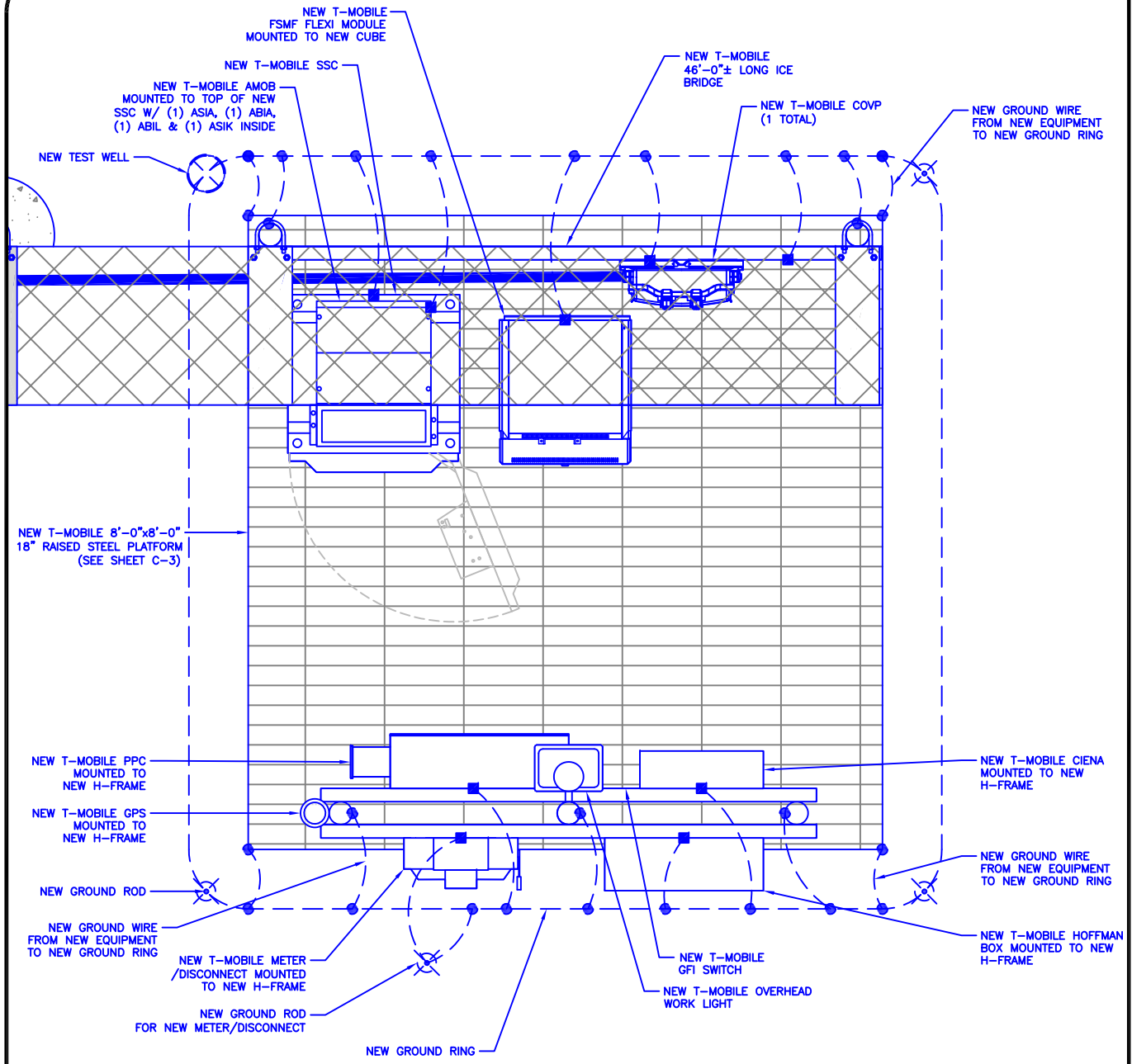


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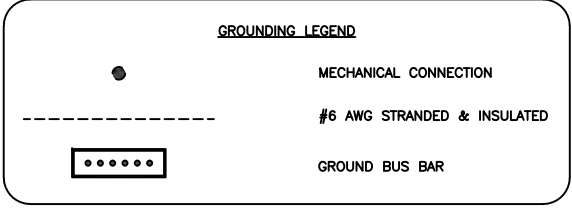
