# Telecommunications Transmission Facility Committee
# Tower Coordinator Recommendation

***Application Number:*** 2023042144 ***Type:*** Colocation ***Received (date):*** 4/10/2023
***Revised:*** 4/21/2023

***Applicant:*** Crown Castle Fiber LLC on behalf of T-Mobile
***Site Name/Location:*** PEPCO 799422-243180/ Corner Hudson Ave & Flower Ave,Takoma Park
***Zoning Standard:*** R-10 ***Property Owner:*** City of Takoma Park
***Description:*** -Strand Cable
-Ericsson 6523 semi-integrated panel antenna (1)
-Ericsson 6525 semi-integrated panel antenna (1)
-Ericsson Diplex Filter B2+B66/B30 (4-2) Diplexer (2)
-Ericsson 4402 Radio (2)
-Ericsson 4435 Radio (1)
***Tower Coordinator Recommendation:*** Recommended. Recommendation is subject to compliance with all applicable laws.

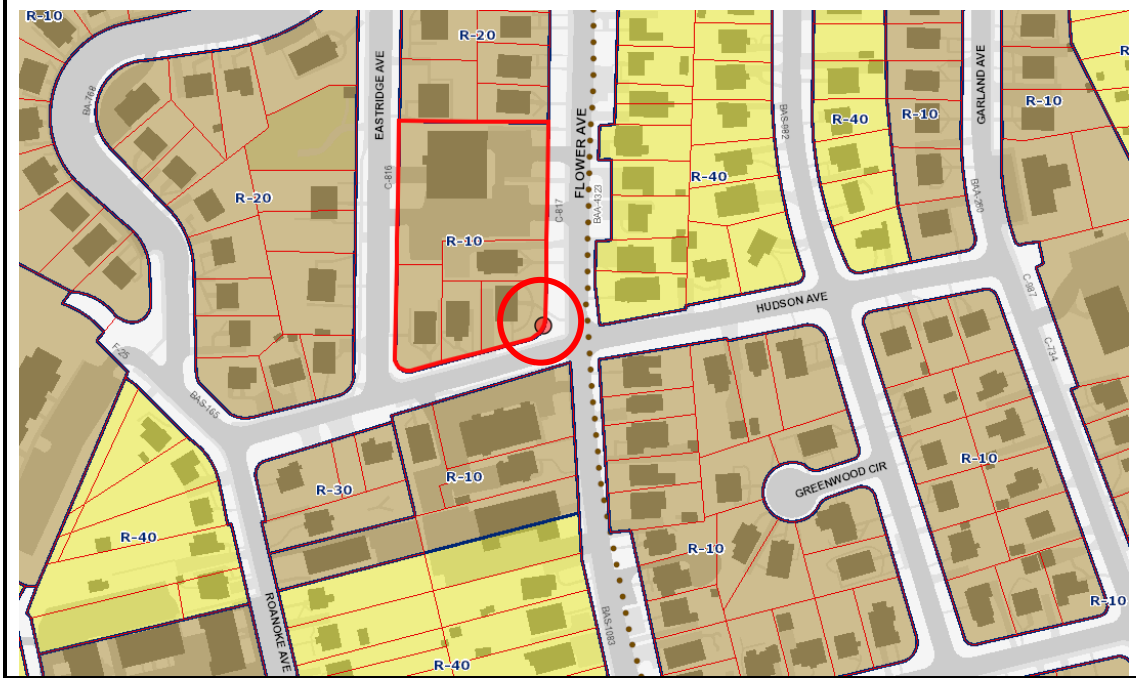
*Signature*: *Date*: 4/21/2023

*Impact on land-owning agency*: N/A

*Existing or future public safety telecommunications facilities and plans*: N/A

*Colocation options*: Crown Castle is applying on behalf of T-Mobile. This location was selected in consultation with the utility structure owner (PEPCO) as it meets the relevant County zoning requirements, utility standards, and wireless coverage/capacity needs of the wireless carrier.

*Implications to surrounding area*: The MCAtlas zoning map (below) shows the location of the utility pole and proposed strand-mounted antenna (circled) along with the general vicinity.



The photo below obtained from an April 13, 2023, site survey shows the 43'10" utility pole with a red arrow indicating the approximate attachment height of the proposed antennas on the proposed strand. The pole is at least 68 feet from the residential and commercial premises.



*Attachments*: Application

*Comments*: The proposed strand-mounted antenna and associated equipment will be mounted to a strand/messenger cable secured to the existing 43'10" wood utility pole with the RAD center of 21'9". All proposed antenna and equipment attachments meet the length and volume requirements set forth in the Montgomery County Ordinance, with the maximum length of the proposed antennas being 7.87" for a total cumulative volume of 0.07 cubic feet. The proposed installation meets the minimum mounting height and setback requirements under Montgomery County Zoning Ordinance Section 3.5.14.c Antenna on Existing Structure as Limited Use.

The maximum effective radiated power (Max ERP) for this installation (387 watts and 86 watts) falls below the maximum permissible exposure limits set forth by the FCC and, as a result, is categorically excluded from a detailed environmental analysis. CTC verified the categorical exclusion calculations are sound and the power levels of the antennas are so low as to exclude them from further environmental analysis.

The applicant provided owner's consent documentation in the form of a Notice To Proceed agreement signed by PEPCO for the proposed work involving this pole.

We recommend this application on its merits from an engineering review perspective.

Revisions received 4.21.23 - JE

App No: 2023042144

## Application General Information

| | | | |
|---|---|---|---|
| Applicant Name | Crown Castle Fiber LLC | Received | 4/10/2023 |
| Application Type | ~~New~~Colocation | Ann. Plan? | Yes |
| Carrier | T-Mobile | Will site be used to support government telecommunications facilities or other equipment for government use? | No |
| Solution Type | Small Cell | | |
| Existing | Existing | Gvt. Use Desc. | |

Application Description

-Strand Cable
-Ericsson 6523 semi-integrated panel antenna (1)
-Ericsson 6525 semi-integrated panel antenna (1)
-Ericsson Diplex Filter B2+B66/B30 (4-2) Diplexer (2)
-Ericsson 4402 Radio (2)
-Ericsson 4435 Radio (1)

## Site Information

| | | | |
|---|---|---|---|
| Site Id | 765 | Zoning | R-10 |
| Structure Type | Utility Pole | Latitude | 38.992506 |
| Street Address | Corner Hudson Ave & Flower Ave | Longitude | -77.002292 |
| County Site Name | PEPCO 799422-243180 | Ground Elevation | 264 |
| Carrier Site Name | MNG-094m1 | City | Takoma Park |
| Site Owner | Takoma Park | Lease Status | Leased |
| Structure Owner | Pepco | Does the structure require an antenna structure registration under FCC Title 47 part 17? | No |
| Existing Structure Height | 43'-10" ~~43'-~~ | | |
| Provide the proposed height of the replacement structure without any antenna (New Apps Only) | | Distance to Residential Property (New, Colocation Only) | 68'-3" |
| | | Distance to Commercial Property (New, Colocation Only) | 1292'-11" |

Justification of why this site was selected:

Nearby Sites (New Apps Only):

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5:04:38 PM

App No: 2023042144

Screening considerations (New, Colocation Apps Only):

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App No: 2023042144

6409 Questions

Does this qualify as a 6409 application? (Minor Mod, Colocations Only)

For towers outside the public ROW will the proposed installation increase the height of the structure by: (1) more than 10% or (2) more than 20 feet, whichever is greater?

Will the proposed installation increase the width by adding appurtenance to the body of the structure that would protrude from the edge of the structure by more than 6 feet?

For towers outside the public ROW will the proposed installation increase the width by adding appurtenance to the body of the structure that would protrude from the edge of the structure by more than 20 feet?

Will the proposed installation require more the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets?YN

Will the proposed installation increase the height of the structure by: (1) more than 10% or (2) more than 10 feet, whichever is greater?

Does the structure or current installation have concealment elements/measures? Yes

Will the proposed installation require excavation or expansion outside the current boundaries of the site?

If yes, describe how the proposed installation does not defeat the existing concealment. Strand Mounted

Small Wireless Facility Information

Is this a Small Wireless Facility? Yes

Is the structure 10% taller than adjacent structures? No

Please list adjacent structure heights

Cumulative volume of the proposed wireless equipment(s) exclusive of antennas in cubic feet: 0.633

Cumulative volume of the proposed antenna(s) exclusive of equipment in cubic feet: 0.07

ROW Information

PROW? Yes

ROW owner Takoma Park

ROW width 43'-9"

Pole Number 799422-243180

Monday, April 10, 2023

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App No: 2023042144

Antenna Information

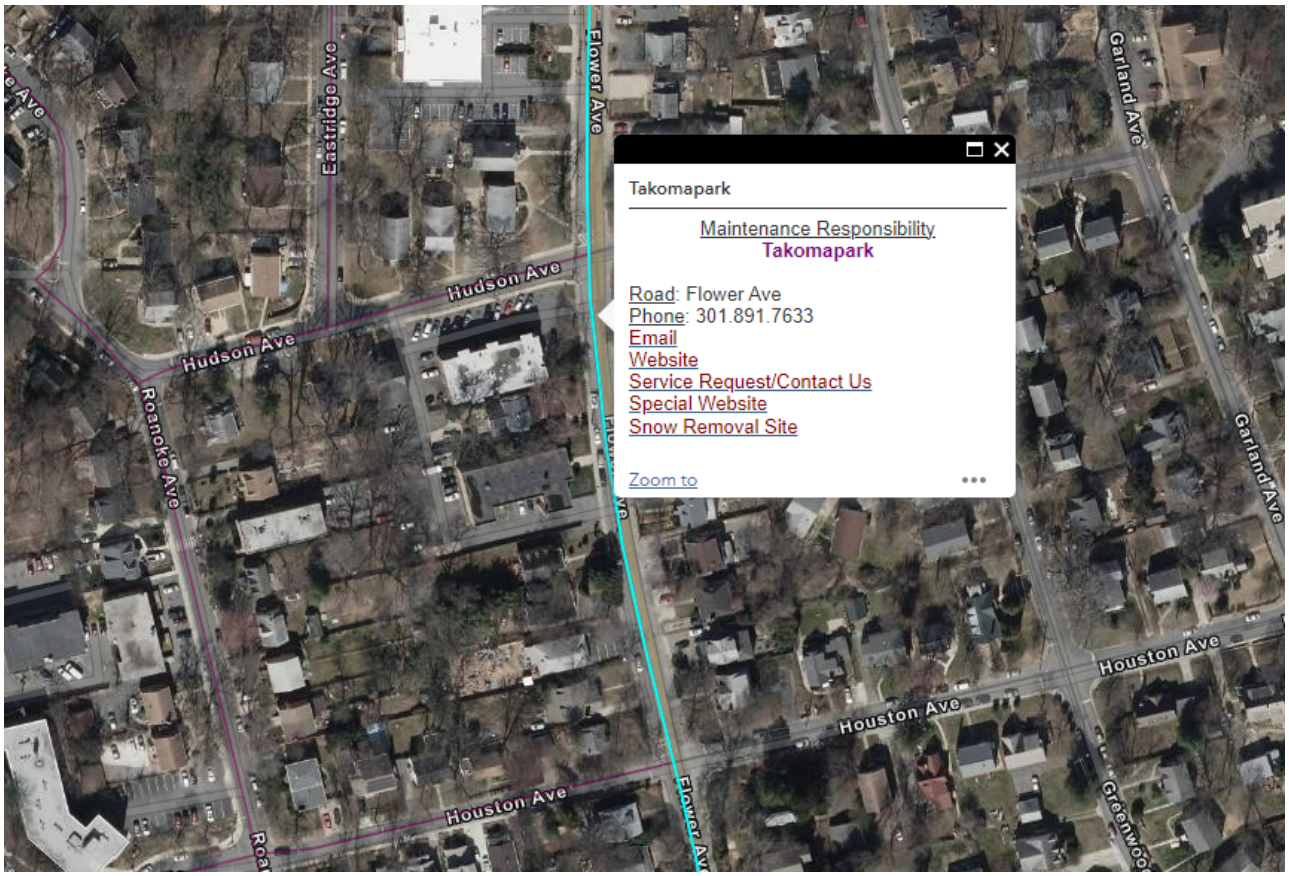
| | |
|---|---|
| Antenna Compliance | Yes |
| Compliance Desc | |
| Antenna Location | No |
| Antenna Loc. Desc. | |
| Env. Assessment | |
| Cat. Excluded? | checked |
| Routine Env. Evaluation | |

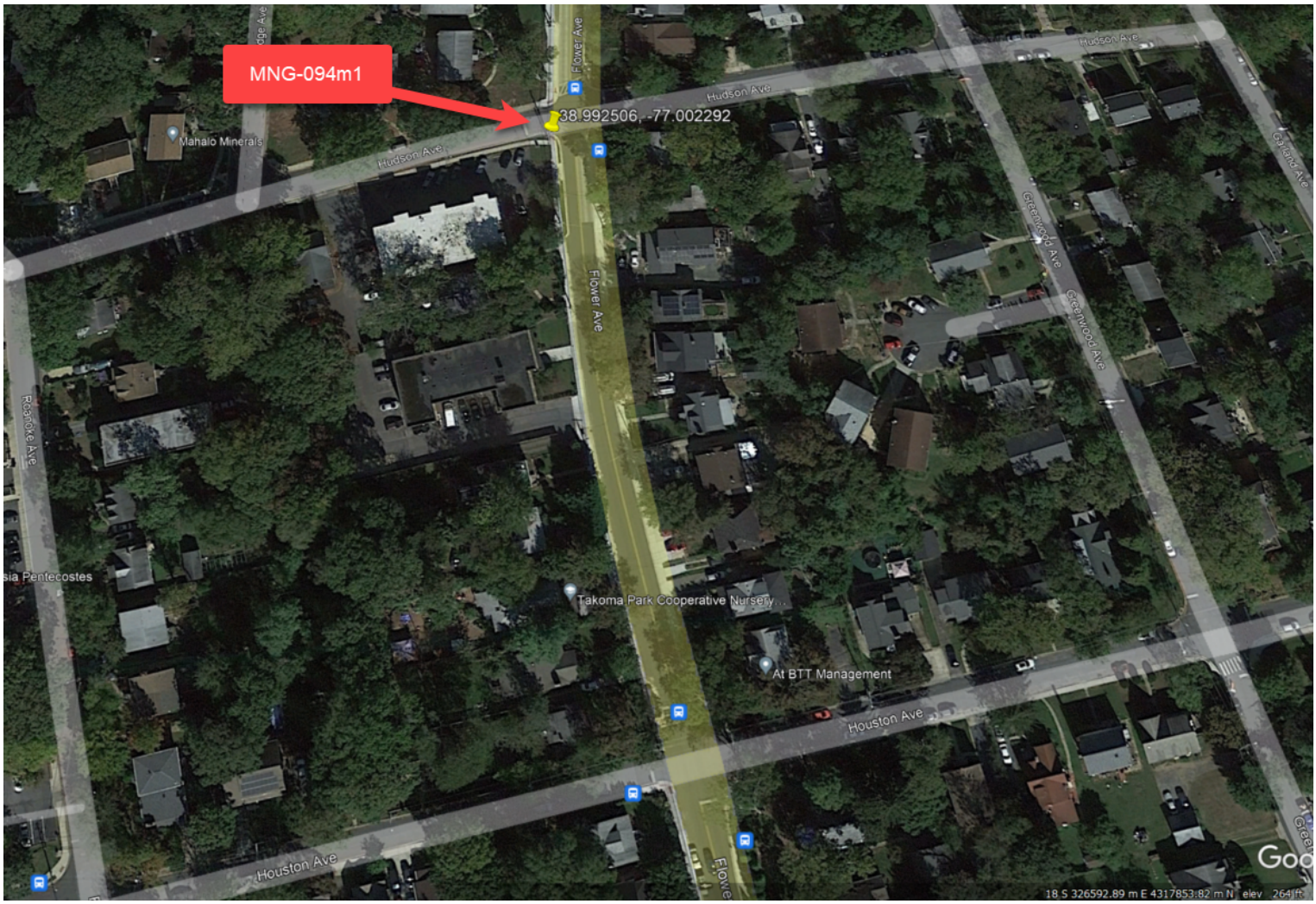
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna Model | Ericsson 6525 | | | | | | |
| Frequency | 2535-2552.5MHz, 2584-2590MHz | | | | | | |
| RAD Center | 21'- 9" ~~21'-~~ | Max ERP | 387 | Antenna Dimension | 7.87"x7.87"x0.98" | Quantity | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna Model | Ericsson 6523 | | | | | | |
| Frequency | 1735-1755,1850 – 1865,1885 – 1895,1910 – 1915, 1930 – 1945, 1965 – 1975,1990-1995,2135-2155 | | | | | | |
| RAD Center | 21'- 9" ~~21'-~~ | Max ERP | 86 | Antenna Dimension | 7.87"x7.87"x0.98" | Quantity | 1 |

Monday, April 10, 2023

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Takomapark
Maintenance Responsibility
Takomapark
Road: Flower Ave
Phone: 301.891.7633
Email
Website
Service Request/Contact Us
Special Website
Snow Removal Site
Zoom to
Hudson Ave
Hudson Ave
Eastridge Ave
Flower Ave
Garland Ave
Roanoke Ave
Houston Ave
Houston Ave
Houston Ave
Garland Ave


MNG-094m1
38.992506, -77.002292
Mahalo Minerals
Hudson Ave
Flower Ave
Greenwood Ave
Takoma Park Cooperative Nursery...
At BTT Management
Houston Ave
Roanoke Ave
18 S 326592.89 m E 4317853.82 m N elev 264 ft




# ANTENNA 6523

**Integrated Directional Antenna 6523**
The modular Micro Radio 4402 supports installations with an integrated directional antenna or external antenna systems.

Antenna 6523 is the integrated directional antenna for Radio 4402 for the 3GPP Band B1, B2/B25, B3 and B66A for Licensed Assisted Access usage and is mounted on the front of Radio 4402 and when used replaces the cover.

The antenna pattern, with a broad horizontal beam, is beneficial for small cell coverage. The fixed electrical tilt is -8 degrees. An optional mechanical down tilt bracket is also available.

Antenna 6523 is designed for optimal performance in all Radio 4402 configurations and integrated for very low visual impact in urban installations.

**Micro Radio 4402**
The Micro Radio 4402 is part of the Ericsson Radio System portfolio. Radio 4402 has best in class design, superior radio performance and power efficiency when it comes to medium range 3GPP radio products.

Radio 4402 has, by use of its small and smart dimensions, support for a wide range of mounting scenarios and has a pioneering flexibility within its product segment. With the Radio 4402, Ericsson evolves the micro radio portfolio to become even more flexible thus making it easier than ever to make small and efficient single and multi-band micro radio installations.

# Technical Specification Antenna 6523

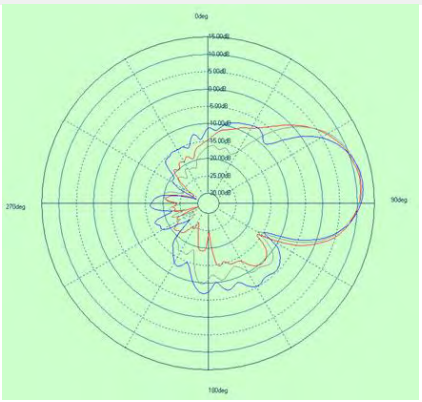
**PRODUCT NUMBER** KRE 105 280/1

| | |
|---|---|
| 3GPP Band: | B1 B2/B25 B3 B66A |
| Frequency range: | 1700 - 2200 MHz |
| Average gain: | 8.5 dBi |
| **Horizontal pattern** | |
| Beam width, 3 dB (0dBi) : | 82° (120°) |
| Beam tracking error ±60°: | ≤ 5 dB |
| Beam pointing error 0°: | ≤7° |
| **Vertical pattern** | |
| Beam width, 3 dB: | 43° |

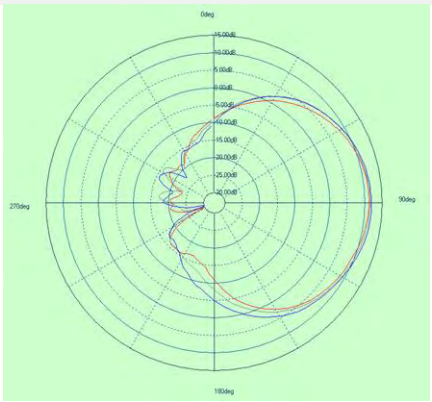
| | |
|---|---|
| Fixed electrical tilt: | -8° |
| Front-to-back 180 ± 30°: | > 15 dB |
| VSWR (Return loss): | < 1.57 (> 13dB) |
| Isolation | > 20 dB |
| Cross Polarization Ratio | > 10 dB(at boresight), > 5 dB(at sector) |
| Antenna pattern files: | Contact local Ericsson sales representative |

**Mechanical specification**

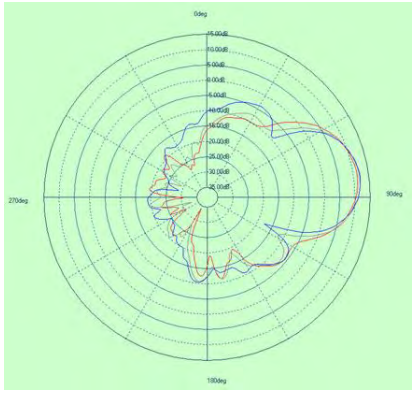
| | |
|---|---|
| Main Dimensions, WxDxH: | 200mm x 25mm x 200 mm |
| Weight: | < 800 g |
| Volume: | 1,0 l |
| Environmental: | IP55, Type 3R |



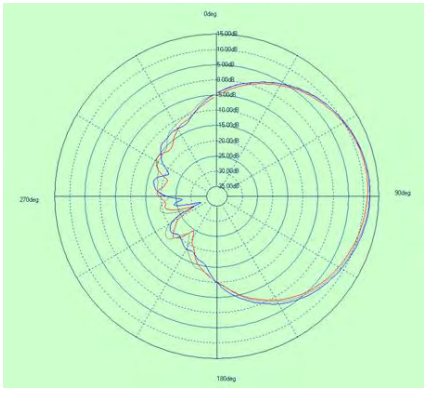
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+45_H-Plane



-45_V-Plane



-45_H-Plane

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# Antenna 6525

Integrated Directional Antenna 6525

The modular Micro Radio 4402 and Radio 4408 support installations with an integrated directional antenna or external antenna systems.

Antenna 6525 is the integrated directional antenna for Radio 4402 and Radio 4408 for the 3GPP Bands B7 B38A B40 B41 (2300 – 2690 MHz) and is mounted on the front of Radio 4402 and Radio 4408 and when used replaces the cover.

The antenna pattern, with a broad horizontal beam, is beneficial for small cell coverage. The fixed electrical tilt is -8 degrees. An optional mechanical down tilt bracket is also available.

Antenna 6525 is designed for optimal performance in all Radio 4402 and Radio 4408 configurations and integrated for very low visual impact in urban installations.

Micro Radio 4402/Micro Radio 4408

The Micro Radio 4402/4408 is part of the Ericsson Radio System portfolio. Radio 4402/4408 has best in class design, superior radio performance and power efficiency when it comes to medium range 3GPP radio products.

Radio 4402/4408 has, by use of its small and smart dimensions, support for a wide range of mounting scenarios and has a pioneering flexibility within its product segment. With the Radio 4402/4408, Ericsson evolves the micro radio portfolio to become even more flexible thus making it easier than ever to make small and efficient single and multi-band micro radio installations.