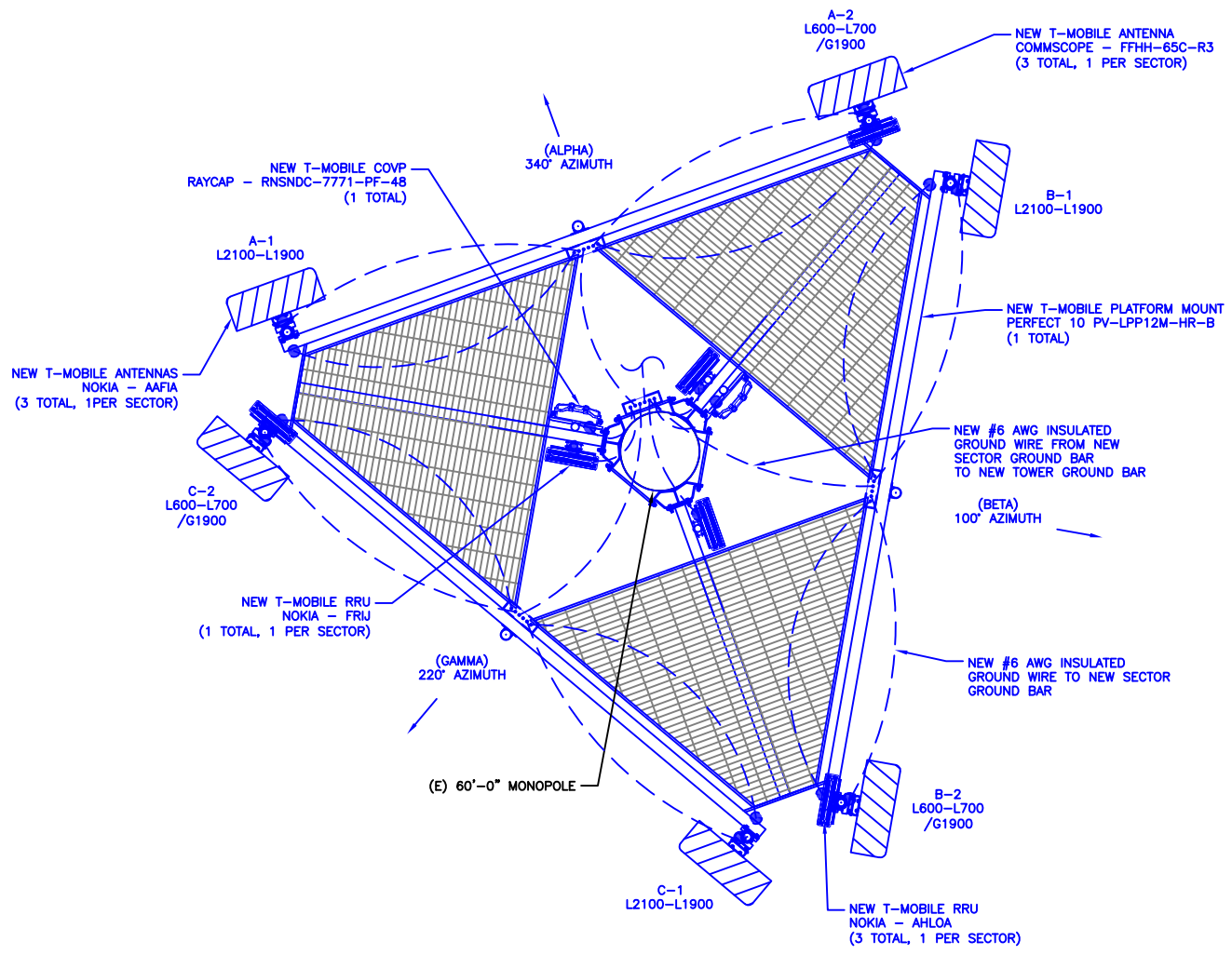
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SHEET NUMBER: E-2 REVISION: 1





1 EQUIPMENT GROUNDING DIAGRAM  
SCALE: NOT TO SCALE



2 ANTENNA GROUNDING PLAN  
SCALE: NOT TO SCALE



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T-MOBILE SITE NUMBER:  
**DN02415A**

BU #: 877103  
**KEEBLER/COLORADO  
SPGS/CSP209**

231 MAIN STREET  
COLORADO SPRINGS, CO  
80911

EXISTING 60.0 FT MONOPOLE

**ISSUED FOR:**

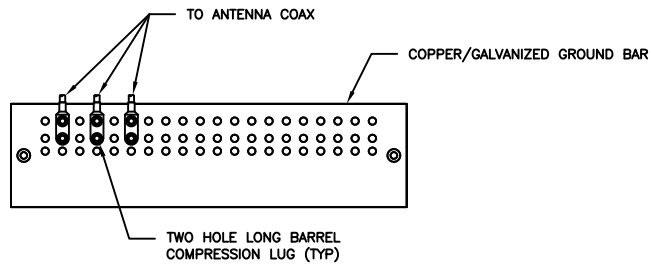
| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
|-----|------------|------|-------------|---------|
| A   | 07-10-2018 | JAS  | PRELIMINARY | ELG     |
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11/29/2018  
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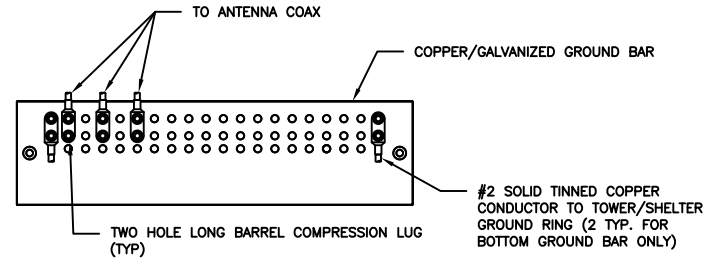
SHEET NUMBER: **G-1** REVISION: **1**



**NOTES:**

1. DOUBLING UP "OR STACKING" OF CONNECTIONS IS NOT PERMITTED.
2. EXTERIOR ANTIOXIDANT JOINT COMPOUND TO BE USED ON ALL EXTERIOR CONNECTIONS.
3. GROUND BAR SHALL NOT BE ISOLATED FROM TOWER. MOUNT DIRECTLY TO TOWER STEEL.

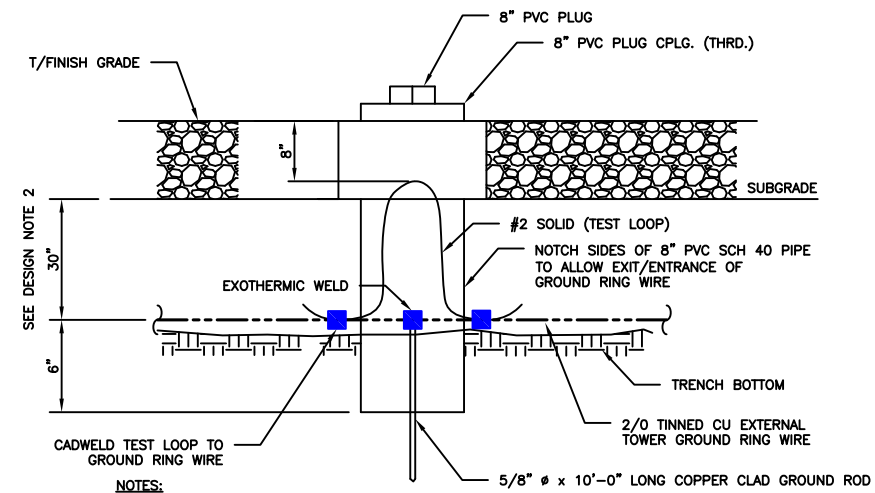
1 ANTENNA GROUND BAR DETAIL  
SCALE: NOT TO SCALE



**NOTES:**

1. EXTERIOR ANTIOXIDANT JOINT COMPOUND TO BE USED ON ALL EXTERIOR CONNECTIONS.
2. GROUND BAR SHALL NOT BE ISOLATED FROM TOWER. MOUNT DIRECTLY TO TOWER STEEL (TOWER ONLY).
3. GROUND BAR SHALL BE ISOLATED FROM BUILDING OR SHELTER.