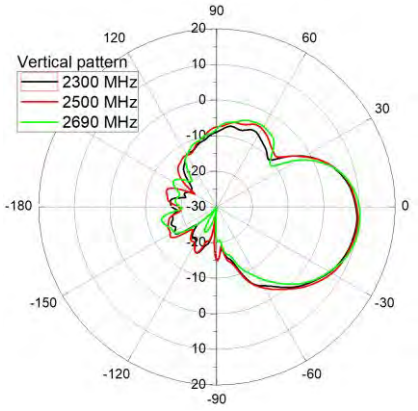
# Technical Specification Antenna 6525

| | |
|---|---|
| **PRODUCT NUMBER** | KRE 105283/1 |

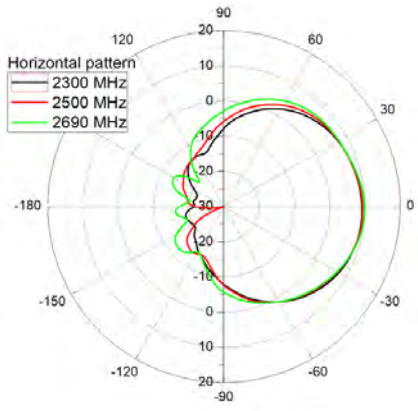
| | |
|---|---|
| 3GPP Band: | B7 B38A B40 B41 |
| Frequency range: | 2300 – 2690 MHz |
| Average gain: | 9 dBi |
| **Horizontal pattern** | |
| Beam width, 3 dB (0dBi) : | 82° (120°) |
| Beam tracking error ±60°: | ≤ 3 dB |
| Beam pointing error 0°: | ≤5° |
| **Vertical pattern** | |
| Beam width, 3 dB: | 43° |
| Fixed electrical down-tilt: | 8° |
| Front-to-back 180 ± 30°: | > 20 dB |
| VSWR (Return loss): | < 1.5 (> 14 dB) |
| Isolation | > 20 dB |
| Cross Polarization Ratio | > 15 dB(at boresight), > 10 dB(at sector) |
| Antenna pattern files: | Contact local Ericsson sales representative |

**Mechanical specification**

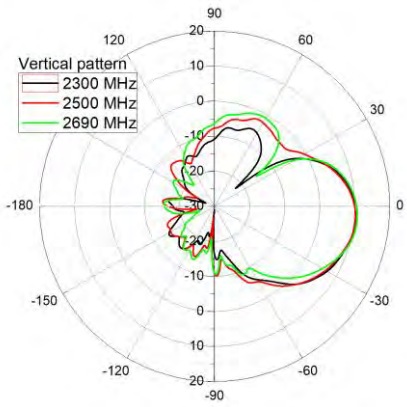
| | |
|---|---|
| Main Dimensions, WxDxH: | 200mm x 25mm x 200 mm |
| Weight: | 800 g |
| Volume: | 1,0 l |
| Environmental: | IP55, Type 3R |



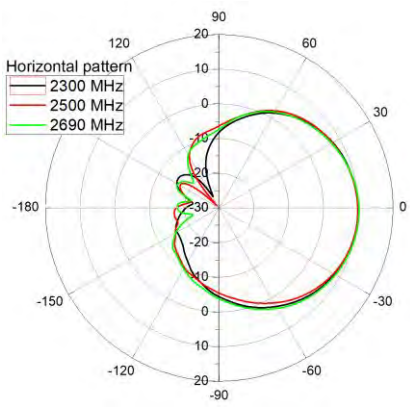

+45_V-Plane




+45_H-Plane




-45_V-Plane




-45_H-Plane

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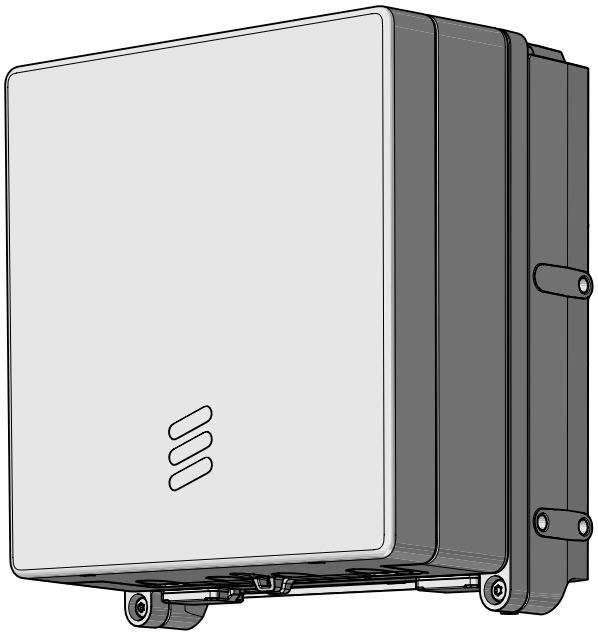
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ERICSSON

# Radio Description

## Radio 4402

## Description



250/1551-LZA 701 6001/1 Uen H

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# 1 Introduction

## 1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

**Note:** Seals that have been implemented by Ericsson must not be broken or removed, as it otherwise voids warranty.

# 2 Product Overview

The radio expands coverage and performance in denser urban areas, where the use of small handheld devices demand high capacity on the operators networks. It is designed to be located in cities and in demanding radio environments.

The radio is part of a modular radio building concept that enables a variety of installation alternatives that is also easy to expand. Flexible mounting solutions are provided using rails and pole clamps. The small size of the radio together with the flexible mounting solutions reduces the site volume. The lower weight also improves the handling of the radio.

The radio can be connected in a star or cascade configuration using optical cable links. An optic cable connects the radio to the main unit, or to an expanded Radio System.

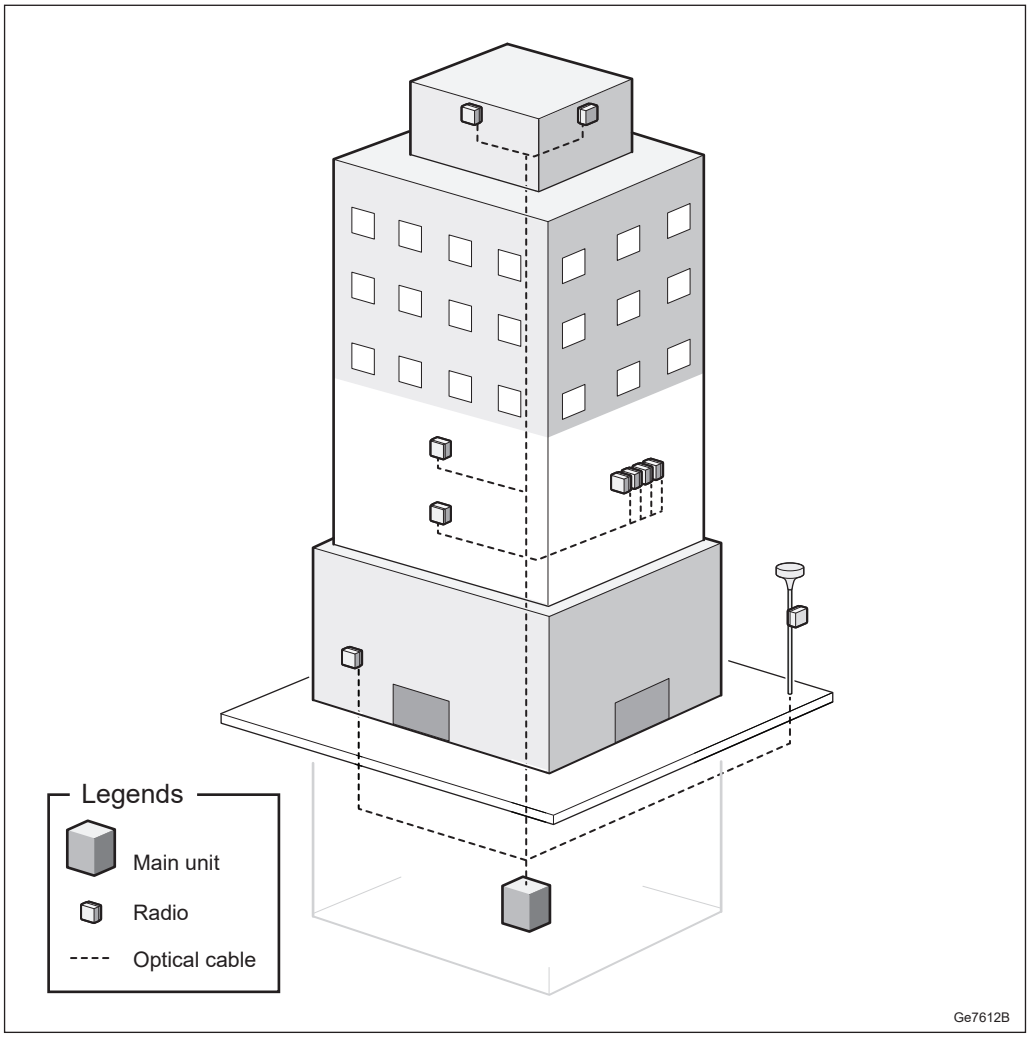



Figure 1 Radio Installations

## 2.1 Main Features

The following are the main features of the radio:

- WCDMA, LTE FDD, and NB-IoT
- Duplex transmitter/receiver (4TX/4RX) branches with 5 W per branch
- Up to 10.1 Gbps CPRI (optical)
- Complies with 3GPP base station classes Medium Range. For a list of relevant standards, see Radio Standards Compliance on page 33.

## 2.2 Optional Equipment

The optional equipment for the radio is the following:

— External antenna equipment

— Integrated directional antenna

— Rail installation equipment

# 3 Technical Data

Table 1 lists regulatory approved configurations. The listed standards on a specific frequency band may not be generally available on all markets. Contact the local Ericsson responsible for details.

Table 1 Radio 4402 Technical Data

| Description | Value |
|---|---|
| Maximum nominal output power(1) | 4 × 5 W |
| Number of carriers per branch | LTE: 6 downlink, 6 uplink<br>WCDMA: 6 downlink, 6 uplink<br>NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier<br>NB-IoT standalone mode: 1 carrier per RF port<br>NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier |
| Number of carriers per radio | LTE: 4 × 6 downlink, 4 × 6 uplink<br>WCDMA: 4 × 6 downlink, 4 × 6 uplink<br>NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier<br>NB-IoT standalone mode: 4 × 1 carriers per RF port<br>NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier |
| Frequency(2) | B66A for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode<br>1710–1780 MHz uplink<br>2110–2180 MHz downlink |
| **Dimensions with Cover, Single Radio** | |
| Height (A) | 213.5 mm |
| Width (B) | 200 mm |
| Depth (C) | 105 mm |
| **Dimensions with Antenna, Single Radio** | |
| Height (A) | 213.5 mm |
| Width (B) | 200 mm |
| Depth (C) | 125 mm |

| Description | Value |
|---|---|
| **Weight** | |
| Radio 4402 with Cover, Single Radio | 4.7 kg |
| Radio 4402 with Antenna, Single Radio | 5.1 kg |
| **Color** | |
| Body | NCS S 1002-B |

(1) For detailed information about licenses and HWAC, see the following:

WCDMA: Licenses and Hardware Activation Codes in Ericsson Software Model in the WCDMA RAN CPI library.

LTE: Manage Licenses and Hardware Activation Codes in the Radio Node libraries.

(2) For information about IBW, see RBS Configurations.

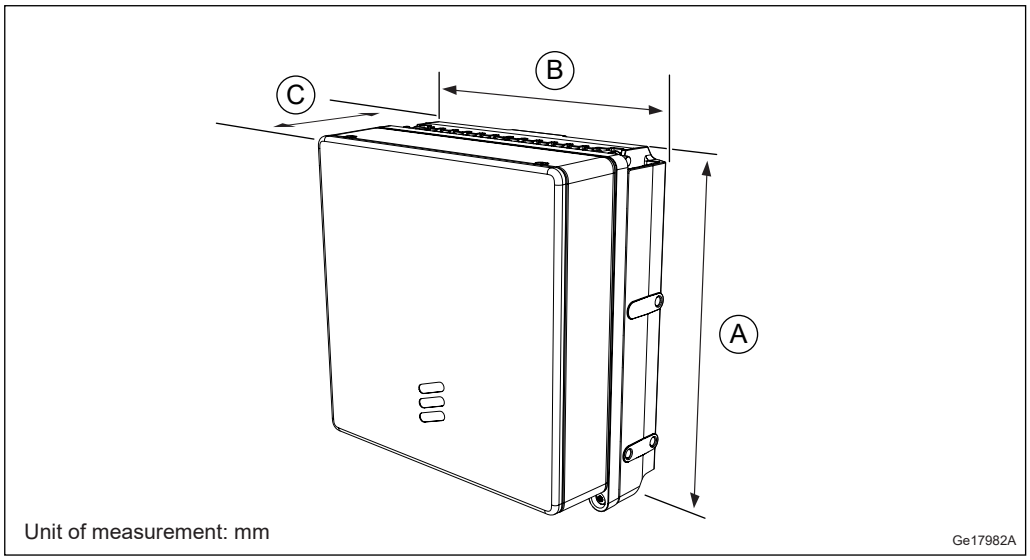



Figure 2 Radio 4402 Dimensions with Cover, Single Radio

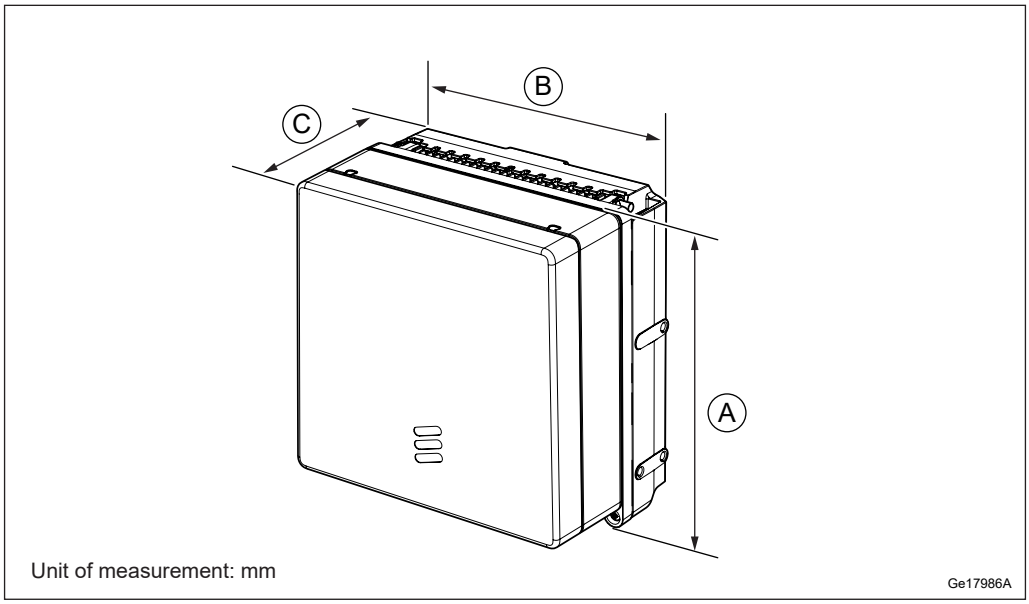



Figure 3 Radio 4402 Dimensions with Antenna, Single Radio

Table 2 Antenna Data

| Antenna | Frequency Band | Frequency |
|---|---|---|
| 6523 Directional | B1, B2/B25, B3, and B66A | 1710–2200 MHz |

## 3.1 Installation Recommendations

To ensure reliable operation and maximum performance, an appropriate installation location must be chosen.

When using the optional integrated directional antenna make sure the radio is not pointing at any elements that can disturb the radio signals.

### 3.1.1 Indoor Locations to Avoid

Although the unit is designed for outdoor use, it can be used indoors. For indoor locations Ericsson recommends to operate according to ETSI EN 300 019-1-3 class 3.1, 3.2, 3.3, and 3.6. This does not cover installation with heat traps or installation in lofts, where air ventilation does not exist. To ensure smooth performance, avoid installing the unit in a potential microclimate location, for example, places with unventilated lofts, with heat traps, or where the product is exposed to direct sunlight through windows. Avoid installing the equipment under glass covers or skylight windows without proper ventilation.

### 3.1.2 Outdoor Locations to Avoid

Although Ericsson declares this product suitable for outdoor environments, avoid installing the unit in a potential microclimate location. Typical examples of microclimate locations are sites where the product is not only exposed to the actual surrounding temperature, but additional temperature as heat coming from dark colored planes, for example, reflections from the floor or walls. The additional temperature can generate heat traps with temperatures up to 10°C higher than expected.

Avoid installing equipment in the following locations:

— Near the exhaust of building ventilation systems

— Near the exhaust of chimneys

— Opposite large surfaces made of glass or new concrete

If the unit is to be placed in an environment subjected to lightning strike, an external Surge Protection Device (SPD) is needed.

### 3.1.3 Other Considerations

Installing the radio close to other electronic equipment can cause interferences.

For sites with risk of ground fire, the recommended minimum installation height is 3 m.

### 3.1.4 Painting Disclaimer

Ericsson recommends to not paint the product as it can affect performance of the product.

Ericsson applies limitations to the warranty and service contract if the product is painted.

If the product is painted, the following commercial limitations apply:

— Failure modes directly related to overheating because of painting are not valid for repair within the scope of the warranty or standard service contract.

— Product failures related to paint contamination of components of the unit are not valid for repair within the scope of warranty or standard service contract.

— When a painted unit is repaired, it might be restored to the standard color before being returned to the market. It is not possible to guarantee that the same unit is sent back to the same place. This is also valid for units repaired under a service contract.

— For repairs within the warranty period or a standard service contract, the customer is charged the additional costs for replacing all painted parts of the unit or the complete unit.

If adaptations are required, contact Ericsson for information.

## 3.2 Installation Alternatives

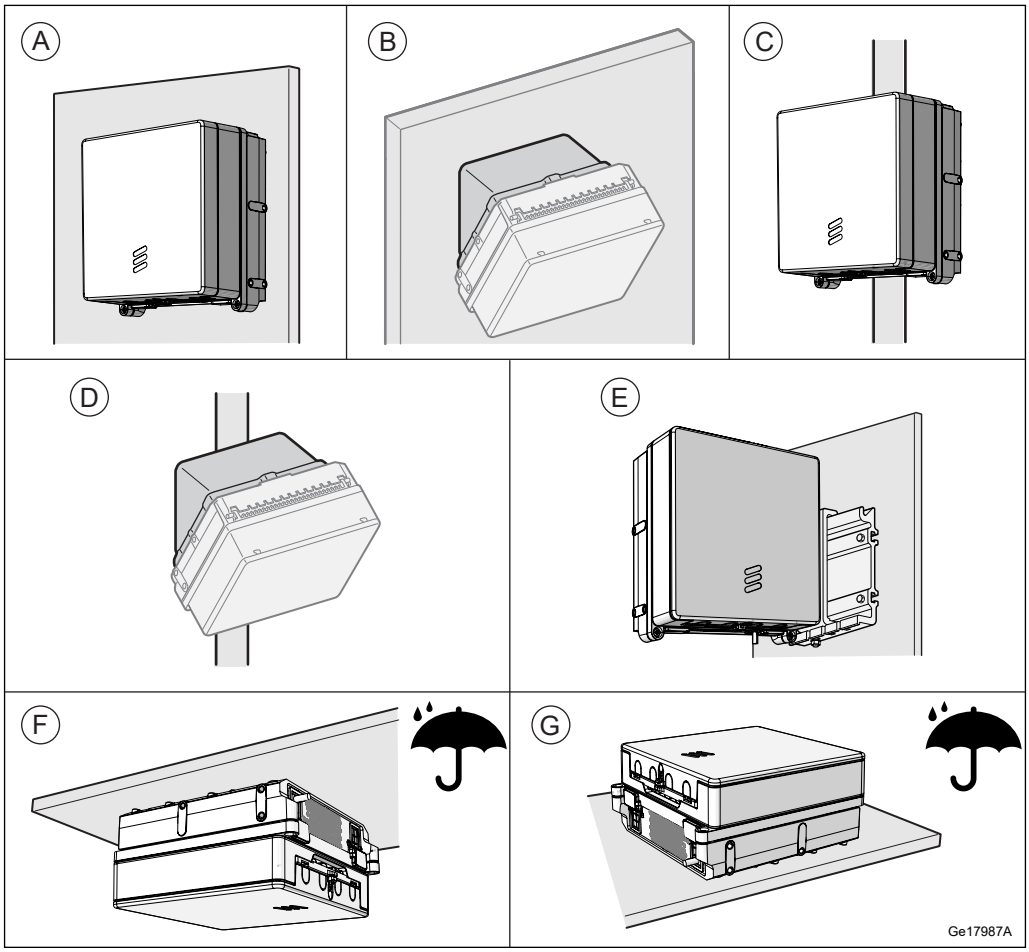



Figure 4 Alternative Installation Methods

Table 3 Key to Alternative Installation Methods

| Installation Method | Description |
|---|---|
| A | Wall installation |
| B | Wall installation with tilt installation kit |
| C | Pole installation |

| Installation Method | Description |
|---|---|
| D | Pole installation with tilt installation kit |
| E | Rail installation (Single Radio only) |
| F | Ceiling installation |
| G | Horizontal installation |

The integrated directional antenna is not applicable to installation alternatives E, F, and G.

For mounting direction F or G in an outdoor environment the Radio needs to be protected from direct rain.

## 3.3 Space Requirements

### 3.3.1 Generic Requirements

The radios can be placed directly against each other side by side. To ensure sufficient working space, allow adequate free space in front of the radio.

### 3.3.2 Wall Installation

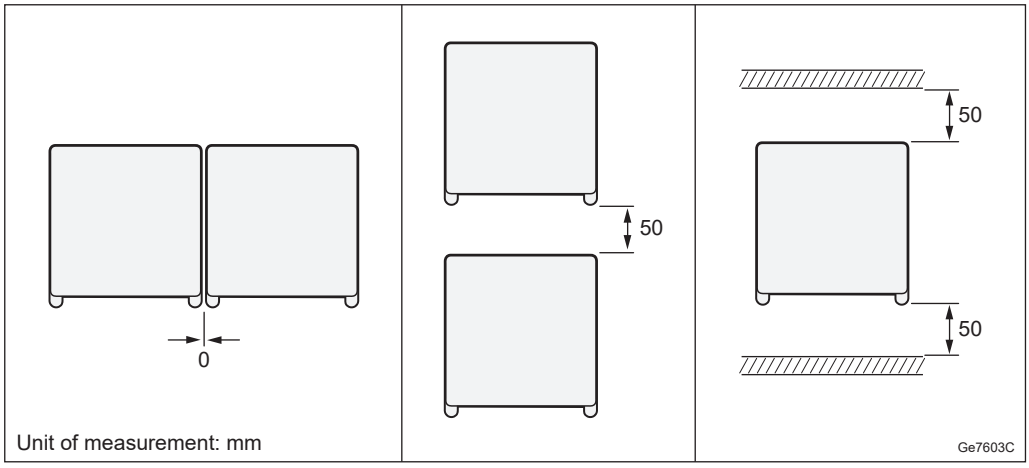



Figure 5 Wall Installation, Single Radio

To ensure adequate airflow between the units, allow a minimum of 50 mm free space between the radio and the roof, and between radios installed on a wall, on top of one another.