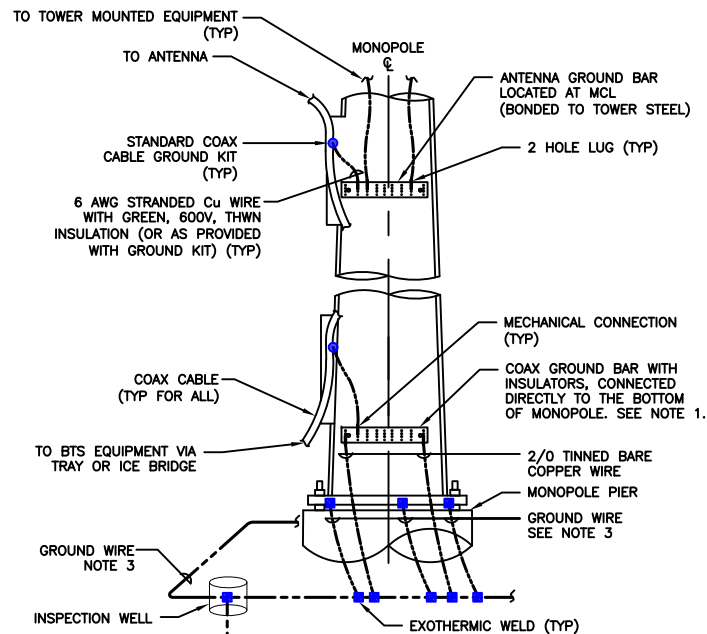
2 TOWER/SHELTER GROUND BAR DETAIL  
SCALE: NOT TO SCALE



**NOTES:**

1. GROUND ROD SHALL BE DRIVEN VERTICALLY, NOT TO EXCEED 45 DEGREES FROM THE VERTICAL.
2. GROUND WIRE SHALL BE MIN. 30" BELOW GRADE OR 6" BELOW FROST LINE. (WHICH EVER IS GREATER) AS PER N.E.C. ARTICLE 250-50(D)

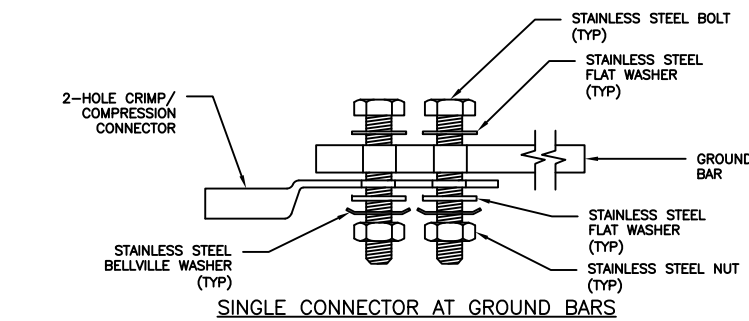
3 INSPECTION WELL DETAIL  
SCALE: NOT TO SCALE



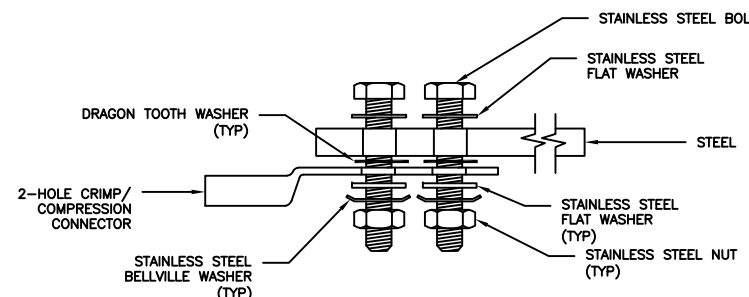
**NOTES:**

1. NUMBER OF GROUNDING BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, ANTENNA LOCATIONS AND CONNECTION ORIENTATION. COAXIAL CABLES EXCEEDING 200 FEET ON THE TOWER SHALL HAVE GROUND KITS AT THE MIDPOINT. PROVIDE AS REQUIRED.
2. ONLY MECHANICAL CONNECTIONS ARE ALLOWED TO BE MADE TO CROWN CASTLE TOWERS. ALL MECHANICAL CONNECTIONS SHALL BE TREATED WITH AN ANTI-OXIDANT COATING.
3. ALL TOWER GROUNDING SYSTEMS SHALL COMPLY WITH THE REQUIREMENTS OF THE RECOGNIZED EDITION OF ANSI/TIA 222 AND NFPA 780.

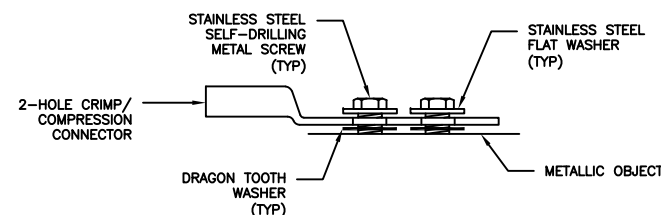
4 TYPICAL ANTENNA CABLE GROUNDING  
SCALE: NOT TO SCALE



SINGLE CONNECTOR AT GROUND BARS

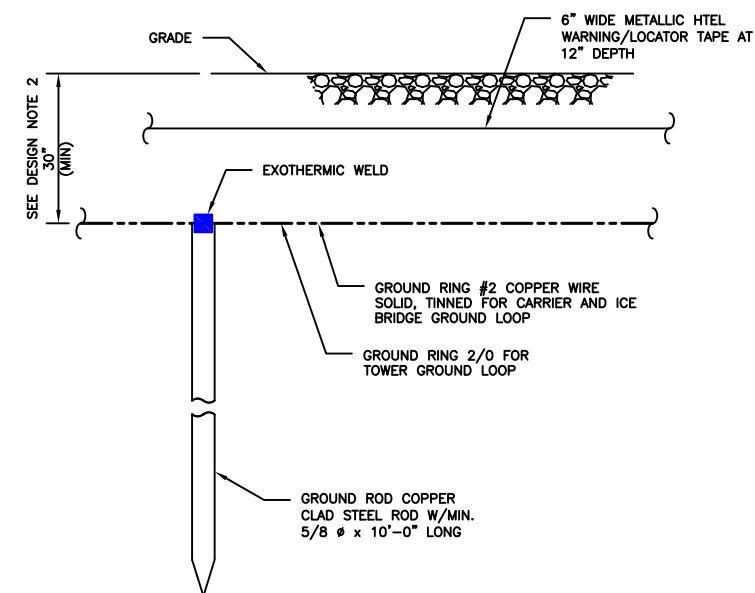


SINGLE CONNECTOR AT STEEL OBJECTS



SINGLE CONNECTOR AT METALLIC/STEEL OBJECTS

5 HARDWARE DETAIL FOR EXTERIOR CONNECTIONS  
SCALE: NOT TO SCALE



**NOTES:**

1. GROUND ROD SHALL BE DRIVEN VERTICALLY, NOT TO EXCEED 45 DEGREES FROM THE VERTICAL.
2. GROUND WIRE SHALL BE MIN. 30" BELOW GRADE OR 6" BELOW FROST LINE. (WHICH EVER IS GREATER) AS PER N.E.C. ARTICLE 250-50(D)

6 GROUND ROD DETAIL  
SCALE: NOT TO SCALE

**T-Mobile**  
18400 E. 22ND AVENUE  
AURORA, CO 80011

**CROWN CASTLE**

116 INVERNESS DR. EAST STE# 280  
ENGLEWOOD, CO 80112

T-MOBILE SITE NUMBER:  
**DN02415A**

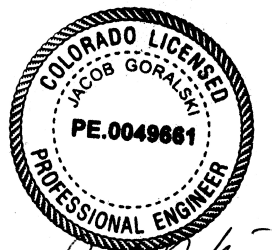
BU #: 877103  
**KEEBLER/COLORADO  
SPGS/CSP209**