### 3.3.3 Wall or Pole Installation Using a Tilt Installation Kit

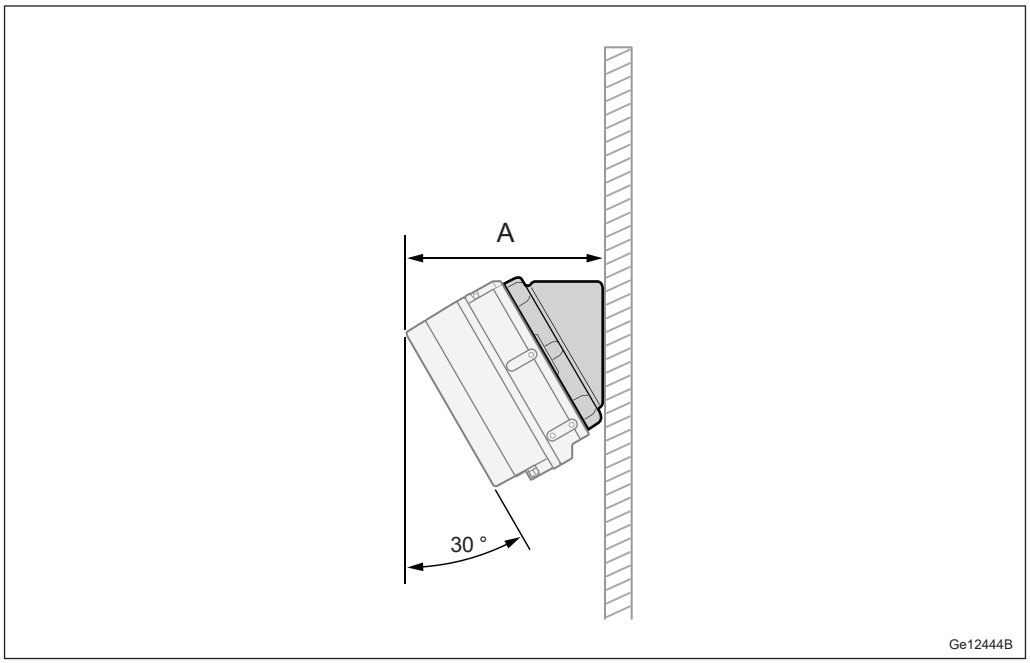



Figure 6 Tilt Installation Kit, Single Radio

Table 4 Tilt Installation Kit, Single Radio

| Description | Value A (mm) |
|---|---|
| Distance with cover | 198 |
| Distance with high-band antenna | 216 |
| Distance with low-band antenna | 224 |

### 3.3.4 Pole Installation

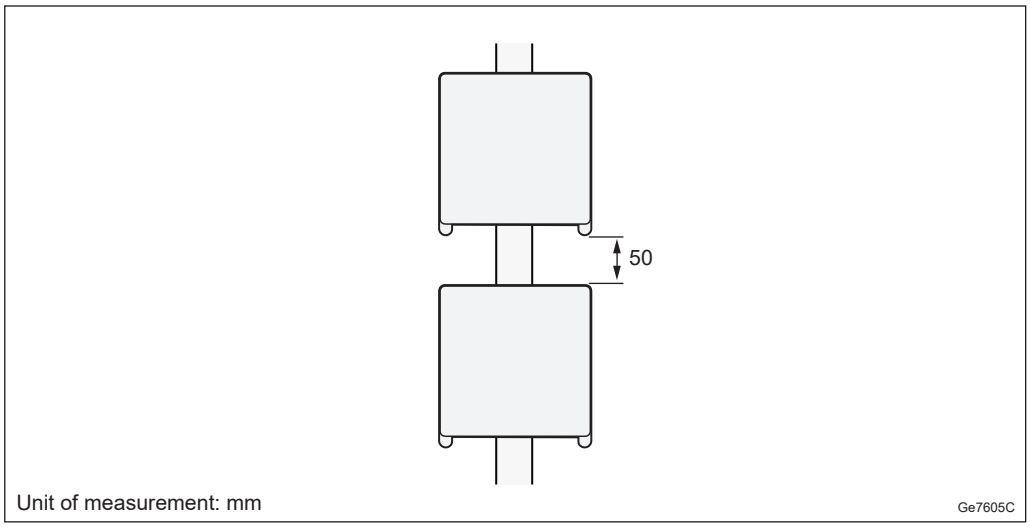



Figure 7 Pole Installation, Single Radio

To ensure adequate airflow between the units, allow a minimum of 50 mm free space above and below each radio.

Table 5 Pole Dimensions

| Pole Clamp Type | Minimum Dimension (mm) | Maximum Dimension (mm) |
|---|---|---|
| Hose clamp steel, Range 40-150 mm | Ø40 | Ø150 |
| Hose clamp steel, Range 140-300 mm | Ø140 | Ø300 |
| Hose clamp steel, Range 250-500 mm | Ø250 | Ø500 |

### 3.3.5 Rail Installation

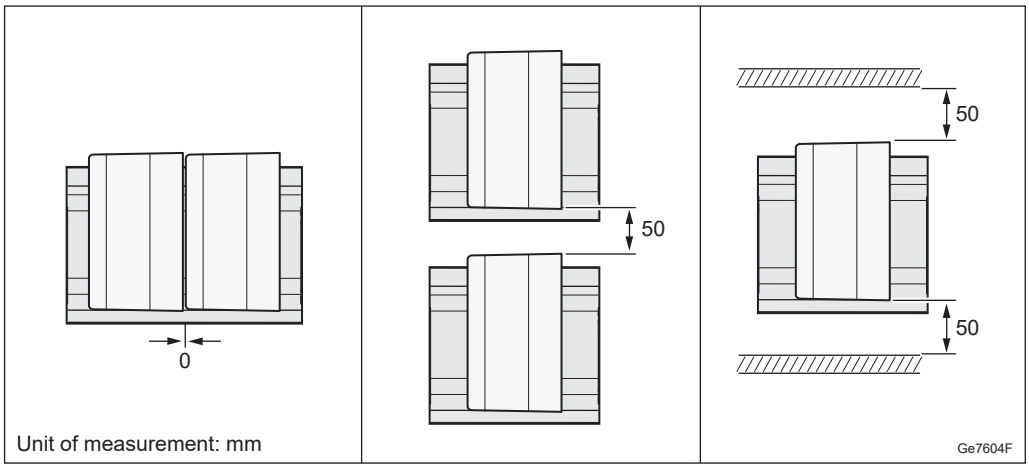



Figure 8 Rail Installation

To ensure adequate airflow between the units, allow a minimum of 50 mm free space above and below each radio, and between the radio and the wall.

### 3.3.6 Ceiling Installation

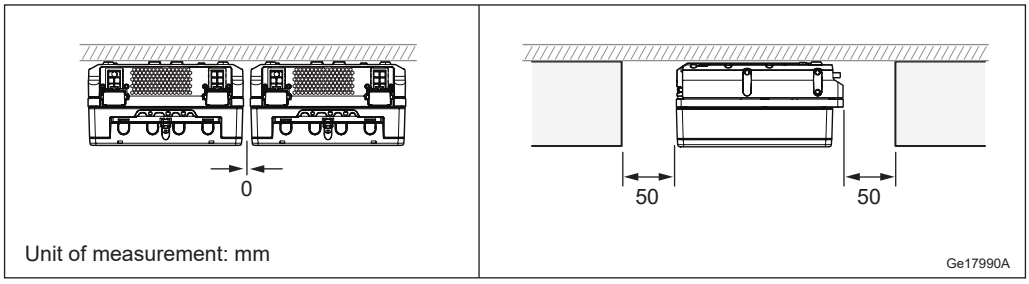



Figure 9 Ceiling Installation

To ensure adequate airflow between the units, allow a minimum of 50 mm free space between the radio and the wall, and 50 mm between radios installed on a roof beside one another.

### 3.3.7 Horizontal Installation

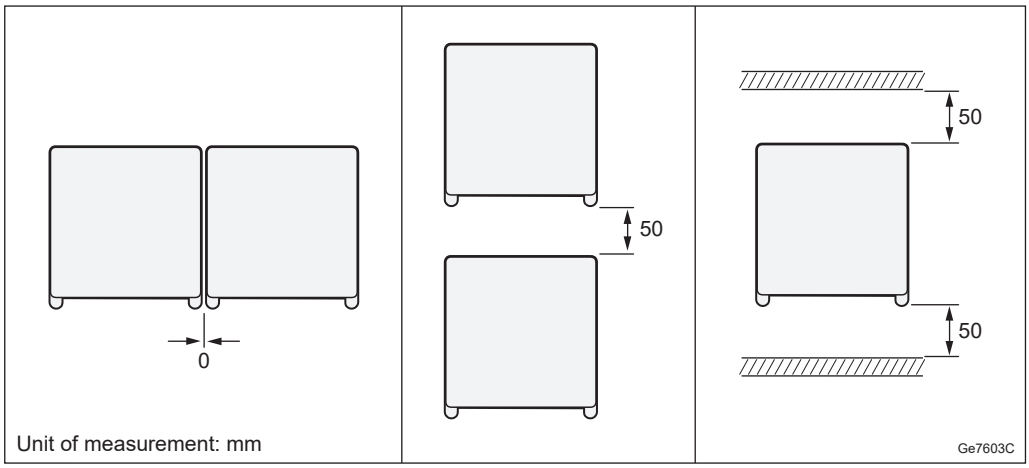



Figure 10 Horizontal Installation, Single Radio

To ensure adequate airflow between the units, allow a minimum of 50 mm free space between the radio and the roof, and between radios installed horizontally.

## 3.4 Acoustic Noise

With the fan, the acoustic noise is ambient temperature dependent, as listed below.

Table 6 Maximum Sound Pressure Level for Radio 4402 with Fan

| Temperature (°C) | Radio 4402 Sound Pressure Level (dB) |
|---|---|
| +20 | 49 |
| +30 | 52 |
| +40 | 55 |
| +55 | 60 |

## 3.5 Environmental Characteristics

This section contains operating environment data for the radio.

### 3.5.1 Operating Environment

The following are the values for the normal operating environment of the radio:

Temperature[(1)] −40°C to +55 °C

| | |
|---|---|
| Solar radiation | ≤ 1120 W/m² |
| Relative humidity | 5 – 100% |
| Absolute humidity | 0.26 – 40 g/m³ |
| Maximum temperature change | 0.5 °C/min |
| Maximum wind load at 150 km/h (pole installed single case) | Radio with cover: 55 N (front), 18 N (side)<br>Radio with antenna: 56 N (front), 24 N (side) |

(1) Depending on product variant, installation scenario, traffic load, and configuration, the product can, in the highest 10 °C temperature range, temporarily reduce the output power. This depends on the durations of the high ambient temperature.

### 3.5.2 Heat Dissipation

The radio is designed for outdoor installation.

Avoid indoor installation in a room without adequate ventilation and cooling.

Table 7 Radio Heat Dissipation

| Unit | Output Power (W) | Maximum Heat Dissipation (W) |
|---|---|---|
| Radio 4402 B66A | 4 × 5 | 120 |

Table 8 Support Heat Dissipation

| Unit | Heat Dissipation (W) |
|---|---|
| Support 6501 | 12 |
| Support 6502 | 12 |

### 3.5.3 Vibration

The radio operates reliably during seismic activity as specified by test method IEC 60068-2-57 Ff.

| | |
|---|---|
| Maximum level of Required Response Spectrum (RRS) | 50 m/s² within 2–5 Hz for DR=2% |
| Frequency range | 0.3–50 Hz |
| Time history signal | Verteq II |

The radio operates reliably during random vibration as specified by test method IEC 60068-2-64 Fh method 1

| | | | |
|---|---|---|---|
| Random vibration, normal operation | +12 m²/s³ | 0.3 m²/s³ | –12 m²/s³ |
| Frequency range | 5–10 Hz | 10–50 Hz | 50–150 Hz |

### 3.5.4 Materials

All Ericsson products fulfill the legal and market requirements regarding the following:

— Material declaration

— Materials' fire resistance, components, wires, and cables

— Recycling

— Restricted and banned material use

## 3.6 Power Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the radio.

The power for the radios can be provided from an AC or a DC power supply.

### 3.6.1 DC Power Characteristics

The power supply voltage for the radio is −48 V DC.

Table 9 Radio DC Power Supply Requirements

| Conditions | Values and Ranges |
|---|---|
| Nominal voltage | −48 V DC |
| Normal voltage range at radio input connector | −36.0 to −58.5 V DC |
| Non-destructive range | 0 to −60 V DC |

#### Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and do not provide information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60934.

Table 10 Radio Fuse or Circuit Breaker Recommendations

| Unit (DC powered) | Output Power (W) | Minimum Fuse Rating (A) | Maximum Allowed Fuse Rating[1] (A) |
|---|---|---|---|
| Radio 4402 B66A | 4 × 5 | 6 | 32 |

(1) The absolute maximum fuse class in accordance with radio design restrictions.

## 3.6.2 AC Power Characteristics

The normal voltage range for the radio is 100 to 250 V AC.

Table 11 Radio AC Power Supply Requirements

| Conditions | Values and Ranges |
|---|---|
| 100–250 V | 85–275 V AC |
| Connection | Line-neutral, line-line |
| Frequency range | 45–65 Hz |
| Voltage harmonics | ≤ 10% at full load(1) |
| Shut-off allowance | At undervoltage or overvoltage |
| Inrush current peak | < 10 A |
| Inrush current duration | < 100 ms |
| AC system | TN, TT and IT |

(1) Must comply with IEC 61000-3-2

### Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and do not provide information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60934.

When the radio connected Line-Line a 2-pole circuit breaker or dual fuses are required for interruption of both lines. This is also valid when the radio is used in an IT system.

Table 12 Radio Fuse or Circuit Breaker Recommendations

| Unit (AC powered) | Output Power (W) | Minimum Fuse Rating (A) | Maximum Allowed Fuse Rating(1) (A) |
|---|---|---|---|
| Radio 4402 B66A | 4 × 5 | 4 | 16 |

(1) The absolute maximum fuse class in accordance with radio design restrictions.

## 3.6.3 Power Consumption

For information on power consumption, see Power Consumption Calculations.

# 3.7 System Characteristics

This section describes the system characteristics of the Radio System.

## 3.7.1 RF Electromagnetic Exposure

For general information on RF EMF exposure, see Radio Frequency Electromagnetic Fields.

The following tables list the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Radio 4402 is below the limits applicable in:

— USA (47 CFR 1.1310)

— Canada (Health Canada Safety Code 6)

Table 13 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in the USA and Markets Employing the FCC RF Exposure Limits (Including 0.6 dB Output Power Tolerance)

| Mode and Output Power for Radio 4402 | | | | Dimensions of the Box-Shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance in Front of Radio | | Width | | Height | | Distance Behind Radio | |
| Band | Single/Dual Radio Version | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | GP | O | GP | O | GP | O | GP | O |
| B66A | Single | 4 × 5 W | E+ | 1.9 | 0.9 | 1.6 | 0.8 | 1.3 | 0.6 | 0.2 | 0.2 |

(1) The compliance boundaries are determined for maximum output power with power tolerance.

Table 14 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in Canada (Including 0.6 dB Output Power Tolerance)

| Mode and Output Power for Radio 4402 | | | | Dimensions of the Box-Shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance in Front of Radio | | Width | | Height | | Distance Behind Radio | |
| Band | Single/Dual Radio version | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | GP | O | GP | O | GP | O | GP | O |
| B66A | Single | 4 × 5 W | E+ | 2.7 | 1.1 | 2.3 | 1.0 | 1.8 | 0.8 | 0.2 | 0.2 |

(1) The compliance boundaries are determined for maximum output power with power tolerance.

## 3.7.2 Software

For information on software dependencies, see Radio Software Support.

### 3.7.3 Radio Configurations

For information about available radio configurations, see RBS Configurations.

# 4 Hardware Architecture

For a description of the supported radio configurations, refer to RBS Configurations.

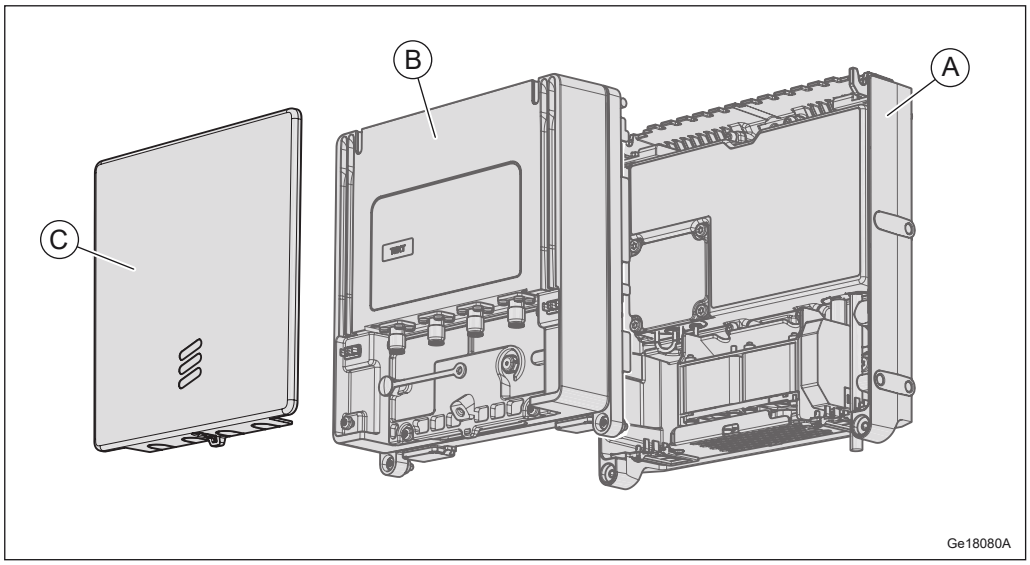



Figure 11 Radio Components, Single Radio

Table 15 Key to Radio Components, Single Radio

| Position | Component |
|---|---|
| A | Support(1) |
| B | Radio Core |
| C | Antenna or Cover |

(1) The Support has several variants. An example is shown in Figure 11.

## 4.1 Support

The Support provides the Radio Core with integrated mechanical attachment, power conversion and cooling. It consists of a mounting bracket, a fan unit, and a PSU.

### 4.1.1 Mounting Bracket

The mounting bracket provides integrated mechanical attachment for wall and pole mounting, and attachment points for the rail bracket.

### 4.1.2 Fan Unit

The fan unit operates autonomous against ambient temperature to cool the Radio Core.

For Single Radio, the fan unit of the Support is integrated with the mounting bracket and cannot be removed.

### 4.1.3 PSU

The PSU provides power to the Radio Core and the fan unit.

The PSU is available in two variants to support AC input and DC −48 V input. The DC variant handles both 2-wire (DC-C) and 3-wire (DC-I) connections.

Included in the PSU is also the external alarm interface and communication between PSU and Radio Core.

## 4.2 Radio Core

The Radio Core handles the radio communication in the unit and consists of a thermal radiator, TRX, and the Filter Unit (FU).

The Antenna Supervision can detect the following disconnected antennas:

— Ericsson Integrated Directional Antenna

— External antenna with feeder loss < 0.5 dB

Use the LTE AILG feature to ensure enough transmitted power.

### 4.2.1 Thermal Radiator

The thermal radiator provides cooling to the radio.

### 4.2.2 TRX

The Transmitter and Receiver (TRX) provides the following:

— Analog/Digital (A/D), Digital/Analog (D/A) conversion

— Channel filtering

— Delay and gain adjustment

— RF modulation and demodulation

— Optical cable interface termination

— Control and surveillance

### 4.2.3 Filter Unit

The Filter Unit consists of band-pass filters.

## 4.3 Antenna

The optional integrated directional Antenna provides directional RF coverage for the radio, and protects the Radio Core.

## 4.4 Cover

The esthetic Cover protects the Radio Core when the radio is connected to an external antenna.

## 4.5 Optical Indicators

The radio is equipped with optical indicators that show system status.

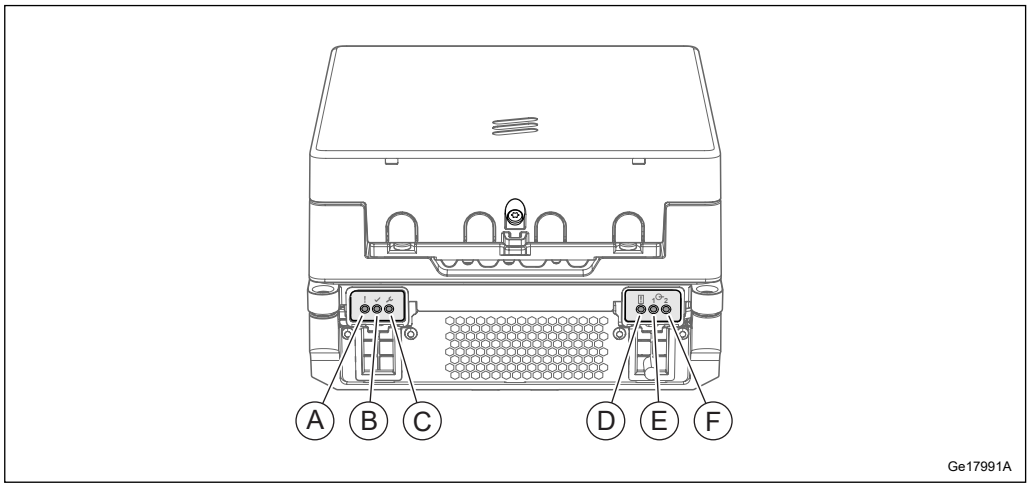



Figure 12 Optical Indicators for Single Radio

Table 16 Description of Optical Indicators for Single Radio

| Position | Name | Marking |
|---|---|---|
| A | Fault | ! |

| Position | Name | Marking |
|---|---|---|
| B | Operational | ✓ |
| C | Maintenance | |
| D | Support System Status | |
| E, F | Interface 1<br>Interface 2 | |

For more information about the behavior of the optical indicators and the maintenance button, refer to Indicators, Buttons, and Switches.

# 5 Connection Interfaces

This section contains information about the radio connection interfaces.

## 5.1 Support

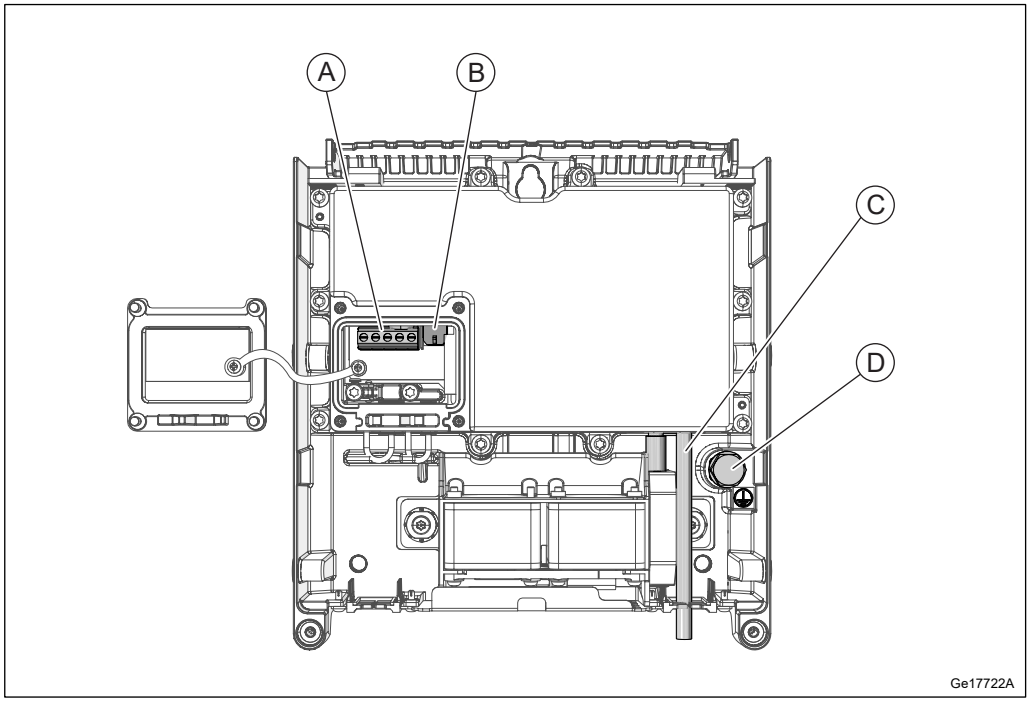
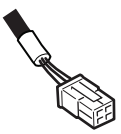
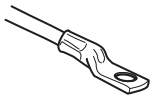



Figure 13 Connection Interfaces for Support, Single Radio

Table 17 Connection Interfaces for Support, Single Radio

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| A | −48 V DC power supply | −48V ⎓ | Screw terminal block | – |
| A | AC power supply | ~ | | |
| B | External alarm | 🔔 | PCB connector |  |
| C | PSU DC output, cable preinstalled | 36V ⎓ | – | – |

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| D | Grounding<br>(With DC power supply) | ⏚ | M8 bolt |  |
| D | Grounding<br>(With AC power supply) | ⏚ | | |

**Note:** Figure 13 shows an example of the Support for Single Radio. The actual product may differ.

For Single Radio, only 195 W Support can be used.

### 5.1.1 Fan Unit Interface

The fan unit provides cooling to the Radio Core.

### 5.1.2 External Alarm Interface

Two external alarms can be connected to the radio external alarm port.

### 5.1.3 AC/−48 V DC Power Interface

Depending on the version of the product, the power supply for the radio can be AC or DC.

#### 5.1.3.1 AC Power Interface

The AC power connection is made through a screw terminal.

Table 18 AC Power Supply Cable Diameter Tolerances

| Cable Length (m) | Cross-Sectional Area of Each Conductor ($mm^2$) | Outer Diameter over Sheath (mm) |
|---|---|---|
| 0–100 | 2.5 | 8–9 |

The power cable has a wire for Line (L), a wire for Line/Neutral (L/N), and a wire for Protective Earth (PE) conductors. The wire color code for wires is market dependent.

All cables must be shielded. The shield must be folded back over the outer jacket of the cable and properly connected to the PSU chassis in the PSU strain relief, otherwise the radio overvoltage protection does not function properly.

The AC cable temperature rating must be at least 70 °C.

### 5.1.3.2 DC Power Interface

The −48 V DC power connection is made through a screw terminal.

Table 19 −48 V DC Power Supply Cable Diameter Tolerances

| Cable Length (m) | Cross-Sectional Area of Each Conductor ($mm^2$) | Outer Diameter over Sheath (mm) |
|---|---|---|
| 0–60 | 2.5 | 8–9 |

For 3-wire power system, the power cable screw terminal has a wire for −48 V conductors, a wire for 0 V, and one wire for FE (Functional Earth). For 2-wire power system, the power cable screw terminal has a wire for −48 V conductors, and a wire for 0 V. The wire color code is market dependent.

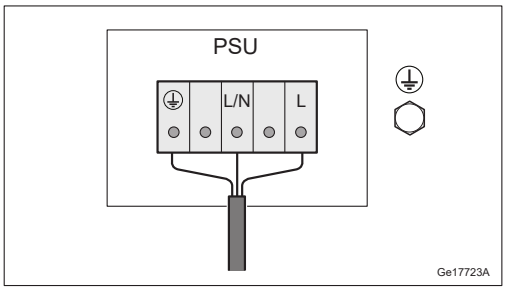
All cables must be shielded. The shield must be folded back over the outer jacket of the cable and properly connected to the PSU chassis in the PSU strain relief, otherwise the radio overvoltage protection does not function properly.

The DC cable temperature rating must be at least 70 °C.

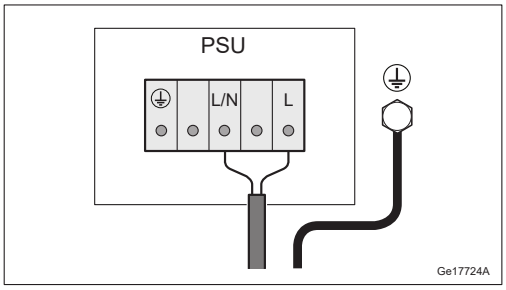
## 5.1.4 Grounding Interface

The possible grounding interface solutions for the radio are as follows:

**AC Grounding, Single Radio**

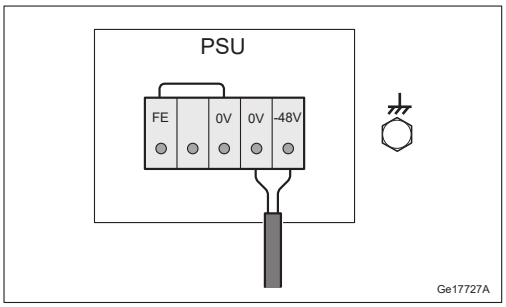



AC power with PE in PSU input terminal.

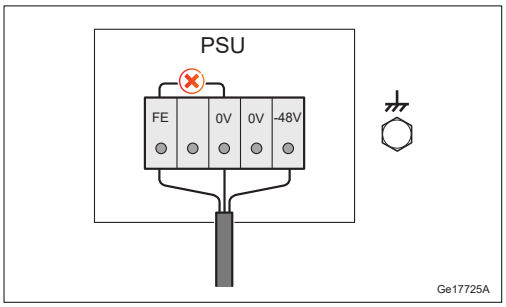



AC power with PE in the grounding interface on the mounting bracket.

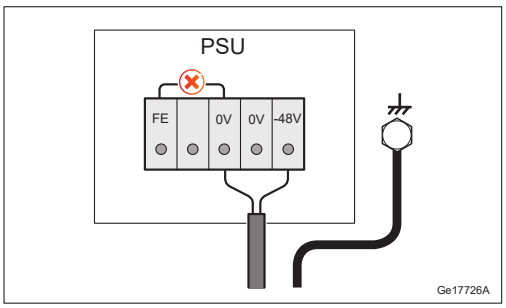
**DC Grounding, Single Radio**




Default 2-wire (DC-C) power system with FE in PSU input terminal.




3-wire (DC-I) power system with FE in PSU input terminal. Remove the jumper between 0V and FE.




3-wire (DC-I) power system with FE in the grounding interface on the mounting bracket. Remove the jumper between 0V and FE.

For more information about grounding principles, see Grounding Guidelines for RBS Sites.

## 5.1.5 PSU DC Power Interface

The PSU DC power connector supplies the radio with +36 V DC and internal communication to the radio.

## 5.2 Radio Core

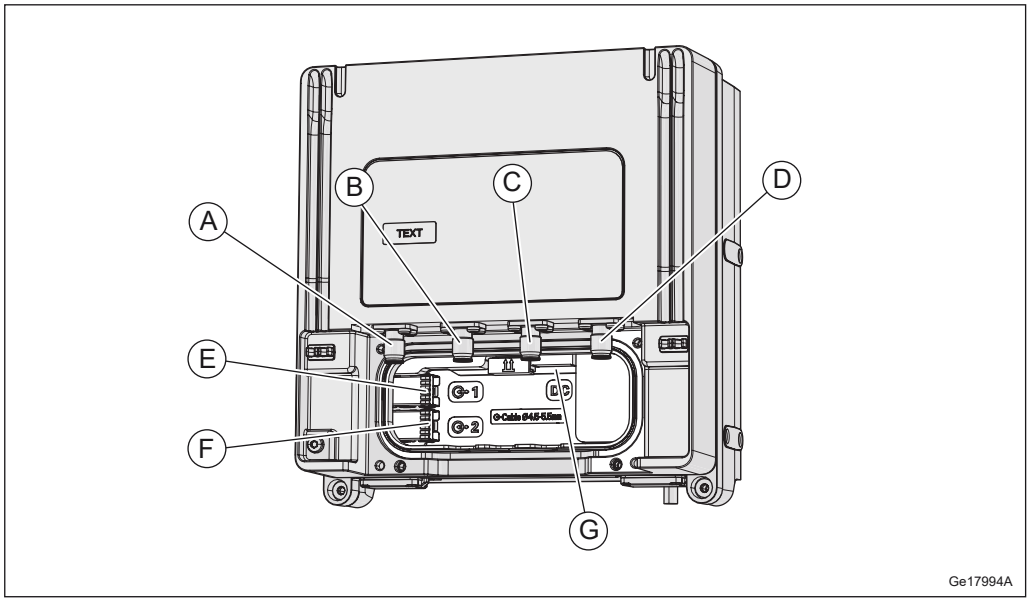
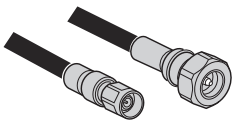
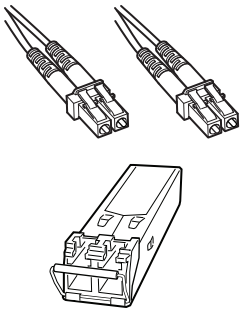



Figure 14 Radio Core Connection Interfaces

Table 20 Connection Interfaces

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| A | Antenna A | A | NEX10 |  |
| B | Antenna B | B | | |
| C | Antenna C | C | | |
| D | Antenna D | D | | |
| E | Optical cable 1 | 1 | LC (On SFP) |  |
| F | Optical cable 2 | 2 | | |
| G | DC power supply and internal communication | DC | – | – |

### 5.2.1 Antenna Interface

The antenna interfaces provide connections for the radio to the antennas. RF cables connect the radio to the antenna.

Table 21 Radio Antenna Connection Interface Characteristics

| Connector Type | Jumper Cable Type | RF Cable Type |
|---|---|---|
| NEX10 female | NEX10 male on one end and 4.3-10 female on the other end | 50 Ω 1/2-inch coaxial, 4.3-10 male |

Table 22 Radio Antenna Cable Connectors

| Radio Connectors | Antenna Connectors |
|---|---|
| A (Antenna A) | TX/RX |
| B (Antenna B) | TX/RX |
| C (Antenna C) | TX/RX |
| D (Antenna D) | TX/RX |

### 5.2.2 Interface for Optical Cable to Main Unit

The 1 and 2 interfaces provide connections to optical cables (with outer diameter 4.5–5.5 mm, and complies with standard G657A2) for traffic and timing signals between the radio and the main unit. An SFP+ is used to connect the optical cable to the radio.

**Note:** The radio uses SFP modules for optical transmission and optical radio interfaces on Data 1 and Data 2.

Only SFP+ modules approved and supplied by Ericsson are to be used. These modules fulfill the following:

— Compliance with Class 1 laser product safety requirements defined in standard IEC 60825-1

— Certification according to general safety requirements defined in standard IEC 60950-1

— Functional and performance verified to comply with Radio System specifications

Recommended SFP+ modules are obtained from the product packages for the Radio System and the Main Remote Installation products. For more information about SFP+ modules, see Spare Parts Catalog and Main-Remote Installation Products Overview.

### 5.2.3 DC Power Interface

The radio DC power connector supplies the radio with +36 V DC and internal communication from the PSU.

# 6 Standards and Regulations

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity for the radio.

## 6.1 Regulatory Approval

The Radio System complies with the following market requirements:

— North American market requirements.

— Products containing radio equipment outside North America and in countries not recognizing the CE-mark may be labeled according to national requirements or standards.

### 6.1.1 Environmental Standards Compliance

The product complies with the following environmental standard:

**Europe**

— Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU)

### 6.1.2 Safety Standards Compliance

In accordance with market requirements, the Radio System complies with the following product safety standards and directives:

**International**

— IEC 62368-1

**Europe**

— EN 50385

— EN 62368-1

**North America**

— FCC CFR 47 Part 1.1310

— FCC CFR 47 Part 2.1091

— Health Canada Safety Code 6

— IC RSS-102

— UL 62368-1

— CSA-C22.2 No. 62368-1

#### 6.1.2.1 Outdoor Specific Requirements

The Radio System complies with the following outdoor specific requirements:

**International**

— IEC 60529 (IP65, IP55 for Directional antenna)

— IEC 60950-22

**Europe**

— EN 60529 (IP65, IP55 for Directional antenna)

— EN 60950-22

**North America**

— CSA-C22.2 No. 60950-22

— UL 50E

— UL 60950-22

### 6.1.3 EMC Standards Compliance

The Radio System complies with the following Electromagnetic Compatibility (EMC) standards:

**International**

— 3GPP TS37.113

**North America**

— IC ICES-003 B

— FCC CFR 47 Part 15 B

#### FCC Compliance Statement

This device complies with Part 15 of the FCC CFR 47 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

### 6.1.4 Radio Standards Compliance

The Radio System complies with the following radio standards:

#### International

— 3GPP TS37.141

#### North America

— FCC CFR 47 Part 27 (USA frequency dependent)

— FCC CFR 47 Part 2 (USA)

— IC RSS-139 (Canada frequency dependent)

— IC RSS-Gen (Canada)

### 6.1.5 Marking

To show compliance with legal requirements, the product is marked with the following labels:

#### North America

— usETL/cETL

— FCC CFR 47 Part 15 Statement

— IC ICES-003 Statement

— FCC ID

— IC ID

## 6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory approved.

### 6.2.1 Spare Parts

The product adheres to the Ericsson Serviceability and Spare Part Strategy.

### 6.2.2 Surface Quality

The surface quality of the radio is in accordance with Ericsson standard class A3.

### 6.2.3 Vandal Resistance

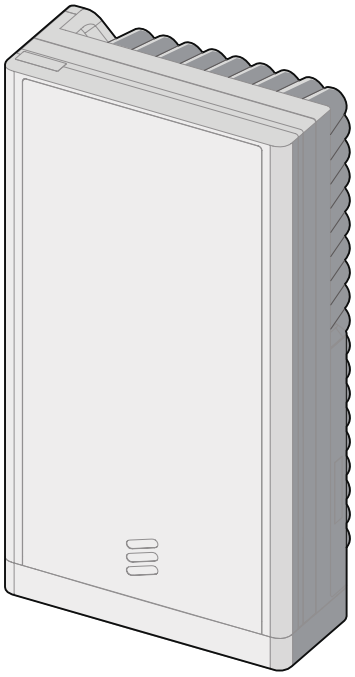
Unauthorized access is not possible without damaging the tamper proof warranty seal.

ERICSSON

# Radio Description

## Radio 4435

## Description



301/1551-LZA 701 6001/1 Uen B

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# 1 Introduction

## 1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

**Note:** Seals that have been implemented by Ericsson must not be broken or removed, as it otherwise voids warranty.

# 2 Product Overview

The radio remotely extends the reach of the Radio System, and is designed to be located near the antenna. The radio is part of a modular radio building concept that enables a variety of installation alternatives that are also easy to expand. Flexible mounting solutions are provided using pole clamps and brackets.

An overview of different radio installations is shown in Figure 1.

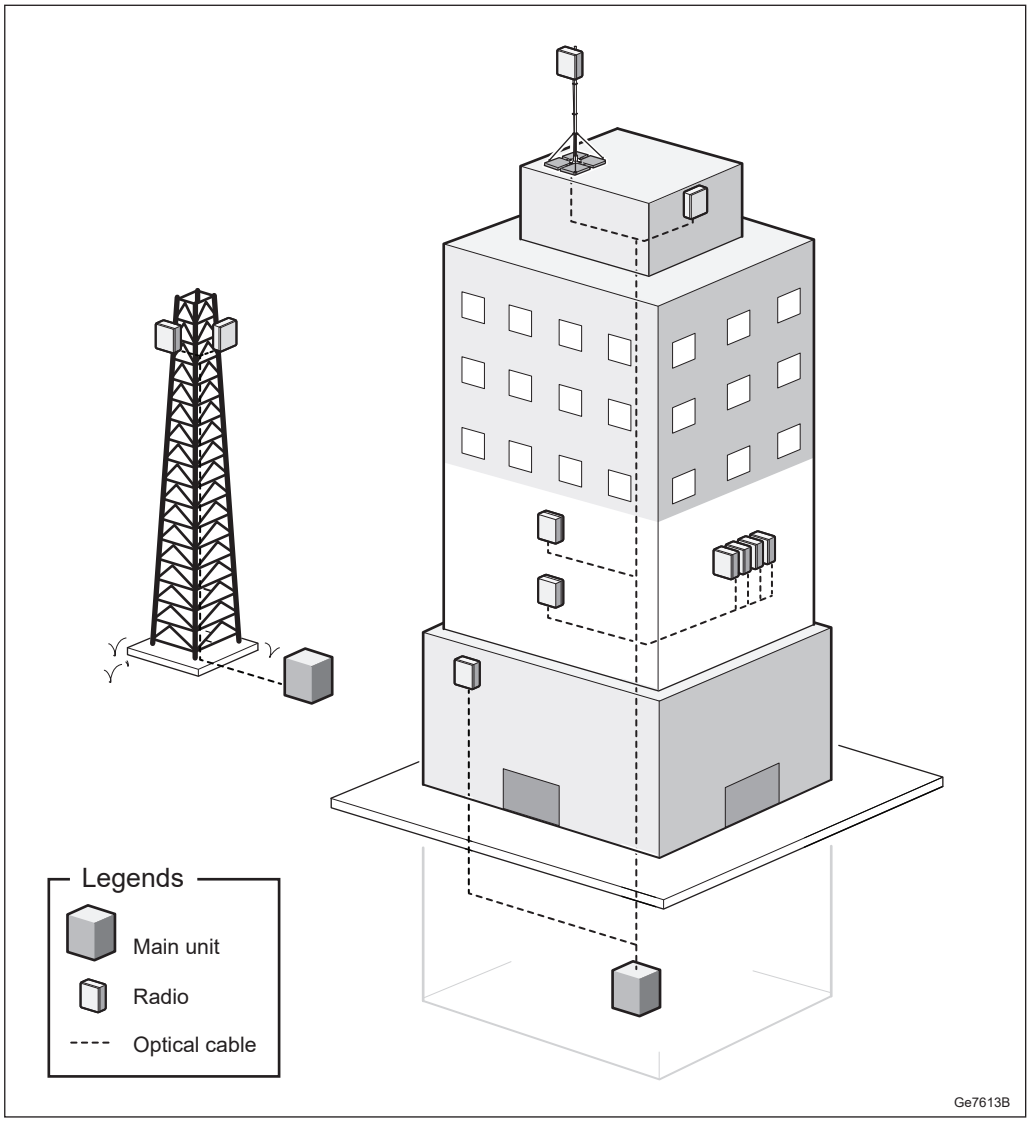



Figure 1 Radio Installations

## 2.1 Main Features

The following are the main features of the radio:

— AC power connection

— LTE TDD, NR TDD

— Mixed mode, for supported mixed mode configurations, see Supported Radio Capabilities.

— Duplex transmitter/receiver (4TX/4RX) branches

— Up to 2 × 10.1 Gbps CPRI (optical)

— Complies with 3GPP base station class Wide Area. For a list of relevant standards, see Radio Standards Compliance on page 25.

## 2.2 Required Installation Equipment

Table 1 Mounting Kit

| Mounting Kit | Product Name | Product Number |
|---|---|---|
| Tilt mounting kit | Streetmacro Wall & Pole Bracket with Tilt | SXK 109 2157/1 |
| Bracket expansion kit for SXK 109 2157/4 | Streetmacro Wall & Pole Bracket with tilt (Exp. kit) | SXK 109 2157/2 |
| Mounting kit without tilt | Streetmacro Wall & Pole Bracket without Tilt | SXK 109 2157/3 |
| Base bracket | Streetmacro Base Bracket | SXK 109 2157/4 |
| Triple bracket | Streetmacro Triple Bracket | SXK 109 2157/5 |
| Bracket for 140 mm pole diameter | Streetmacro 140mm pole dia bracket | SXK 109 2157/6 |

# 3 Technical Data

This section describes the physical characteristics, environmental data, and the power supply characteristics of the radio.

## 3.1 Bands, Carriers, and Output Power

For detailed information on available radio configurations, see Radio Node Configurations.

Table 2 Frequency Bands of Radio

| Radio Type | Value |
|---|---|
| Maximum nominal output power(1)(2) | 4 × 20 W<br>(Hardware Activation Codes (HWAC) are required for total output power over 20 W.) |
| Minimum configurable output power on an RF Port | 2.5 W |
| Number of carriers | For information about number of carriers, see Supported Radio Capabilities. |
| Frequency | B41 for LTE, NR, and mixed mode<br>2496–2690 MHz downlink<br>2496–2690 MHz uplink |

(1) For detailed information about licenses and HWAC, see:

NR: Manage Licenses and Hardware Activation Codes in the NR RAN library.

LTE: Manage Licenses and Hardware Activation Codes in the LTE RAN library.

(2) For detailed information about output power, see:

NR: Hardware-Related Capabilities in the NR RAN library.

LTE: Hardware-Related Capabilities in the LTE RAN library.

## 3.2 Physical Characteristics

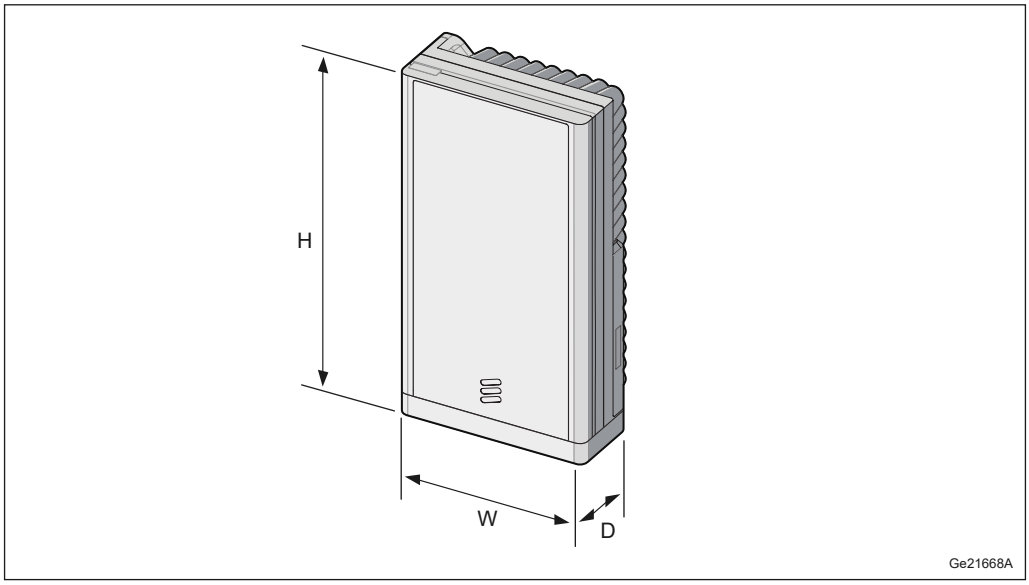



Figure 2 Radio Dimensions

Table 3 Radio Dimensions

| Radio Type | Height (H) × Width (W) × Depth (D) |
|---|---|
| Radio 4435 B41 | 373 × 200 × 93 mm |

Table 4 Radio Weight

| Radio Type | Weight(1) |
|---|---|
| Radio 4435 B41 | 6.7 kg |

(1) The weight is given with ±5% accuracy.

Table 5 Mounting Kit Weight

| Mounting Kit | Weight |
|---|---|
| SXK 109 2157/1 | 3.2 kg |
| SXK 109 2157/2 | 2.3 kg |
| SXK 109 2157/3 | 2.0 kg |
| SXK 109 2157/4 | 0.9 kg |
| SXK 109 2157/5 | 7.9 kg |
| SXK 109 2157/6 | 2.5 kg |

Table 6 Radio 4435 Color

| Part | Color Code |
|---|---|
| Body | NCS S 1002-B |

## 3.3 Installation Recommendations

To achieve reliable operation, and maximum performance, an appropriate installation location must be chosen.