231 MAIN STREET  
COLORADO SPRINGS, CO  
80911

EXISTING 60.0 FT MONOPOLE

**ISSUED FOR:**

| REV | DATE       | DRWN | DESCRIPTION | DES./QA |
|-----|------------|------|-------------|---------|
| A   | 07-10-2018 | JAS  | PRELIMINARY | ELG     |
| B   | 08-17-2018 | JAS  | PRELIMINARY | ELG     |
| 0   | 08-29-2018 | JAS  | FINAL       | ELG     |
| 1   | 11-20-2018 | JAS  | FINAL       | ELG     |



11/29/2018

**JACOB GORALSKI, PLLC**

CONSULTING ENGINEER  
JACOB GORALSKI, PLLC  
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1106 COLBI ST.  
KENNEDALE, TX 76060  
(817) 456-2621

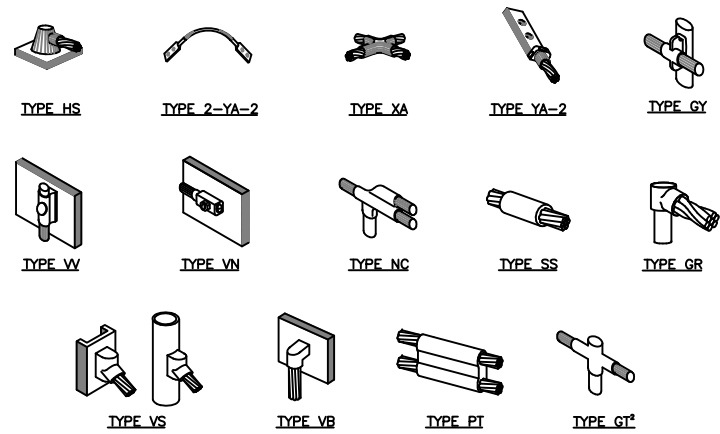
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SHEET NUMBER:

**G-2**

REVISION:

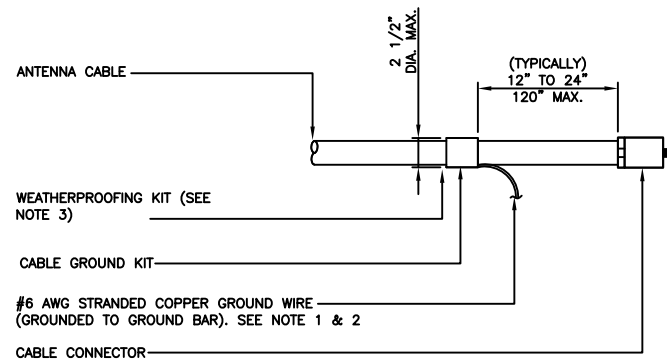
**1**



**NOTE:**

1. ERICO EXOTHERMIC "MOLD TYPES" SHOWN HERE ARE EXAMPLES. CONSULT WITH CONSTRUCTION MANAGER FOR SPECIFIC MOLDS TO BE USED FOR THIS PROJECT.
2. MOLD TYPE ONLY TO BE USED BELOW GRADE WHEN CONNECTING GROUND RING TO GROUND ROD.

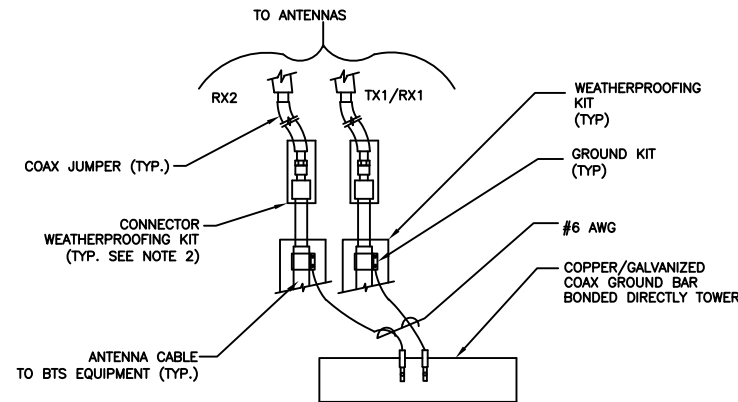
**1 CADWELD GROUNDING CONNECTIONS**  
SCALE: NOT TO SCALE



**NOTES:**

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR.
2. GROUNDING KIT SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.
3. WEATHER PROOFING SHALL BE TWO-PART TAPE KIT. COLD SHRINK SHALL NOT BE USED.