### 3.3.1 Outdoor Locations to Avoid

Although Ericsson declares this product suitable for most outdoor environments, this does not cover installations where the planned installation site for the unit is a potential microclimate location. Typical examples of these microclimate locations are sites where the products are not only exposed to the actual temperature, but also additional temperature as heat coming from dark-colored planes, for example, reflections from the floor or walls. The additional temperature can generate heat traps with temperatures up to 10°C higher than expected.

Avoid installing equipment in the following locations:

— Near the exhaust of the building ventilation system.

— Near the exhaust of the chimney.

— Opposite large surfaces made of glass or new concrete.

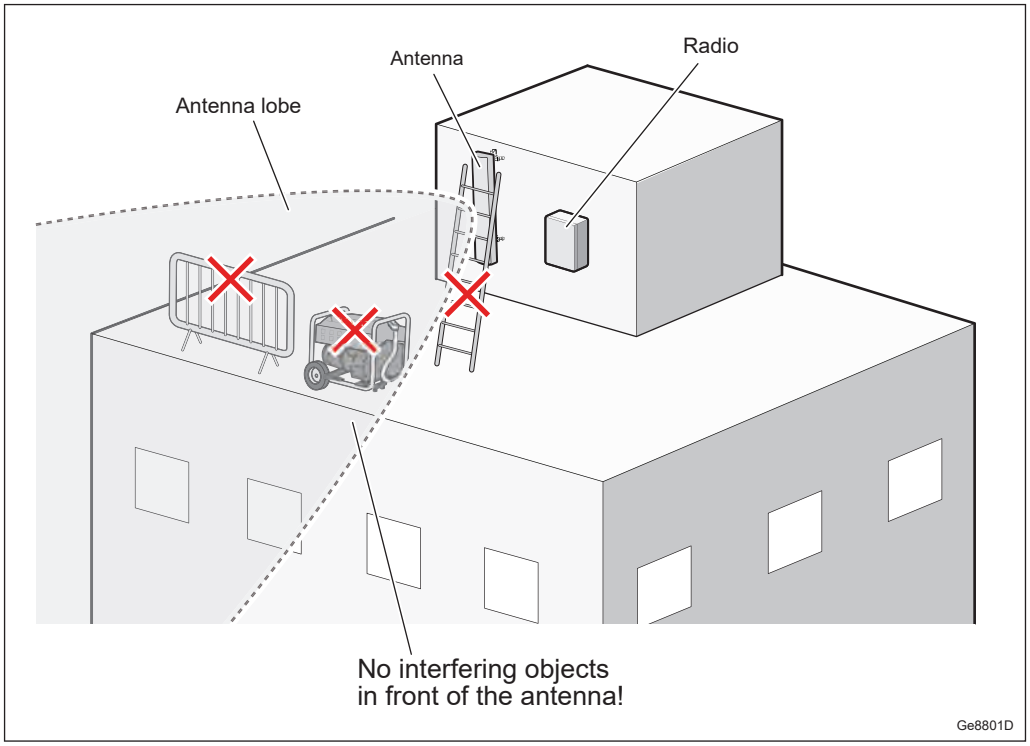
— Near overhanging structures such as roof overhangs.

Avoid radio interference by keeping the area directly in front of the antenna clear of the following:

— Metal surfaces or objects such as railings, ladders or chains

— Equipment generating electromagnetic fields, such as electric motors in air conditioners or diesel generators

— RBS equipment




### 3.3.2 Painting Disclaimer

Ericsson recommends to not paint the product as it can affect performance of the product.

Ericsson applies limitations to the warranty and service contract if the product is painted.

If the product is painted, the following commercial limitations apply:

— Failure modes directly related to overheating because of painting are not valid for repair within the scope of the warranty or standard service contract.

— Product failures related to paint contamination of components of the unit are not valid for repair within the scope of warranty or standard service contract.

— When a painted unit is repaired, it might be restored to the standard color before being returned to the market. It is not possible to guarantee that the same unit is sent back to the same place. This is also valid for units repaired under a service contract.

— For repairs within the warranty period or a standard service contract, the customer is charged the additional costs for replacing all painted parts of the unit or the complete unit.

If adaptations are required, contact Ericsson for information.

## 3.4 Installation Alternatives

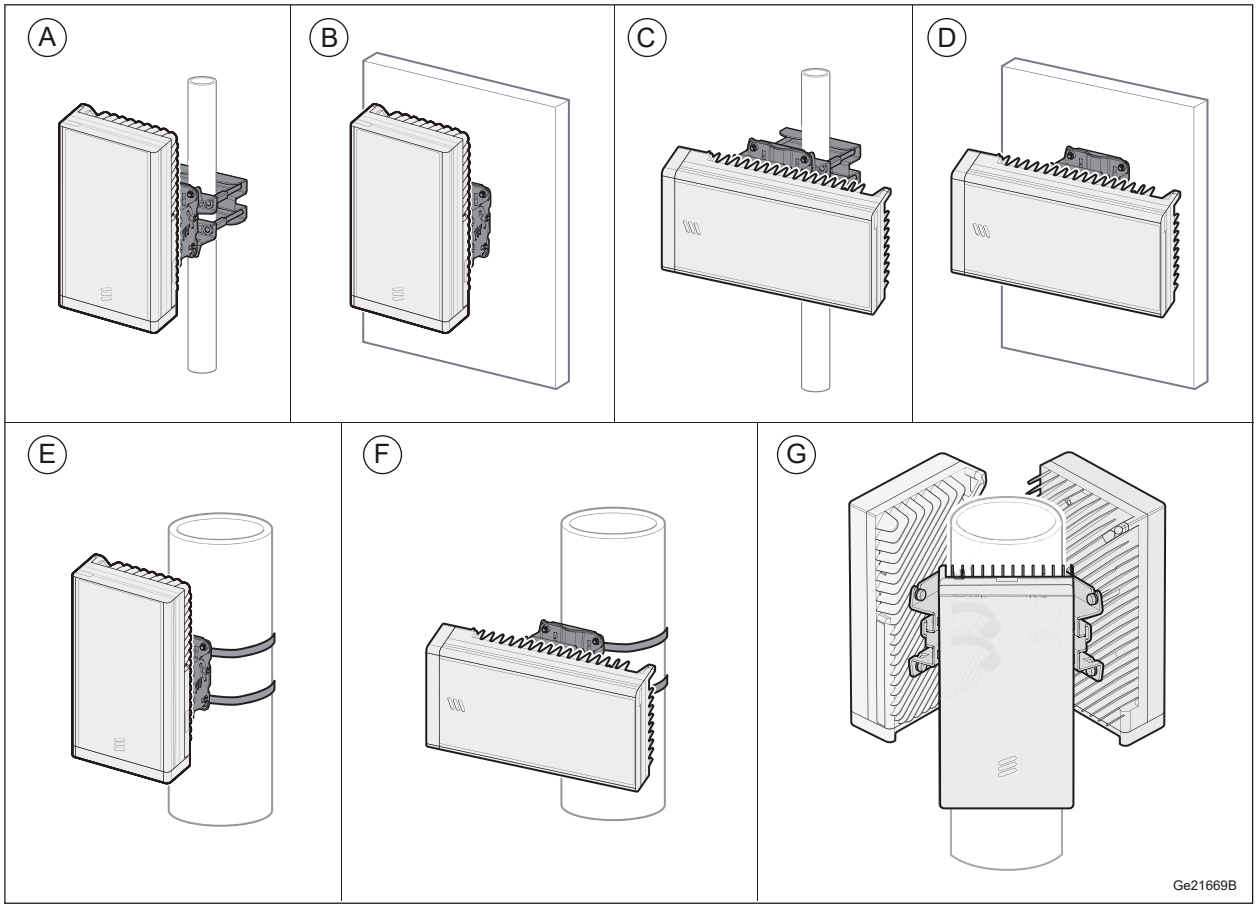



Figure 3 Installation Method Alternatives

Table 7 Key to Installation Alternatives

| Installation Method | Description |
|---|---|
| A | Pole installation (pole with circular, square, or 90° angle cross section) with vertical placement |
| B | Wall installation with vertical placement |
| C | Pole installation (pole with circular, square, or 90° angle cross section) with horizontal placement(1) |
| D | Wall installation with horizontal placement(1) |
| E | Utility pole installation with vertical placement(2)(3)(4) |
| F | Utility pole installation with horizontal placement(1) |
| G | Triple bracket pole installation |

(1) The PSU faces to the bottom.

(2) Steel bands for utility pole installations must be supplied locally.
(3) The strength and size of the steel bands used must be based on local requirements and environmental factors.
(4) For wooden utility poles, steel bands are not allowed. Use through bolt instead.

Table 8 Pole Mounting Range

| Pole | Circular | Square | 90° Angle |
|---|---|---|---|
| Minimum outer dimension(1) | Ø35 mm | 30 x 30 mm | 45 x 45 mm |
| Maximum outer dimension(1) | Ø300 mm | 80 x 80 mm | 80 x 80 mm |

(1) Depends on mounting kit used. For detailed information, see Site Installation Products Overview.

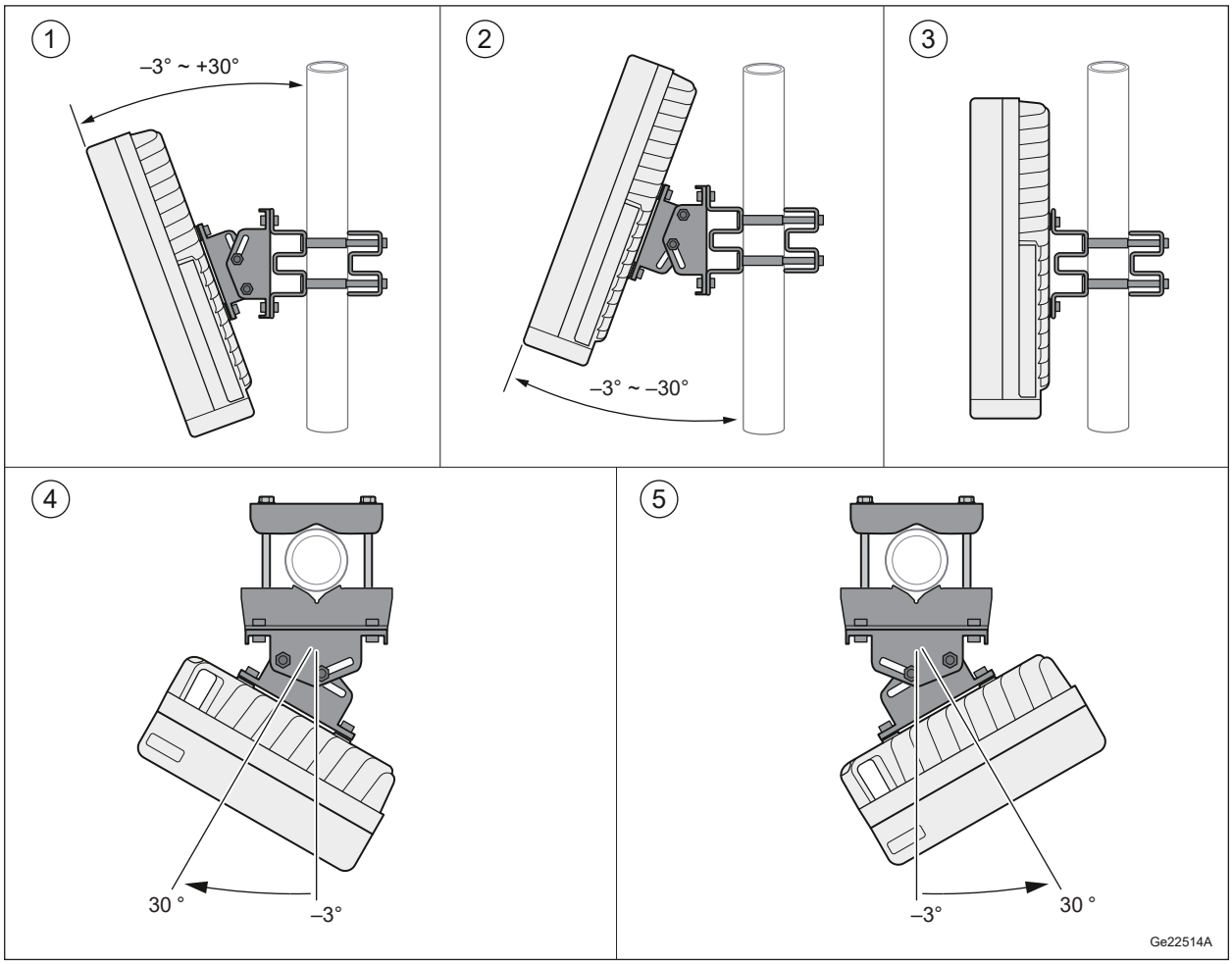



Figure 4 Tilt and Swivel Angle

# 3.5 Space Requirements

## 3.5.1 Generic Requirements

Parts of the radio can attain high temperatures during normal operation. Therefore the radio must be installed in a classified service access area. Exception applies when the radio is installed at a height that is not reachable from ground level.

Allow a sufficient working space in front of the radio.

It is recommended that the radio is installed below, or behind the antenna. Do not install the radio closer than 25 m from the main lobe of it its own antenna, or antennas belonging to other services or operators using the same site.

## 3.5.2 Pole or Mast Installation

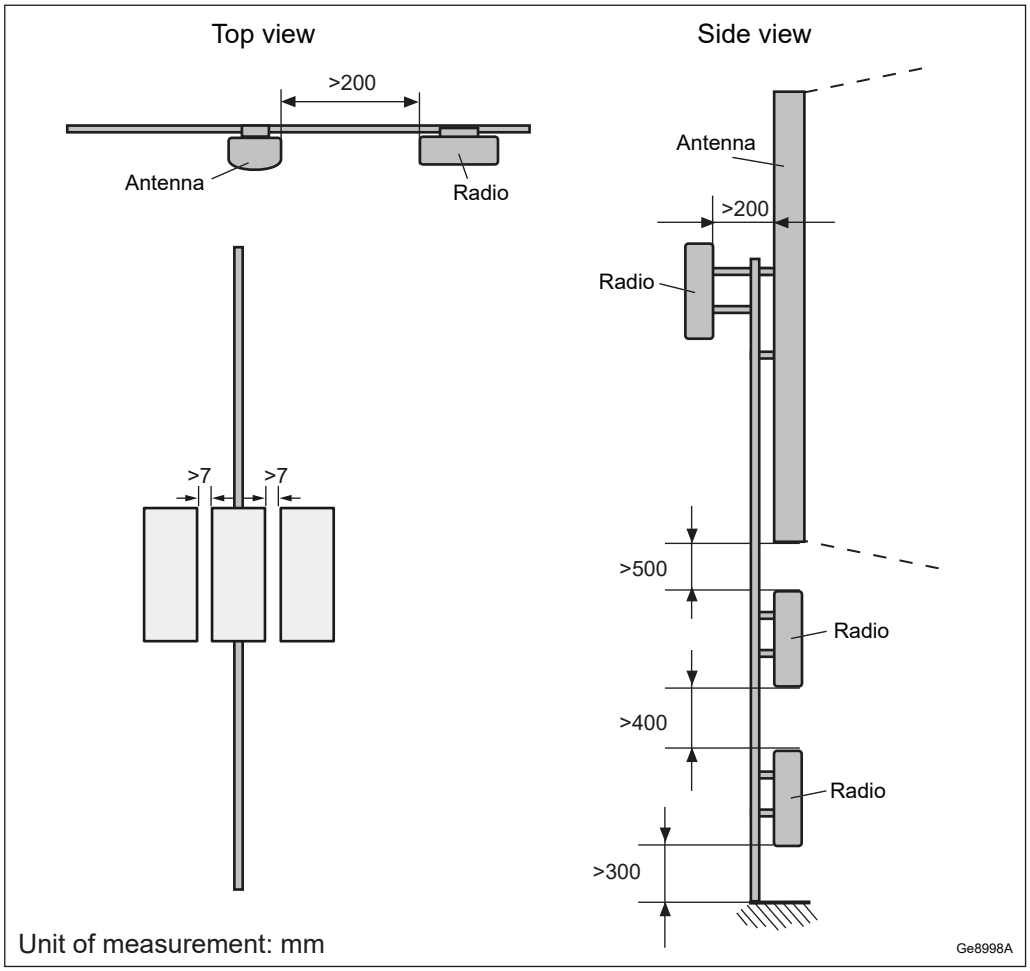



Figure 5 Radio Pole Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal bracket on a single pole, or a dual pole installation. Allow a minimum vertical distance of 500 mm between radio and antenna, if installed above or below an antenna. The minimum distance from the bottom of the radio to the floor is 300 mm for vertically installed radios.

Allow a minimum of 7 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be below +42°C.

Allow a minimum of 100 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be above +42°C and below +50°C. Only single radio installation on the bracket is supported when ambient temperature is expected to be above +50°C and below +55°C.

**Note:** A radio cannot be installed in the uppermost position of a pole or mast.

### 3.5.3 Radio Installation on Outdoor Wall

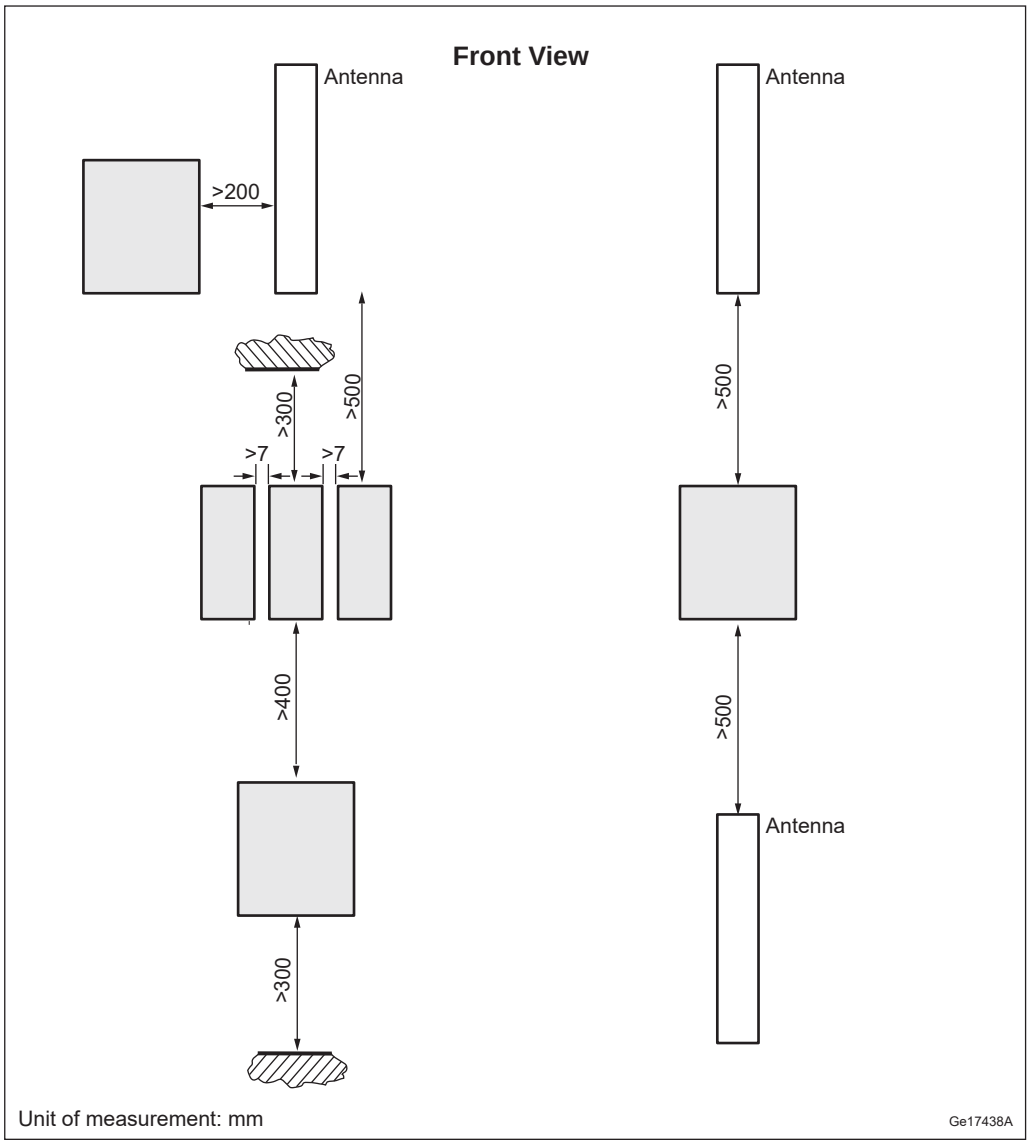



Figure 6 Radio Outdoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal bracket on a wall. Allow a minimum vertical distance of 500 mm between radio and antenna, if installed above or below an antenna.

Allow a minimum of 300 mm to any overhanging roof or other structure that may obstruct airflow and create a heat trap.

The minimum distance from the bottom of the radio to the floor is 300 mm for vertically installed radios.

Allow a minimum of 7 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be below +42°C.

Allow a minimum of 100 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be above +42°C and below +50°C. Only single radio installation on the bracket is supported when ambient temperature is expected to be above +50°C and below +55°C.

## 3.6 Acoustic Noise

The radio does not have active cooling components. It can emit low levels of acoustic noise when operating on low capacity.

The sound pressure level when operating on low capacity is lower than 28 dBA at 1-meter distance and hemispherical distribution, and 25 dBA for spherical distribution.

## 3.7 Environmental Characteristics

This section contains operating environment data for the radio.

### 3.7.1 Operating Environment

The following are the values for the normal operating environment of the radio:

Table 9 Operating Environment

| Description | Value |
|---|---|
| Temperature(1) | −40 to +55 °C |
| Solar radiation | ≤ 1,120 W/m$^2$ |
| Relative humidity | 5–100% |
| Absolute humidity | 0.26–40 g/m$^3$ |
| Maximum temperature change | 6.0 °C/min |
| Maximum wind load at 42 m/s (pole installed single case) | B41: 121 N (front), 33 N (side) |

(1) Depending on installation scenario, traffic load, and configuration, the product can, in the highest 10 °C temperature range, temporarily reduce the output power. This depends on the durations of the high ambient temperature.

### 3.7.2 Heat Dissipation

The radio is convection cooled and designed for outdoor installation.

Avoid indoor installation in a room without adequate ventilation and cooling.

Max heat dissipation is calculated using the following formula:

```
Max Heat Dissipation = Max Power Consumption - Configured
Output Power
```

Heat dissipation can be calculated for different traffic loads using values from Power Consumption Data. For more information, see Power Consumption Calculations.

### 3.7.3 Vibration

This section describes how the Radio tolerates vibrations. The Radio operates reliably during seismic activity as specified by test method IEC 60068-2-57 Ff.

| | |
|---|---|
| Maximum level of RRS | 50 $m/s^2$ within 2–5 Hz for DR=2% |
| Frequency range | 1–35 Hz |
| Time history signal | Verteq II from earthquake standard ATIS 0600329.2014 |

The Radio operates reliably during random vibration as specified by test method IEC 60068-2-64.

Random vibration, normal operation:

| | |
|---|---|
| ASD-level | 0.3 $m^2/s^3$ on horizontal axes X and Y |
| | 0.2 $m^2/s^3$ on vertical axis Z |
| Frequency range | 2–200 Hz |
| Time per test direction | 30 minutes |

The Radio operates reliably during shock as specified by test method IEC 60068-2-27 Ea.

| | |
|---|---|
| Peak acceleration | 40 $m/s^2$ |
| Duration | 22 ms |

### 3.7.4 Materials

All Ericsson products fulfill the legal and market requirements regarding the following:

— Material declaration

— Materials' fire resistance, components, wires, and cables

— Recycling

— Restricted and banned material use

## 3.8 Power Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the radio.

Different power systems can supply power for multiple radios, if necessary.

### 3.8.1 AC Power Supply Characteristics

The AC power source must provide protection for overcurrent, short circuit, and grounding fault.

Voltage values and ranges are listed in Table 10.

Table 10 Radio AC Power Supply Requirements

| Conditions | Values and Ranges |
|---|---|
| Nominal Voltage | 100–250 V AC |
| Voltage Range including tolerance | 90–275 V AC |
| Connection | Line-Neutral, Line-Line |
| Operating frequency | 50/60 Hz |
| Voltage harmonics | < 10% at full load (1) |
| Shut-off allowance | At undervoltage or overvoltage |
| Inrush current peak | < 15 A |
| Inrush current duration | < 100 ms |
| AC system | TN, TT and IT |

(1) Must comply with IEC 61000-3-2

#### Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and give no information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60947-2.

The PSU AC has a built-in Class 1 (Type 1) SPD to protect the equipment in case of lightning and network transients. The recommended fuse or circuit breaker rating is therefore dimensioned for not tripping the fuse or circuit breaker in case of SPD operation. The PSU AC is described in Table 11.

Table 11 Radio 4435 Fuse and Circuit Breaker Recommendations

| Unit (AC Powered) | Output Power | Nominal AC Input Voltage | Maximum AC Input Current(1) | Maximum Allowed Fuse Rating(2) |
|---|---|---|---|---|
| B41 | 4 × 20 W | 100–127 V | 5 A | 10 A |
| | | 200–250 V | 3 A | 6 A |

(1) The Maximum AC Input Current is calculated at a total tolerance of -10% of the nominal value.

(2) The Maximum Allowed Fuse Rating must be larger than the Maximum AC Input Current, yet still within a safety margin of 15%. This is to ensure reliable operation. However, it must not be larger than the standard value of the next or nearest higher fuse or circuit breaker. This is in order to minimize the cable cross-section area and comply with the relevant safety standard.

When the radio connected Line-Line a 2-pole circuit breaker or dual fuses are required for interruption of both lines. This is also valid when the radio is used in an IT system.

### 3.8.2 Power Consumption

For information on power consumption, see Power Consumption Calculations.

## 3.9 System Characteristics

This section describes the system characteristics of the Radio System.

### 3.9.1 RF Electromagnetic Field Exposure

For general information on RF EMF exposure, see Radio Frequency Electromagnetic Fields.

Table 12 and Table 13 list the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Radio 4435 is below the limits specified by the ICNIRP, and the limits applicable in:

— EU (1999/519/EC, 2013/35/EU, EN 50385)

— USA (47 CFR 1.1310)

Table 12 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in the EU and Markets Employing the ICNIRP RF Exposure Limits (Including 0.5 dB Transmission Loss and 0.6 dB Power Tolerance)

| Mode and Output Power for Radio 4435 | | | | | Dimensions of the Box-shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance in Front of Antenna | | Width | | Height | | Distance Behind Antenna | |
| Band | Standard | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | TDD DL Duty Cycle | GP | O | GP | O | GP | O | GP | O |
| B41 | LTE/NR | 4 × 20 W | E+ | 75% | 8.2 | 3.0 | 5.2 | 1.7 | 2.5 | 1.5 | <0.1 | <0.1 |

(1) The compliance boundaries are determined for maximum output power with transmission loss, output power tolerance, and TDD downlink duty cycle included using the antenna 80020622 for an electrical tilt of 2°.

Table 13 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in the USA and Markets Employing the FCC RF Exposure Limits (Including 0.5 dB Transmission Loss and 0.6 dB Power Tolerance)

| Mode and Output Power for Radio 4435 | | | | | Dimensions of the Box-shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance in Front of Antenna | | Width | | Height | | Distance Behind Antenna | |
| Band | Standard | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | TDD DL Duty Cycle | GP | O | GP | O | GP | O | GP | O |
| B41 | LTE/NR | 4 × 20 W | E+ | 75% | 8.7 | 3.9 | 6.2 | 2.8 | 2.5 | 1.9 | 0.3 | 0.2 |

(1) For B41, the compliance boundaries are determined for maximum output power with transmission loss, output power tolerance, and TDD downlink duty cycle included using the antenna 80020622 for an electrical tilt of 2°.

### 3.9.2 Software

For information on software dependencies, see Supported Radio Capabilities.

### 3.9.3 Radio Configurations

For information about available radio configurations, see Radio Node Configurations.

# 4 Hardware Architecture

This section describes the radio hardware structure regardless of configuration or frequency. For a description of the currently available radio configurations, see RBS Configurations.

## 4.1 Radio Parts

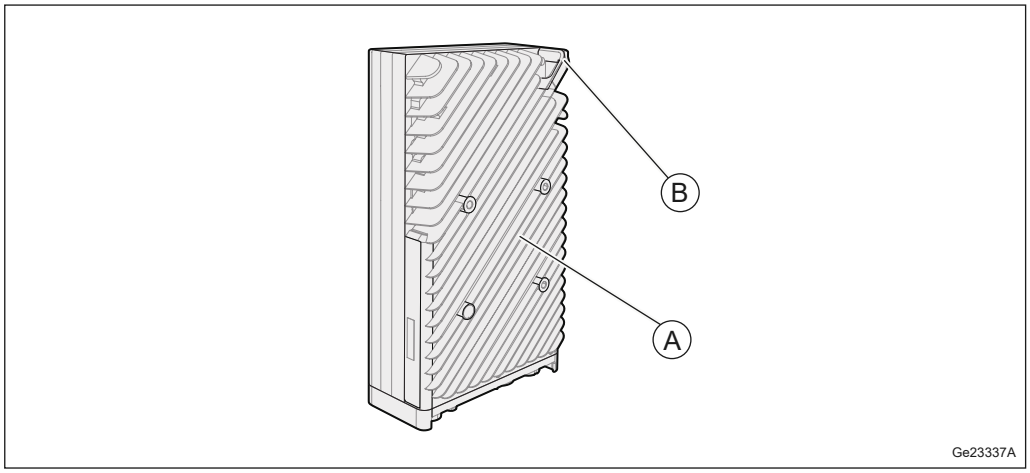



Figure 7 Radio Parts

Table 14 Key to Radio Parts

| Position | Component |
|---|---|
| A | Cooling fins |
| B | Lifting eye |

## 4.2 TRX

The Transmitter and Receiver (TRX) provides the following:

— Analog/Digital (A/D), Digital/Analog (D/A) conversion

— Channel filtering

— Delay and gain adjustment

— Digital predistortion

— RF modulation and demodulation

— Optical cable interface termination

— Four receivers for RX diversity

## 4.3 Optical Indicators and Maintenance Button

The radio unit is equipped with optical indicators and a maintenance button. The locations of the optical indicators and the maintenance button are shown in .

Table 15 describes how to interpret the optical indicators and maintenance button on the radio unit. For detailed information, refer to Indicators, Buttons, and Switches.

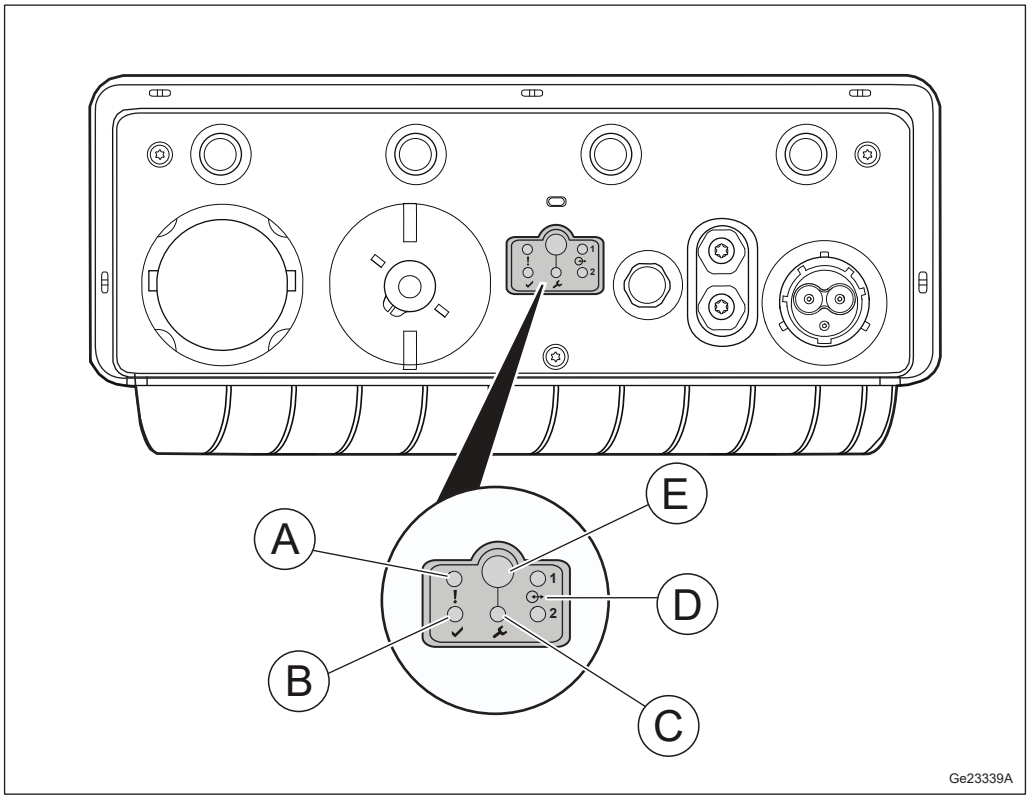



Figure 8 Optical Indicators and Maintenance Button

Table 15 Radio Unit Optical Indicators and Maintenance Button

| Position | Marking | Indicator | Color | Mode | Interpretation |
|---|---|---|---|---|---|
| A | ! | Fault | Red | Off | No fault detected in unit |
| | | | | On | Fault detected in unit |
| B | ✔ | Operational | Green | Off | No power |

| Position | Marking | Indicator | Color | Mode | Interpretation |
|---|---|---|---|---|---|
| | | | | On | Operational |
| | | | | Flashing Slowly (0.5 Hz) | Missing dependent resource |
| | | | | Flickering (16 Hz) | Transitory activity |
| | | | | Double flashing Off | Loading in progress<br>No ongoing traffic |
| | | | | Double flashing On | Loading in progress<br>Traffic is ongoing |
| C |  | Maintenance | Blue | Off | No ongoing maintenance activity<br>Traffic is ongoing |
| | | | | On | Maintenance mode<br>All traffic and alarms are suppressed |
| | | | | Flashing Slowly (0.5 Hz) | Maintenance mode is initiated<br>When traffic and alarms are removed, the indicator switches to **On** |
| D |  1,  2 | Interface | Green | Off | Disconnected |
| | | | | On | Connected |
| E | – | Maintenance button | – | – | – |

# 5 Connection Interfaces

This section contains information about the connection interfaces of the radio.

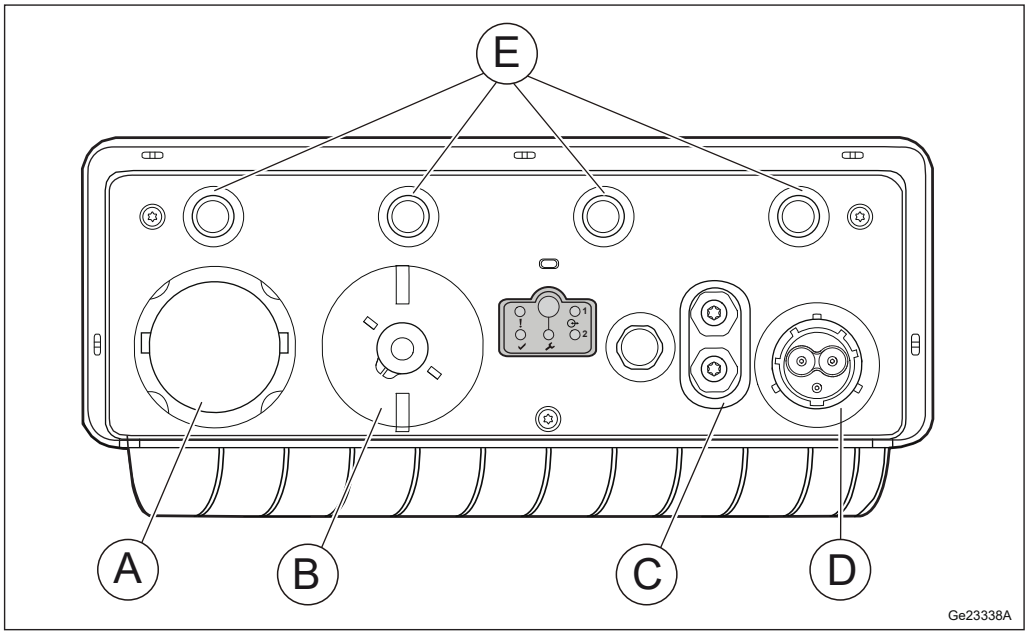
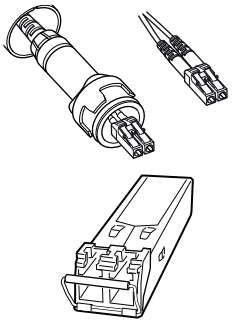
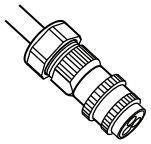
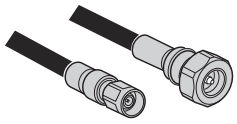



Figure 9 Connection Interfaces

Table 16 Connection Interfaces

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| A | Optical cable 1 | 1 | LC (On SFP+) with support for FullAXS |  |
| B | Optical cable 2 | 2 | | |
| C | Grounding | ⏚ | 2 × 6 mm dual lug |  |

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| D | 100–250 V AC power supply | 100–250V ~ | Power connector |  |
| E | Antenna A–D (from left to right) | A<br>B<br>C<br>D | NEX10 |  |

## 5.1 Antenna Interface

The antenna interfaces provide connections for the radio to antennas. The jumper and RF cables connect the radio to the antenna.

Table 17 Radio Antenna Connection Interface Characteristics

| Connector Type | Jumper Cable Type | RF Cable Type |
|---|---|---|
| NEX10 female | NEX10 male on one end and 4.3-10 female on the other end | 50 Ω 1/2-inch coaxial, 4.3-10 male |

Table 18 Antenna Cable Connectors

| Radio Connectors | Antenna Connectors |
|---|---|
| (Antenna A–Antenna D) | TX/RX |

## 5.2 Interface for Optical Cable to Main Unit

The ⊶ 1 and ⊶ 2 interfaces provide connections to optical cables for traffic and timing signals between the radio and the main unit. An SFP+ is used to connect the optical cable to the radio.

**Note:** The radio uses SFP+ modules for optical transmission and optical radio interfaces on Data 1 (optical cable 1) and Data 2 (optical cable 2).

Only use SFP+ modules approved and supplied by Ericsson. These modules fulfill the following:

— Compliance with Class 1 laser product safety requirements defined in standard IEC 60825-1.

— Certification according to general safety requirements defined in standard IEC 62368-1.

— Functional and performance verified to comply with Radio System specifications.

Recommended SFP+ modules are obtained from the product packages for the Radio System and the Main Remote Installation products. For more information about SFP modules, see SFP Module Selector Guide and Site Installation Products Overview.

## 5.3 100-250 V AC Power Supply Interface

The AC power connection is made through a connector (RNT 447 31/03).

Table 19 AC Power Connector Capabilities

| Conditions | Values and Ranges |
|---|---|
| Cable outer diameter | 6 to 18 mm |
| Terminal size | 1.5 to 4.0 $mm^2$ |

Table 20 Minimum AC Power Supply Cable

| Cable Length | Cross-Sectional Area of Each Conductor |
|---|---|
| ≤ 100 m | 3 x 1.5 $mm^2$ |

The power cable has a wire for Line (L), a wire for Line/Neutral (L/N), and a wire for Protective Earth (PE) conductors. The wire color code for wires is market dependent.

All cables must be shielded. The shield must be folded back over the outer jacket of the cable and properly connected to the radio chassis, otherwise the radio overvoltage does not function properly.

The AC cable temperature rating must be at least 70 °C.

## 5.4 Grounding Interface

The unit must be grounded to protect it from overvoltage and lightning strikes.

For more information about grounding principles, see Grounding Guidelines for RBS Sites.

# 6 Standards and Regulations

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity for the radio.

This device complies with Part 15 of the FCC CFR 47 rules. Operation is subject to the following two conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation.

## 6.1 Regulatory Approval

### 6.1.1 Environmental Standards Compliance

The product complies with the following environmental standard:

**Europe**

— Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU)

### 6.1.2 Safety Standards Compliance

In accordance with market requirements, the product complies with the following product safety standards and directives:

**Europe**

— EN 50385

— EN 62368-1

**North America**

— Health Canada Safety Code 6

— UL 62368-1

— CSA-C22.2 No. 62328-1

#### 6.1.2.1 Outdoor Specific Requirements

The product complies with the following outdoor specific requirements:

**Europe**

— EN 60529 (IP65)

— EN 60950-22

**North America**

— UL 50E

— UL 60950-22

— CSA-C22.2 No. 60950-22-07

### 6.1.3 EMC Standards Compliance

The product complies with the following Electromagnetic Compatibility (EMC) standards:

**North America**

— FCC CFR 47 Part 15 B

— IC ICES-003 B

### 6.1.4 Radio Standards Compliance

The product complies with the following radio standards:

**North America**

— FCC CFR 47 Part: 2, 27 (US Band/Frequency Specific)

### 6.1.5 Marking

To show compliance with legal requirements, the product is marked with the following labels:

**North America**

— cETLus

— FCC CFR 47 Part 15 Statement

— IC ICES-003 Statement

— FCC ID Number

## 6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory approved.

### 6.2.1 Spare Parts

The product adheres to the Ericsson Serviceability and Spare Part Strategy.

### 6.2.2 Surface Quality

The surface quality of the radio is according to Ericsson standard class A5 for the top, front, and side covers, and A6 for the heat-sink.

### 6.2.3 Vandal Resistance

Unauthorized access is not possible without damaging the tamper proof warranty seal.

pepco holdings
AN EXELON COMPANY

ATLANTIC CITY ELECTRIC (ACE), DELMARVA POWER & LIGHT (DPL), and
POTOMAC ELECTRIC POWER (PEPCO)

# STANDARD AGREEMENT
## Notice to Proceed (NTP)

**Notice to Proceed (NTP) expires 6 months from issue Date** **Issue Date:** 03-22-2023

**[(CHECK ONE) [Licensor]**

☐ **ATLANTIC CITY ELECTRIC** ☐ **DELMARVA POWER & LIGHT** ☒ **POTOMAC ELECTRIC POWER COMPANY**

| LICENSEE NAME: | SITE ID: | LOCATION: |
|---|---|---|
| Crown Castle NG Atlantic LLC (formerly NextG Networks Atlantic Inc) | MNG-094m1 | 789 Hudson Avenue Takoma Park MD 20912 |

In regards to the site referenced above PHI give (Licensee) Crown Castle NG Atlantic LLC (formerly NextG Networks Atlantic Inc) Notice to proceed with the (Installation/Upgrade) of this site with the conditions outlines below.

**SCOPE OF WORK (SOW)**

| PHI WORK REQUEST: | PHI APPROVED CONTRACTOR IF APPLICABLE: |
|---|---|
| 16715823 PM20DF125/HP20PM347 | |

DESCRIPTION OF SOW: Specific node plan drawings are attached hereto and incorporated into this NTP by reference. Installation of the equipment set forth in these drawings is being permitted in this NTP.

Pole Loading - MNG-094m1 - P# 799422-243180 - 12-03-2019
Construction Drawing - MNG-094m1 - P# 799422-243180 - 04-02-2020

**CONDITIONS:**

| UTILITY POLE NUMBER: | |
|---|---|
| 799422-243180 | ☐ This pole does not support any primary Circuits and an outage is NOT necessary to complete this work safely.<br>☐ All above ground work within the "power space" must be done by PHI or PHI approved contractor. |

**This NTP must be presented to PHI field representative in order for work to commence.**
Each request installation workday may require confirmation and coordination at least 24 hours in advance with PHI field representative. Prior to Licensee installation, Licensee must obtain approval from local municipality /permitting entity to install wireless and/or strand mount equipment to any Pepco owned pole. A PHI representative must be present on site when the work is being performed. Licensee and its contractors must adhere to PHI construction protocol; Joint Use Department, Transmission Construction and Project Management PHI Standards Guideline No. 1722 Rev D, PHI's Safety Manual.

**POST INSPECTION**

Upon completion of Installation/Upgrade work, please contact the Joint Use Project Coordinator to schedule a Post Construction Inspection. Failing Post Construction inspection locations will not have a meter placed until any and all deficiencies are corrected.

**LICENSEE SIGNATURE**

By Signing below Licensee authorized representative hereby acknowledges receipt of the documents listed herein.

Name: Neil Begelman Date: 3/28/23

CROWN CASTLE FIBER LLC
TITLE SHEET

## CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND 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 THE LATEST EDITIONS OF THE FOLLOWING CODES.

- COMAR 9.12.53, ADAAG & FHAG
- 2018 ICC INTERNATIONAL BUILDING CODE INCORPORATING MONTGOMERY COUNTY AMENDMENTS PUBLISHED PER ER #31-19
- 2018 ICC INTERNATIONAL RESIDENTIAL CODE
- 2018 ICC INTERNATIONAL EXISTING BUILDING CODE
- MBRC MARYLAND BUILDING REHABILITATION CODE
- 2012 IGCC GREEN BUILDING CODE
- 2018 ICC INTERNATIONAL ENERGY CONSERVATION
- 2018 ICC INTERNATIONAL FUEL/GAS CODE
- 2018 ICC INTERNATIONAL MECHANICAL CODE
- 2017 NFPA 70 NATIONAL ELECTRICAL CODE
- 2013 NFPA 72
- 2013 COMAR NFPA 72
- 2015 NFPA 1 & 101
- WSSC PLUMBING CODE
- WSSC FUEL GAS CODE
- 2013 NFPA 13D
- 2013 COMAR NFPA 13D
- 2013 NFPA 13/13R
- 2013 COMAR NFPA 13/13R
- TIA-222-H-2016

## SCOPE OF WORK

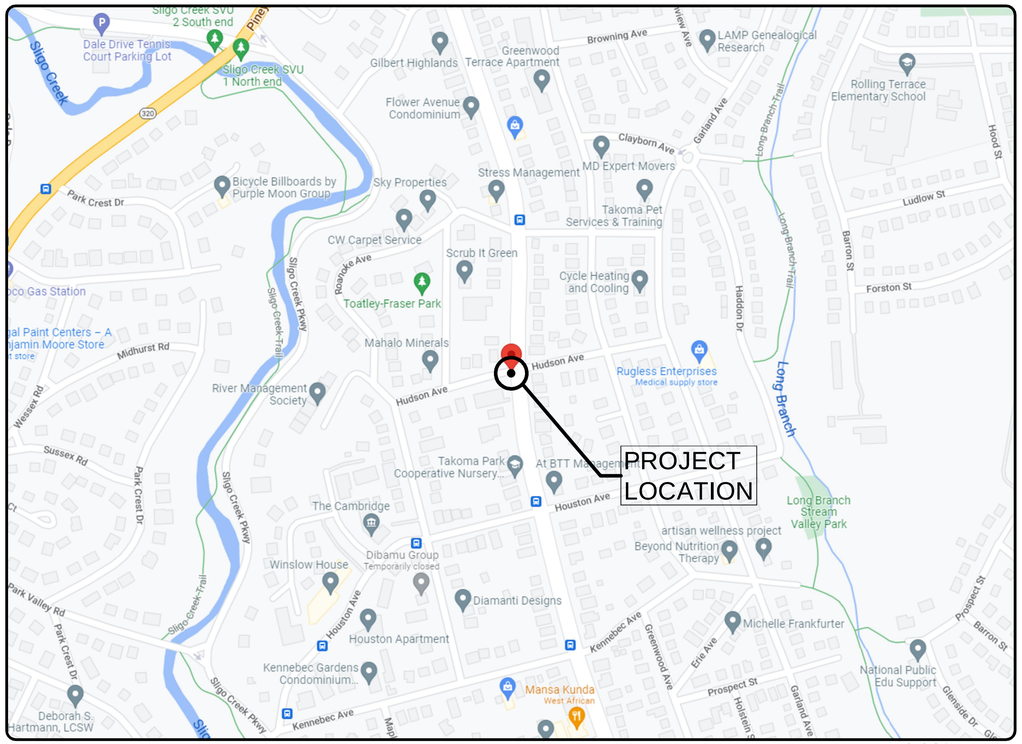
SCOPE OF WORK CONSISTS OF INSTALLING A NEW STRAND MOUNT AND AUXILIARY EQUIPMENT ON NEW STRAND / MESSENGER CABLE. STRAND / MESSENGER CABLE WILL BE ATTACHED TO EXISTING WOODEN UTILITY POLE. NEW ANTENNA, DIPLEXER, AND RADIO SHALL BE MOUNTED ON A PROPOSED BRACKET MOUNT AND THE BRACKET MOUNT, SPLICE BOX, AND POWER CONVERTER WILL ALL BE MOUNTED ON NEW STRAND / MESSENGER CABLE.