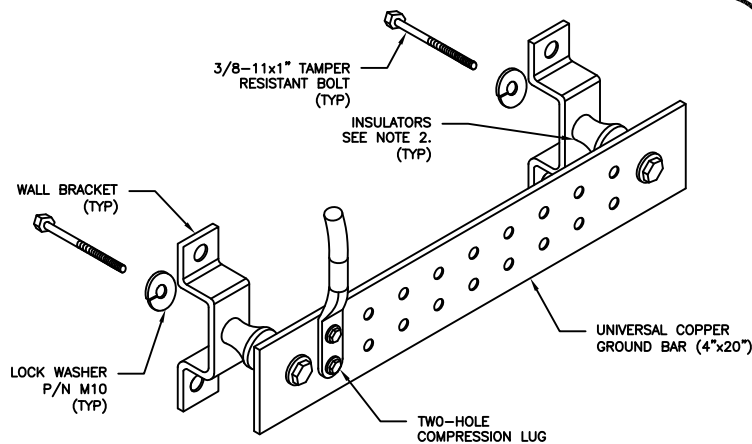
**3 CABLE GROUND KIT CONNECTION**  
SCALE: NOT TO SCALE



**NOTES:**

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO ANTENNA GROUND BAR.
2. WEATHER PROOFING SHALL BE TWO-PART TAPE KIT. COLD SHRINK SHALL NOT BE USED.

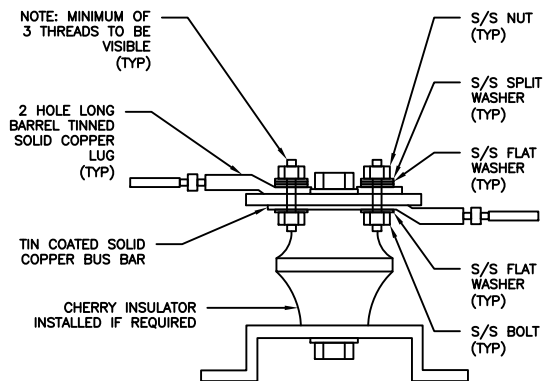
**4 GROUND CABLE CONNECTION**  
SCALE: NOT TO SCALE



**NOTES:**

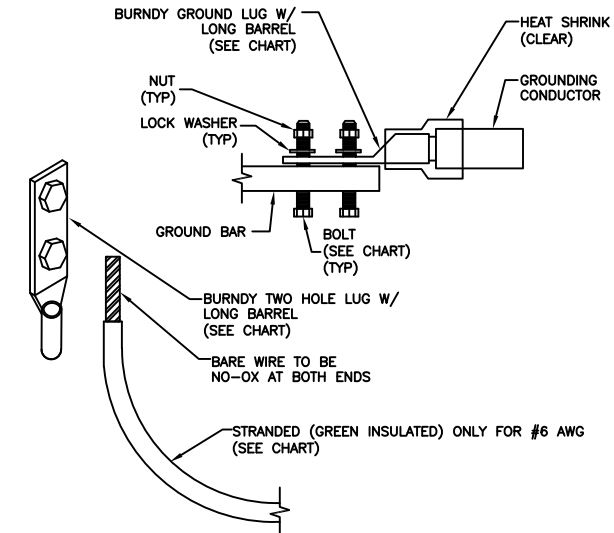
1. DOWN LEAD (HOME RUN) CONDUCTORS ARE NOT TO BE INSTALLED ON CROWN CASTLE TOWER, PER THE GROUNDING DOWN CONDUCTOR POLICY GAS-STD-10091. NO MODIFICATION OR DRILLING TO TOWER STEEL IS ALLOWED IN ANY FORM OR FASHION, CAD-WELDING ON THE TOWER AND/OR IN THE AIR ARE NOT PERMITTED.
2. OMIT INSULATOR WHEN MOUNTING TO TOWER STEEL OR PLATFORM STEEL. USE INSULATORS WHEN ATTACHING TO BUILDING OR SHELTERS.