DPS BATCH STAMP

# CROWN CASTLE FIBER LLC
# SITE NAME: MNG-094M1
# 8240 FLOWER AVE
# TAKOMA PARK, MD 20912
# JURISDICTION: MONTGOMERY COUNTY
# PROPOSED STRAND MOUNT INSTALLATION

## INDEX OF SHEETS

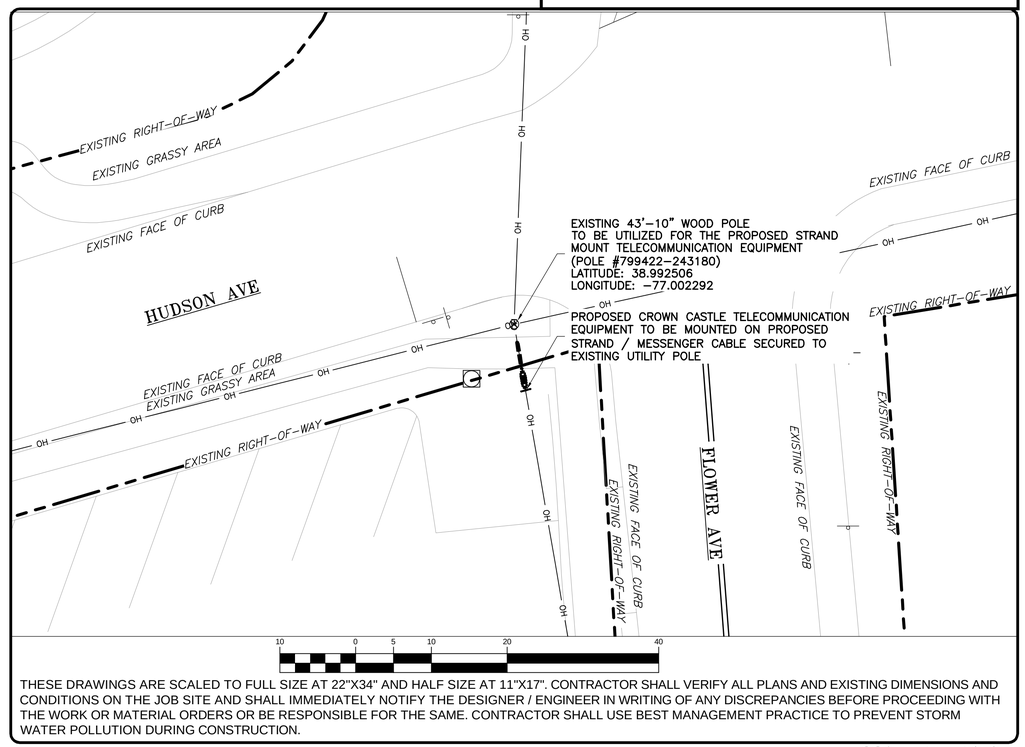

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| T-1 | TITLE SHEET |
| GN-1 | GENERAL NOTES |
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| C-1 | SITE PLAN |
| C-2 | ENLARGED SITE PLAN |
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| D-3 | POWER CONVERTER & DISCONNECT ASSEMBLY DETAILS |
| G-1 | GROUNDING DETAILS |
| TCP-1 | TRAFFIC CONTROL PLANS |


NO SCALE

## LOCATION MAP

NODE LOCATION:
LATITUDE: 38.992506° (N 38° 59' 33.021")
LONGITUDE: -77.002292° (W -77° 0' 8.2506")




THESE DRAWINGS ARE SCALED TO FULL SIZE AT 22"X34" AND HALF SIZE AT 11"X17". CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE DESIGNER / ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR MATERIAL ORDERS OR BE RESPONSIBLE FOR THE SAME. CONTRACTOR SHALL USE BEST MANAGEMENT PRACTICE TO PREVENT STORM WATER POLLUTION DURING CONSTRUCTION.

SCALE: 1" = 10'-0"

MARYLAND ONE CALL SYSTEM, INC. 1-800-257-7777 STOP. CALL BEFORE YOU DIG!

MARYLAND LAW REQUIRES THREE WORKING DAYS NOTICE PRIOR TO ANY EARTH MOVING ACTIVITIES

811 Know what's below. Call before you dig.

## NODE PLACEMENT

8240 FLOWER AVE
POLE TAG ID: 799422-243180
PEPCO FACILITY ID: 799422-243180
ZONING CLASSIFICATION = R-10

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1
8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY
LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND TRENT TRAVIS SNARR 55491 PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

| | |
|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: T-1

# CROWN CASTLE FIBER LLC
# GENERAL NOTES

## GENERAL NOTES:

1. THE CONTRACTOR SHALL GIVE ALL NOTICE AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY, MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, AND LOCAL AND STATE JURISDICTIONAL CODES BEARING ON THE PERFORMANCE OF THE WORK. THE WORK PERFORMED ON THE PROJECT AND THE MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES.
2. THE ARCHITECT/ENGINEER HAS MADE EVERY EFFORT TO SET FORTH IN THE CONSTRUCTION AND CONTRACT DOCUMENTS THE COMPLETE SCOPE OF WORK. THE CONTRACTOR BIDDING THE JOB IS NEVERTHELESS CAUTIONED THAT MINOR OMISSIONS OR ERRORS IN THE DRAWINGS AND SPECIFICATIONS SHALL NOT EXCUSE SAID CONTRACTOR FROM COMPLETING THE PROJECT AND IMPROVEMENTS IN ACCORDANCE WITH THE INTENT OF THESE DOCUMENTS.
3. THE CONTRACTOR OR BIDDER SHALL BEAR THE RESPONSIBILITY OF NOTIFYING (IN WRITING) THE CROWN CASTLE CONSTRUCTION MANAGER OF ANY CONFLICTS, ERRORS, OR OMISSIONS PRIOR TO THE SUBMISSION OF CONTRACTOR'S PROPOSAL OR PERFORMANCE OF WORK. IN THE EVENT OF DISCREPANCIES THE CONTRACTOR SHALL PRICE THE MORE COSTLY OR EXTENSIVE WORK, UNLESS DIRECTED IN WRITING OTHERWISE.
4. THE SCOPE OF WORK SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, LABOR AND ALL OTHER MATERIALS AND LABOR DEEMED NECESSARY TO COMPLETE THE WORK/PROJECT AS DESCRIBED HEREIN, EXCEPT FOR FIBER OPTIC CABLE AND OTHER MATERIALS IDENTIFIED BY CROWN CASTLE.
5. THE CONTRACTOR SHALL VISIT THE JOB SITE PRIOR TO THE SUBMISSION OF BIDS OR PERFORMING WORK TO FAMILIARIZE HIMSELF WITH THE FIELD CONDITIONS AND TO VERIFY THAT THE PROJECT CAN BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
6. THE CONTRACTOR SHALL OBTAIN AUTHORIZATION TO PROCEED WITH CONSTRUCTION PRIOR TO STARTING WORK ON ANY ITEM NOT CLEARLY DEFINED BY THE CONSTRUCTION DRAWING/CONTRACT DOCUMENTS.
7. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS ACCORDING TO THE MANUFACTURE'S/VENDOR'S SPECIFICATION UNLESS NOTED OTHERWISE OR WHERE LOCAL CODES OR ORDINANCES TAKE PRECEDENCE.
8. THE CONTRACTOR SHALL PROVIDE A FULL SET OF CONSTRUCTION DOCUMENTS AT THE SITE UPDATED WITH THE LATEST REVISIONS AND ADDENDUMS OR CLARIFICATIONS AVAILABLE FOR THE USE BY ALL PERSONNEL INVOLVED WITH THE PROJECT.
9. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE PROJECT DESCRIBED HEREIN. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTIONS MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING, AND KEEPING A COPY ON SITE, ALL PERMITS AND INSPECTIONS WHICH MAY BE REQUIRED FOR THE ARCHITECT/ENGINEER, THE STATE, COUNTY OR LOCAL GOVERNMENT AUTHORITY.
11. THE CONTRACTOR SHALL MAKE NECESSARY PROVISIONS TO PROTECT EXISTING IMPROVEMENTS, EASEMENTS, PAVING, CURBING, ETC. DURING CONSTRUCTION. UPON COMPLETION OF WORK, THE CONTRACTOR SHALL REPAIR ANY DAMAGE THAT MAY HAVE OCCURRED DUE TO CONSTRUCTION ON OR ABOUT THE PROPERTY TO ORIGINAL OR BETTER CONDITION.
12. THE CONTRACTOR SHALL KEEP THE GENERAL WORK AREA CLEAN AND HAZARD FREE DURING CONSTRUCTION AND DISPOSE OF ALL DIRT, DEBRIS, RUBBISH AND REMOVE EQUIPMENT NOT SPECIFIED AS REMAINING ON THE PROPERTY. PREMISES SHALL BE LEFT IN CLEAN CONDITION AND FREE FROM PAINT SPOTS, DUST, OR SMUDGES OF ANY NATURE.
13. THE CONTRACTOR SHALL COMPLY WITH ALL OSHA REQUIREMENTS AS THEY APPLY TO THIS PROJECT.
14. THE CONTRACTOR SHALL NOTIFY THE CROWN CASTLE CONSTRUCTION MANAGER WHERE A CONFLICT OCCURS ON ANY OF THE CONTRACT DOCUMENTS. THE CONTRACTOR IS NOT TO ORDER MATERIAL OR CONSTRUCT ANY PORTION OF THE WORK THAT IS IN CONFLICT UNTIL IS RESOLVED BY THE CROWN CASTLE CONSTRUCTION MANAGER.
15. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, PROPERTY LINES, ETC. ON THE PROJECT.
16. OWNER/CONTRACTOR SHALL CONTACT ONE CALL MINIMUM 72 HOURS PRIOR TO THE START OF CONSTRUCTION FOR LOCATION OF EXISTING UNDERGROUND UTILITIES.
17. SUBMITTAL OF BID INDICATES THAT THE CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
18. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.
19. CONTRACTOR SHALL COORDINATE ALL WORK BETWEEN TRADES AND ALL OTHER SCHEDULING AND PROVISIONARY CIRCUMSTANCES SURROUNDING THE PROJECT.
20. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR COMPLETE AND FUNCTIONALLY OPERATING SYSTEMS ENERGIZED AND READY FOR USE THROUGHOUT AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
21. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION. LEGALLY DISPOSE OF ALL REMOVED, UNUSED AND EXCESS MATERIAL GENERATED BY THE WORK OF THIS CONTRACT. DELIVER ITEMS INDICATED ON THE DRAWINGS TO THE OWNER IN GOOD CONDITION. OBTAIN SIGNED RECEIPT UPON DELIVERY.
22. AFTER COMPLETION OF CONSTRUCTION, RED LINED AS-BUILT PLANS SHALL BE PROVIDED TO CROWN CASTLE CONSTRUCTION MANAGER.

## GROUNDING NOTES:

1. GROUNDING SHALL COMPLY WITH ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE.
2. ALL GROUNDING DEVICES SHALL BE U.L. APPROVED OR LISTED FOR THEIR INTENDED USE.
3. ALL WIRES SHALL BE AWG THHN/THWN COPPER UNLESS NOTED OTHERWISE.
4. GROUNDING CONNECTIONS TO GROUND RODS, GROUND RING WIRE AND POLE BASE, SHALL BE EXOTHERMIC ("CADWELDS") UNLESS NOTED OTHERWISE. CLEAN SURFACES TO SHINY METAL WHERE GROUND WIRES ARE CADWELDED TO GALVANIZED SURFACES, SPRAY CADWELD WITH GALVANIZING PAINT.
5. GROUNDING CONNECTIONS TO GROUND BARS ARE TO BE TWO-HOLE BRASS MECHANICAL CONNECTORS WITH STAINLESS STEEL HARDWARE (INCLUDING SCREW SET) CLEAN GROUND BAR TO SHINY METAL AFTER MECHANICAL CONNECTION, TREAT WITH PROTECTIVE ANTIOXIDANT COATING.
6. ROUTE GROUNDING CONDUCTORS THE SHORTEST AND STRAIGHTEST PATH POSSIBLE. BEND GROUNDING LEADS WITH A MINIMUM 12" RADIUS.
7. INSTALL #2 AWG GREEN-INSULATED STRANDED WIRE FOR ABOVE GRADE GROUNDING AND #2 TINNED SOLID COPPER WIRE FOR BELOW GRADE GROUNDING UNLESS OTHERWISE NOTED.
8. REFER TO GROUNDING PLAN FOR GROUND BAR LOCATIONS. GROUNDING CONNECTIONS SHALL BE EXOTHERMIC TYPE ("CADWELDS") TO ANTENNA MOUNTS AND GROUND RING. REMAINING GROUNDING CONNECTIONS SHALL BE COMPRESSION FITTINGS. CONNECTIONS TO GROUND BARS SHALL BE MADE WITH TWO-HOLE LUGS.
9. THE GROUND ELECTRODE SYSTEM SHALL CONSIST OF DRIVEN GROUND RODS POSITION ACCORDING TO GROUNDING PLAN. THE GROUND RODS SHALL BE 5/8"X10'-0" COPPER CLAD STEEL INTERCONNECTED WITH #2AWG BARE, TINNED SOLID COPPER WIRE BURIED 36" BELOW GRADE. BURY GROUND RODS A MAXIMUM OF 15' APART, AND A MINIMUM OF 6' APART.
10. IF ROCK IS ENCOUNTERED GROUND RODS SHALL BE PLACED AT AN OBLIQUE ANGLE NOT TO EXCEED 45°.
11. EXOTHERMIC WELDS SHALL BE MADE IN ACCORDANCE WITH ERICO PRODUCTS BULLETIN A-AT OR EQUAL.
12. CONSTRUCTION OF GROUND RING AND CONNECTIONS TO EXISTING GROUND RING SYSTEM SHALL BE DOCUMENTED WITH PHOTOGRAPHS PRIOR TO BACKFILLING SITE. PROVIDE PHOTOS TO THE CROWN CASTLE CONSTRUCTION MANAGER.
13. ALL GROUND LEADS EXCEPT THOSE TO THE EQUIPMENT ARE TO BE #2 TINNED SOLID COPPER WIRE. ALL EXTERIOR GROUND BARS TINNED COPPER.
14. PRIOR TO INSTALLING LUGS ON GROUND WIRES, APPLY THOMAS & BETTS KOPR-SHIELD (TM OF JET LUBE INC.), PRIOR TO BOLTING GROUND WIRE LUGS TO GROUND BARS, APPLY KOPR-SHIELD OR EQUAL.
15. ENGAGE AN INDEPENDENT ELECTRICAL TESTING FIRM TO TEST AND VERIFY THAT IMPEDANCE DOES NOT EXCEED FIVE OHMS TO GROUND BY MEANS OF "FALL OF POTENTIAL TEST". TEST SHALL BE WITNESSED BY A CROWN CASTLE REPRESENTATIVE, AND RECORDED ON THE "GROUND RESISTANCE TEST" FORM.
16. WHERE BARE COPPER GROUND WIRES ARE ROUTED FROM ANY CONNECTION ABOVE GRADE TO GROUND RING, INSTALL WIRE IN 3/4" PVC SLEEVE, FROM 1' BELOW GRADE AND SEAL TOP WITH SILICONE MATERIAL.
17. PREPARE ALL BONDING SURFACES FOR GROUNDING CONNECTIONS BY REMOVING ALL PAINT AND CORROSION DOWN TO SHINY METAL. FOLLOWING CONNECTION, APPLY APPROPRIATE ANTI-OXIDIZATION PAINT.

## GROUNDING GUIDELINES:

ALL EQUIPMENT THAT IS INSTALLED AND MAY CAUSE ANY KIND OF ELECTRICAL CHARGE OR BUILD UP MUST HAVE PROPER AND ADEQUATE GROUNDING IN PLACE TO PREVENT FROM EQUIPMENT DAMAGE AND SHOCK HAZARDS.

RRH'S

MUST BE GROUND TO A MAIN BUSS BAR OR HOME RUN GROUND FROM THE GROUND PIN OR STUD THAT IS ON THE CHASSIS. IF ANY EQUIPMENT HAS A GROUND POINT ON IT, IT SHOULD BE GROUND. THE GROUNDING CABLE SIZE SHOULD FOLLOW LOCAL GUIDELINES ON EQUIPMENT GROUNDING. NORMALLY THE STANDARD IS 6 UV RATED STRANDED GROUND CABLE TO BE USED ON RRH'S. THE LUG NEEDS TO FIT THE PROPER CABLE SIZE AS WELL AS THE HOLE SIZE FOR THE STUD. IF IT'S A SINGLE STUD IT SHOULD BE A ONE HOLE LUG, IF IT HAS A PLACE FOR TWO HOLE LUG THEN THAT SHOULD BE USED. (I.E. COMMSCOPE ION M HAS A SINGLE STUD GROUND, TE PRISM HAS A GROUND FOR A 2 HOLE LUG.) DO NOT CUT THE LUGS TO FIT. THEY MAKE LUGS IN ALL SHAPES AND SIZES. ORDER THE CORRECT ONE AND ATTACH IT PROPERLY.

SURGE ARRESTORS

IF IT HAS A PLACE FOR A GROUND – GROUND IT.

MAST PIPES

ALL MAST PIPES SHOULD BE GROUND WITH BEAR METAL ON THE PLACE THE GROUND IS ATTACHED AND THEN COLD GALVANIZATION OVER THE BARE METAL TO PREVENT RUST. THE GROUND CAN BE ATTACHED MECHANICALLY OR AN EXOTHERMIC WELD (CAD WELD) MAY BE USED. IF THE MAST PIPE IS THE TALLEST POINT ON A BUILDING IT SHOULD ALSO HAVE A LIGHTNING ROD ATTACHED TO IT AS WELL.

DIPLEXERS/DUPLEXERS/SPLITTERS/PASSIVE COMPONENTS

IF IT HAS A PLACE FOR A GROUND TO BE INSTALLED – INSTALL IT.

ANY STRUCTURE OR FRAME SHOULD HAVE #2 GROUND WIRE, I.E. MAST PIPES, OUTDOOR ENCLOSURES, SHROUDS, BUSS BAR HOME RUN TO EARTH GROUND. ALL EQUIPMENT HAS #6 TO BUSS BARS.

DPS BATCH STAMP

ALL BUSS BARS NEED TO HAVE A LINK TO AN EARTH GROUND SYSTEM AND MUST BE ISOLATED IF MOUNTED ON ANYTHING THAT MAY RETAIN AN ELECTRIC CHARGE. NO EXCEPTIONS. ALL EQUIPMENT SHOULD RUN TO BUSS BARS. LUGS ON BUSS BARS SHOULD HAVE FRONT AND BACK FLAT WASHERS SANDWICHING THE LUG(S) TO THE BAR AND NOT OVERLAPPING CAUSING IT TO HOLD OR PIN DOWN OTHER LUGS ON THE BAR. THERE SHOULD ALWAYS BE A LOCK WASHER CLOSEST TO THE NUT ON THE BOLT FOR A LUG. NEVER IS IT OK TO STACK LUGS ON TOP OF EACH OTHER. IF THERE IS NOT ENOUGH SPACE, GET A BIGGER BUSS BAR. THEY SHOULD ALL HAVE A DIRECT CONTACT TO A BUSS BAR WITH NO-OX COATED BETWEEN THE LUG AND THE BUSS BAR. ALL GROUNDS SHOULD HAVE HEAT SHRINK OVER THE LUG (UNLESS IT'S NON-JACKETED WIRE). ALL LUGS NEED TO BE CRIMPED ON SECURELY WITH THE PROPER DYE AND TOOL (NOT CHANNEL LOCK CRIMPED). THERE SHOULD BE NO MORE THAN 1/16 INCH BARE CABLE SHOWING (SHINER) BETWEEN THE JACKET AND THE LUG. INSIDE LUGS SHOULD HAVE CLEAR HEAT SHRINK TO INSPECT THE CRIMPS AND SHINERS. INSIDE LUGS SHOULD HAVE INSPECTION WINDOWS TO SHOW THE GROUND WIRE IS INSERTED INTO THE LUG ALL THE WAY AND IS PROPERLY INSTALLED. OUTDOOR LUGS MAY HAVE BLACK OR GREEN HEAT SHRINK.

## WEATHER SEAL GUIDELINES:

BUTYL

1. PRE WRAP ALL CONNECTIONS WITH BLACK ELECTRICAL TAPE TO COVER ALL METAL SHOWING TO PREVENT DAMAGE TO CONNECTOR WHEN WEATHER SEAL IS TO BE REMOVED. 3/4 INCH OR 2 INCH TAPE CAN BE USED FOR THIS PROCESS.
2. WRAP CONNECTIONS WITH BUTYL WEATHER SEALANT WITH TWO LAYERS TO FORM A CONE LIKE SHAPE, OVER LAPPING THE LAYERS BY AT LEAST 50%. MOLD SEALANT TO PROPER SHAPE. THIS STEP IS CRUCIAL OR THE BUTYL WILL LEAK OVER TIME.
3. WRAP SEALANT WITH 2 LAYERS OF 2 INCH TAPE, (YOU CAN CUT INTO STRIPS IN TIGHT AREAS). FIRST WRAP SHOULD BE PULLED SMOOTH TO MAKE FINAL WRAPS CLEAN AND CRISP. 2ND WRAP SHOULD BE PULLED TIGHTER THAN FIRST TO HOLD SEALANT INTO PROPER (CONE LIKE) SHAPE. OVER LAPPING TAPE SHOULD COVER AT LEAST 50% OF EACH LAYER OF TAPE PRIOR.
4. UPON COMPLETION OF 2 LAYERS OF 2 INCH TAPE FINALIZE WITH AT LEAST 3 LAYERS OF 3/4 INCH TAPE. EACH WRAP OF TAPE SHOULD BE PULLED TIGHTER THAN WRAP BEFORE TO SQUEEZE SEALANT INTO A MOLD AND WILL PREVENT ANY SEALANT FROM LEAKING OUT THE SIDES OVER TIME. EACH LAYER SHOULD COVER PRIOR LAYERS AT LEAST 50%.
5. OVERLAP THE TAPE 50% OF THE PREVIOUS LAYER.
6. ALWAYS FINISH THE LAST WRAP OF TAPE GOING UP TO CREATE A SHINGLING OF THE TAPE SO IN THE WEATHER ANYTHING THAT RUNS DOWN THE CABLE WILL NOT LEAK INTO THE SEALANT. CUT THE END OF THE TAPE AND LAY IT ONTO THE FINISH. DO NOT STRETCH THE END OF THE TAPE. THIS WILL CAUSE THE TAPE TO PULL OFF OVER TIME AND CREATE A FLAGGING AFFECT.