**6 GROUND BAR DETAIL**  
SCALE: NOT TO SCALE



**7 LUG DETAIL**  
SCALE: NOT TO SCALE

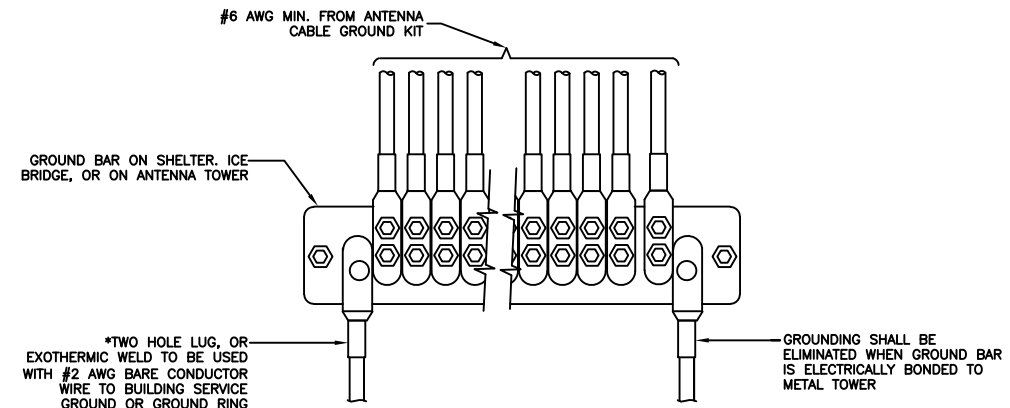
| WIRE SIZE              | BURNDY LUG | BOLT SIZE             |
|------------------------|------------|-----------------------|
| #6 AWG GREEN INSULATED | YA6C-2TC38 | 3/8" - 16 NC S 2 BOLT |
| #2 AWG SOLID TINNED    | YA3C-2TC38 | 3/8" - 16 NC S 2 BOLT |
| #2 AWG STRANDED        | YA2C-2TC38 | 3/8" - 16 NC S 2 BOLT |
| #2/0 AWG STRANDED      | YA26-2TC38 | 3/8" - 16 NC S 2 BOLT |
| #4/0 AWG STRANDED      | YA28-2N    | 1/2" - 16 NC S 2 BOLT |



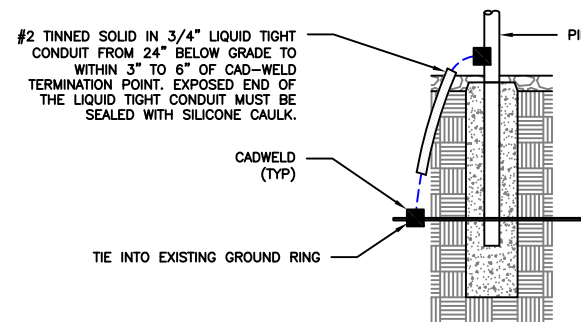
**NOTES:**

1. ALL GROUNDING LUGS ARE TO BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. ALL HARDWARE BOLTS, NUTS, LOCK WASHERS SHALL BE STAINLESS STEEL. ALL HARDWARE ARE TO BE AS FOLLOWS: BOLT, FLAT WASHER, GROUND BAR, GROUND LUG, FLAT WASHER AND NUT.

**2 MECHANICAL LUG CONNECTION**  
SCALE: NOT TO SCALE



**5 GROUNDWIRE INSTALLATION**  
SCALE: NOT TO SCALE



**8 TRANSITIONING GROUND DETAIL**  
SCALE: NOT TO SCALE

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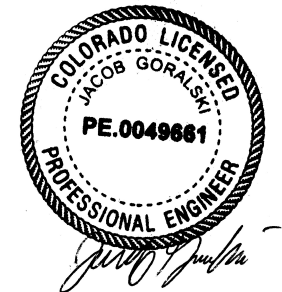
T-MOBILE SITE NUMBER:  
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11/29/2018  
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SHEET NUMBER: **G-3** REVISION: **1**