FUSION TAPE

1. CHECK TO MAKE SURE ALL CONNECTORS ARE TORQUED TO PROPER SPECIFICATIONS BEFORE YOU BEGIN.
2. NOTE: THIS STEP DOES NOT NEED A CURTSY WRAP BECAUSE THE TAPE DOES NOT ACTUALLY ADHERE TO THE CONNECTOR ITSELF BUT BINDS TO ITSELF. ALSO KNOWN AS "SELF-AMALGAMATING TAPE.
3. WRAP CONNECTIONS FUSION TAPE SEALANT WITH TWO LAYERS TO FORM A CONE LIKE SHAPE. FUSION TAPE MUST OVER LAP AT LEAST 50% TO FORM A PROPER SEAL. COVER ALL OF THE BARE METAL SHOWING (AT LEAST 1-1/2 INCH PAST END OF CONNECTOR.)
4. IF THIS "TAPE" IS NOT PULLED TIGHT WHILE WRAPPING YOU WILL NOT CREATE A PROPER SEAL, IT MUST BE STRETCHED TO CREATE BOND TO ITSELF.
5. WRAP AT LEAST 2 LAYERS OF 3/4 INCH TAPE. EACH LAYER SHOULD COVER AT LEAST 50% OF PREVIOUS TAPE WRAP.
6. ALWAYS FINISH THE LAST WRAP OF TAPE GOING UP TO CREATE A SHINGLING OF THE TAPE SO IN THE WEATHER ANYTHING THAT RUNS DOWN THE CABLE WILL NOT LEAK INTO THE SEALANT. CUT THE END OF THE TAPE AND LAY IT ONTO THE FINISH. DO NOT STRETCH THE END OF THE TAPE. THIS WILL CAUSE THE TAPE TO PULL OFF OVER TIME AND CREATE A FLAGGING AFFECT.

HEAT SHRINK

1. PRE WRAP ALL CONNECTIONS WITH BLACK ELECTRICAL TAPE TO COVER ALL METAL SHOWING TO PREVENT DAMAGE TO CONNECTOR WHEN WEATHER SEAL IS TO BE REMOVED. 3/4 INCH OR 2 INCH TAPE CAN BE USED FOR THIS PROCESS.
2. USE ONLY OUTDOOR RATED HEAT SHRINK THAT HAS THE SELF-ADHESIVE WHEN HEATED PROPERLY. THIS IS WHAT WILL CREATE THE SEAL TO THE CONNECTOR.
3. MAKE SURE HEAT SHRINK COVERS ALL OF THE COUPLERS AND CONNECTIONS. HEAT THE HEAT SHRINK TO SHRINK TIGHTLY TO THE CONNECTIONS AND CABLE. MAKE SURE THE HEAT SHRINK IS SEALED TOP AND BOTTOM OF THE CONNECTIONS. ALSO CHECK TO MAKE SURE HEAT SHRINK WAS NOT OVER HEATED AND THERE ARE NO BREAKS IN SEAL THROUGH-OUT THE SHRINK TUBING.

ANDREWS CLAM SHELL

1. PROPERLY TORQUE CONNECTOR TO SPECIFICATION.
2. APPLY ONE LAYER OF 3/4 INCH BLACK TAPE AROUND ENTIRE CONNECTOR ENDING AT LEAST 1-1/2 INCHES PAST TOP AND BOTTOM OF CONNECTOR TO PREVENT ANY MOISTURE FROM STICKING TO THE CONNECTOR.
3. INSPECT THE DEVICE TO MAKE SURE IT IS NOT CHIPPED, CRACKED OR ANY SIGNS OF NEGLECT THAT WILL TAKE AWAY FROM MAKING A FULL SEAL AROUND THE CONNECTOR.
4. USE ONLY CORRECT SIZE PER CABLE AND CONNECTOR TYPE – I.E: 1/2 INCH FOR 1/2 INCH NOT 7/8TH FOR 1/2 INCH.
5. FOLLOW DIRECTIONS THAT COME WITH PRODUCT – MOST CLAM SHELL TYPE SEALANT DEVICES WRAP AROUND OR CLAMP AROUND A CONNECTION POINT.

**GROUNDING AND BONDING NOTE:**
**GENERAL CONTRACTOR SHALL FOLLOW ALL CONSTRUCTION GUIDELINES PER CROWN CASTLE'S GROUNDING AND BONDING REQUIREMENTS FOR STRAND MOUNT NODES (oDAS) – DOCUMENT 337910.**

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C™
TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1
8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY
LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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| JED | SDR | PCQ |

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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

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GN-1

# CROWN CASTLE FIBER LLC
# GENERAL NOTES

6. BE CAREFUL WHEN SETTING LOCKING DEVICE INTO PLACE ON CLAM SHELL STYLE SEALANTS (THEY ARE PLASTIC AND TEND TO BREAK OR CRACK IN EXTREME WEATHER CONDITIONS WHEN LOCKING DEVICE IS CLOSED TO CREATE THE SEAL.) IF THE LOCKING MECHANISM CRACKS OR BREAKS, REPLACE IT. DO NOT TAPE THE CLAMP CLOSED OR TRY TO RE-ENGINEER IT.

7. ONCE THE CLAMP IS ON AND LOCKED AROUND THE CONNECTOR THE PROCESS IS COMPLETE.

PPC BOOT

1. PLACE BOOT OVER CABLE BEFORE CONNECTOR IS ATTACHED TO CABLE. THIS IS ONLY RATED FOR PPC TYPE CONNECTORS. (NOTE: IF THIS STEP IS SKIPPED OR NOT COMPLETED BEFORE MAKING A CONNECTOR THE SUBCONTRACTOR WILL NOT BE ABLE TO USE THE BOOT STYLE DEVICE TO SEAL THE CONNECTOR. IT IS NOT RECOMMENDED TO WASTE A CONNECTOR AND CUT IT OFF AND START AT STEP NO. 1 AGAIN. SINCE PPC CONNECTORS ARE NOT REUSABLE AND CAN GET QUITE EXPENSIVE. DO NOT TRY TO STRETCH THE BOOT TO SLIDE IT OVER THE CONNECTION.)

2. PLACE THE BOOT OVER THE CABLE, AND THEN MAKE THE CONNECTOR.

3. TORQUE THE CONNECTION TO PROPER SPECIFICATIONS.

4. SLIDE BOOT UP TO COVER THE ENTIRE CONNECTOR, FOLLOWING THE PPC GUIDELINES.

5. THIS PROCESS IS COMPLETE AT THIS TIME.

## ELECTRICAL NOTES

1. SUBMITTAL OF BID INDICATES THAT THE CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.

2. CONTRACTOR SHALL PERFORM ALL VERIFICATIONS, OBSERVATION TESTS, AND EXAMINATION WORK PRIOR TO ORDERING OF ANY EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A WRITTEN NOTICE OF ALL FINDINGS TO THE PROJECT MANAGER LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT AND DISCREPANCIES.

3. VERIFY HEIGHTS WITH PROJECT MANAGER PRIOR TO INSTALLATION.

4. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.

5. CONTRACTOR SHALL COORDINATE ALL WORK BETWEEN TRADES AND ALL OTHER SCHEDULING AND PROVISIONARY CIRCUMSTANCES SURROUNDING THE PROJECT.

6. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR COMPLETE AND FUNCTIONALLY OPERATING SYSTEMS ENERGIZED AND READY FOR USE THROUGHOUT AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.

7. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. ELECTRICAL MATERIALS SHALL BE LISTED AND APPROVED BY UNDERWRITER'S LABORATORIES AND SHALL BEAR THE INSPECTION LABEL "J" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF ALL GOVERNING BODIES HAVING JURISDICTION OVER THE CONSTRUCTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH ALL CURRENT APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA AND NBFU. ALL MATERIALS AND EQUIPMENT SHALL BE APPROVED FOR THEIR INTENDED USE AND LOCATION.

8. ALL WORK SHALL COMPLY WITH ALL APPLICABLE GOVERNING STATE, COUNTY AND CITY CODES AND OSHA, NFPA, NEC & ASHRAE REQUIREMENTS.

9. ENTIRE JOB SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF JOB ACCEPTANCE. ALL WORK, MATERIAL AND EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.

10. PROPERLY SEAL ALL PENETRATIONS. PROVIDE UL LISTED FIRE-STOPS WHERE PENETRATIONS ARE MADE THROUGH FIRE-RATED ASSEMBLIES. WATER-TIGHT USING SILICONE SEALANT.

11. LOCATE ALL PENETRATIONS SUCH THAT ALL REINFORCEMENT CONTAINED WITHIN THE EXISTING BUILDING CONSTRUCTION REMAINS INTACT AND UNDISTURBED. SUBMIT LOCATING METHOD TO THE PROJECT MANAGER FOR APPROVAL PRIOR TO EXECUTION.

12. DELIVER ALL BROCHURES, OPERATING MANUALS, CATALOGS AND SHOP DRAWINGS TO THE PROJECT MANAGER AT JOB COMPLETION. PROVIDE MAINTENANCE MANUALS FOR MECHANICAL EQUIPMENT. AFFIX MAINTENANCE LABELS TO MECHANICAL EQUIPMENT.

13. ALL CONDUCTORS SHALL BE COPPER. MINIMUM CONDUCTOR SIZE SHALL BE #12 AWG., UNLESS OTHERWISE NOTED. CONDUCTORS SHALL BE TYPE THHW, RATED IN ACCORDANCE WITH NEC 110-14(C).

14. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING RATING NOT LESS THE MAXIMUM INTERRUPTING CURRENT TO WHICH THEY MAY BE SUBJECTED.

15. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE; ARTICLES 250 & 810 AND THE UTILITY COMPANY STANDARDS.

16. CONDUIT: ALL ABOVE GRADE CONDUITS SHALL BE RIGID & LFMC TO 6' AS STATED BELOW:

   A. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS, IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3.

   B. ELECTRICAL METALLIC TUBING SHALL HAVE U.L. LABEL, FITTINGS SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.

   C. LIQUID-TIGHT FLEXIBLE METAL CONDUIT SHALL BE U.L. LISTED AND SHALL BE USED AT FINAL CONNECTIONS TO MECHANICAL EQUIPMENT & RECTIFIERS AND WHERE PERMITTED BY CODE. ALL CONDUIT IN EXCESS OF SIX FEET IN LENGTH SHALL CONTAIN A FULL-SIZE GROUND CONDUCTOR.

   D. CONDUIT RUNS SHALL BE SURFACE MOUNTED ON CEILINGS OR WALLS UNLESS NOTED OTHERWISE. ALL CONDUIT SHALL RUN PARALLEL OR PERPENDICULAR TO WALLS, FLOOR, CEILING, OR BEAMS. VERIFY EXACT ROUTING OF ALL EXPOSED CONDUIT WITH THE PROJECT MANAGER PRIOR TO INSTALLING.

   E. PVC CONDUIT MAY BE PROVIDED ONLY WHERE SHOWN, OR IN UNDERGROUND INSTALLATIONS. PROVIDE UV-RESISTANT CONDUIT WHERE EXPOSED TO THE ATMOSPHERE. PROVIDE GROUND CONDUCTOR IN ALL PVC RUNS; EXCEPT WHERE PERMITTED BY CODE TO OMIT.

17. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PHENOLIC PLASTIC NAMEPLATES. METER, DISCONNECT, ETC. BACKGROUND SHALL BE BLACK WITH WHITE LETTERS; EXCEPT AS REQUIRED BY CODE TO FOLLOW A DIFFERENT SCHEME.

18. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUNDING TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. GROUNDING SYSTEM RESISTANCE SHALL NOT EXCEED 5 OHMS. IF THE RESISTANCE VALUE IS EXCEEDED, NOTIFY THE PROJECT MANAGER FOR FURTHER INSTRUCTION ON METHODS FOR REDUCING THE RESISTANCE VALUE.

19. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION. LEGALLY DISPOSE OF ALL REMOVED, UNUSED AND EXCESS MATERIAL GENERATED BY THE WORK OF THIS CONTRACT. DELIVER ITEMS INDICATED ON THE DRAWINGS TO THE OWNER IN GOOD CONDITION. OBTAIN SIGNED RECEIPT UPON DELIVERY.

20. COORDINATE WITH UTILITY COMPANY FOR CONNECTION OF TEMPORARY AND PERMANENT POWER TO THE SITE. THE TEMPORARY POWER AND ALL HOOKUP COSTS SHALL BE PAID BY THE CONTRACTOR.

21. VERIFY ALL EXISTING CIRCUITRY PRIOR TO REMOVAL AND NEW WORK. MAINTAIN POWER TO ALL OTHER AREAS & CIRCUITS NOT SCHEDULED FOR REMOVAL.

22. RED LINED AS-BUILT PLANS SHALL BE PROVIDED TO THE CONSTRUCTION MANAGER UPON REQUEST.

## PEPCO GUIDELINES:

STRUCTURAL

1. ANTENNA SUPPORT POLES SHALL BE DESIGNED TO WITHSTAND THE HEAVY LOAD CASE AS DEFINED IN NATIONAL ELECTRIC SAFETY CODE (NESC) RULE 250B. IF ANY PART OF THE ANTENNA SUPPORTPOLE PROJECTS OVER SIXTY FEET ABOVE THE GROUND, THEN THE POLE SHALL BE DESIGNED TO WITHSTAND THE NESC EXTREME WIND LOAD CASE, AS DEFINED IN RULE 250C AND NESC FIGURE 250-2(B) (120 MPH WIND SPEED). THE SPECIFIED OVERLOAD CAPACITY FACTOR FOR THE NESC LOAD CASES, ARE SPECIFIED IN SECTION 26 OF THE NESC.

2. POLES REPLACED (TO SUPPORT ANTENNAS) SHALL BE DESIGNED FOR AT LEAST GRADE B CONSTRUCTION. POLES THAT ARE NOT REPLACED AND WILL SERVE AS SUPPORTS FOR ANTENNAS CAN BE DESIGNED FOR GRADE C CONSTRUCTION PROVIDED THAT APPROPRIATE RELATED STRENGTH REDUCTION FACTORS ARE APPLIED.

3. ALL POLES REPLACED TO SUPPORT ANTENNAS SHALL BE CLASS 1 OR LARGER. INSTALLATIONS THAT REQUIRE POLES LARGER THAN A CLASS 1 SHALL USE AN APPROPRIATE POLE CLASS, HEIGHT AND TYPE APPROVED BY STANDARDS. THE DESIGN OF THE STEEL POLE AT A MINIMUM SHALL MEET THE STRENGTH REQUIREMENTS OF THE NEXT HIGHER ANSI WOOD POLE CLASS.

a. TO MAINTAIN RELIABILITY AND ACCOMMODATE GEOMETRIC ALTERATIONS, ALL 69KV CANDIDATE POLES WILL BE CHANGED TO A TALLER CLASS 1 OR LARGER POLE.

b. EXCEPTIONS WILL BE CONSIDERED ON A CASE-BY-CASE BASIS, WHEN THE EXISTING 69KV POLE MEETS OR EXCEEDS THE SPECIFICATIONS TO BE OBTAINED IN THIS SPECIFICATION WITHOUT REPLACING THE POLE. ALL EXCEPTIONS TO THE REQUIREMENT TO REPLACE POLES THAT CARRY 69KV FEEDERS ARE SOLELY AT THE DISCRETION OF PEPCO.

4. ALL HARDWARE USED TO SUPPORT THE ANTENNA SHALL BE GALVANIZED, IN NEW CONDITION AND CAPABLE OF WITHSTANDING ALL DESIGNED LOADS.

5. LOCK WASHERS SHALL BE USED ON ALL THRU BOLTS USED TO CONNECT ANTENNA SUPPORT BRACKETS AND OTHER CARRIER EQUIPMENT TO THE POLE.

6. SPLIT BOLTS WITH WASHERS SHALL BE INSTALLED PERPENDICULAR TO THE ANTENNA SUPPORT BRACKET BOLTS.

7. THE ANTENNA SUPPORT BRACKET SHALL BE ABLE TO WITHSTAND THE NESC HIGH WIND DESIGN LOADS SPECIFIED ABOVE.

8. ALL STRUCTURAL AND DESIGN ANALYSIS SHALL BE PERFORMED BY THE CARRIER AND BE REVIEWED BY PEPCO'S DISTRIBUTION ENGINEERING DEPARTMENT. PEPCO SHALL PROVIDE REQUESTED DATA FOR SUCH ANALYSIS AND RESERVES THE RIGHT TO VALIDATE THE ANALYSIS. DESIGNS MUST PASS THE STRUCTURAL ANALYSIS REQUIREMENTS BEFORE PROCEEDING TO THE FINAL DESIGN PHASE OR CONSTRUCTION.

9. CARRIER SHALL PROVIDE AND OWN ALL POLE TOP EXTENSIONS USED TO SUPPORT ANTENNAS ABOVE THE PEPCO OVERHEAD COVERED CONDUCTORS (SECONDARY OR PRIMARY VOLTAGES). THE CONDITION OF THE MOUNTING SURFACE AT THE TOP OF THE POLE SHALL BE INSPECTED BY APPROVED PEPCO PERSONNEL. IF ANY DETERIORATION IS FOUND, THE POLE SHALL BE REPLACED BEFORE MOUNTING. "POLE TOP EXTENSIONS" SHALL BE AT LEAST 5' BUT NOT TO EXCEED 8'; AND NOT BE USED IN THE FOLLOWING INSTANCES:

a. TO SUPPORT ELECTRICAL CONDUCTORS.

b. TO SUPPORT ANTENNAS ON 69KV POLES.

10. THE LOWEST GROUNDED POINT OF A CARRIER'S EQUIPMENT SHALL MAINTAIN THE FOLLOWING MINIMUM SEPARATIONS:
- AT LEAST 4FT FOR OVERHEAD SECONDARY FACILITIES.
- AT LEAST 8FT FOR OVERHEAD PRIMARY FACILITIES.
CLEARANCES SHALL BE INCREASED AS REQUIRED, FOR BUCKET ACCESS.

11. POLE ANALYSIS SHALL BE BASED ON FIELD MEASUREMENTS.

DPS BATCH STAMP

SAFETY:

1. AUTHORIZED PEPCO PERSONNEL SHALL INSTALL ALL THE EQUIPMENT SUCH AS ANTENNA SUPPORT BRACKETS, ANTENNAS, JUMPERS AND COAXIAL CABLE AND APPROPRIATE CHANNEL RISER, WHICH ARE DESIGNED TO BE ABOVE THE COMMUNICATION AND SAFETY ZONES ON EACH POLE.

2. BOTH RF AND POWER SUPPLY DISCONNECT SWITCHES SHALL BE PROVIDED. THE RF DISCONNECT SWITCH SHALL BE A "LOCK-OUT" TYPE TO MAKE THE EQUIPMENT FREQUENCY (RF) TRANSMITTER EQUIPMENT INOPERABLE, SUCH THAT ELECTRIC UTILITY CREWS WILL HAVE TOTAL CONTROL OVER OPERATION OF THE EQUIPMENT. THE "LOCK-OUT" DEVICE SHALL BE DESIGNED INTO ANY SYSTEM DEPLOYED IN PEPCO'S SERVICE TERRITORY. THE DISCONNECT MECHANISM SHALL BE OF A CLEARLY VISIBLE MECHANICAL TYPE. PEPCO PERSONNEL MUST BE ABLE TO CLEARLY DETERMINE BY VIABLE MEANS THAT THE RF OUTPUT OF THE SUBJECT SYSTEM IS DISABLED. THE SWITCHING MECHANISM REQUIRED TO DISABLE THE RF TRANSMITTER SHALL BE CLEARLY MARKED WITH SIGNAGE AND IT SHALL BE LOCATED OUTSIDE THE MAXIMUM PERMISSIBLE RF EXPOSURE (SAFE APPROACH) DISTANCE/RADIUS FROM THE ANTENNA. A "KEEP-OUT" TAG SHALL BE PLACED ON THE DISCONNECTING DEVICES DURING SERVICE ON THE POLE.

3. AN RF SIGN SHALL BE PLACED ON THE POLE AND SHALL INDICATE THE SAFE/MINIMUM APPROACH DISTANCE FROM THE ANTENNA BASED ON THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS AS INDICATED IN TABLE 1 OF FCC'S RULE 47C.F.R.1.1310, IEEE C95.1 AND IEEE C95.5 (AS APPLICABLE) IN CONJUNCTION WITH ITS EFFECTIVE SOTROPIC RADIATED POWER (EIRP) VALUE AND THE OPERATIONAL FREQUENCY. THE SIGN SHALL INDICATE THE CARRIER'S NAME, AND 24-HOUR SYSTEM OPERATOR CONTACT INFORMATION, SO THAT NOTIFICATION CAN BE GIVEN TO THE APPROPRIATE PERSONNEL. IT SHALL BE AT LEAST 9" X 11" SIZE AND SHALL COMPLY WITH IEEE C95.2 STANDARDS. IN ADDITION, AN RF MAXIMUM PERMISSIBLE EXPOSURE (MPE) REPORT MUST BE SUBMITTED TO PEPCO.

4. ANY TREE TRIMMING REQUIRED FOR ANTENNA FACILITIES ABOVE THE COMMUNICATION ZONE WILL BE PERFORMED BY PEPCO AT THE CARRIER'S EXPENSE.

5. CARRIER PERSONNEL ARE NOT PERMITTED TO ACCESS THE POLE ABOVE THE COMMUNICATIONS ZONE. ONLY APPROVED PEPCO PERSONNEL OR CONTRACTORS UNDER THE DIRECTION OF AN AUTHORIZED PEPCO EMPLOYEE ARE PERMITTED TO ACCESS THIS SECTION OF THE POLE.

6. WHEN REQUIRED, ALL PERMITS SHALL BE COORDINATED BETWEEN THE CARRIER AND PEPCO'S APPROPRIATE SYSTEM DESIGN DEPARTMENT.

7. EQUIPMENT INSTALLED BELOW THE SAFETY ZONE SHALL BE MAINTAINED BY THE CARRIER.

8. IF AN ANTENNA POLE IS DAMAGED DUE TO HEAVY STORMS, PEPCO WILL NOTIFY THE CARRIER, USING THE PHONE NUMBER PROVIDED ON THE CAUTION SIGN BUT SHALL NOT BE RESPONSIBLE FOR ANY EQUIPMENT.

9. TO ACCOMMODATE FUTURE PEPCO POLE REPLACEMENTS, THE CARRIER SHALL AGREE TO TRANSFER THEIR EQUIPMENT WITHIN 30 DAYS OF NOTIFICATION OF SUCH WORK.

CLEARANCES:

1. RF CAUTION SIGNAGE SHALL BE PLACED OUTSIDE THE SAFE APPROACH DISTANCE RADIUS OF THE ANTENNA.

2. THE SEPARATION OF ANTENNA MOUNTING BRACKET PARTS FROM UNPROTECTED ENERGIZED RIGID CONDUCTOR MOUNTED ON THE SAME POLE SHALL BE AT LEAST 40" FOR DP (48" FOR PEPCO).

3. CLEARANCES AT THE SUPPORT AND MID-SPAN SHALL NOT BE REDUCED, BUT SHALL BE INCREASED AS REQUIRED FOR BUCKET ACCESS.

4. FIBER OPTIC WIRE SHALL BE INSTALLED IN THE COMMUNICATION ZONE WITH 12 INCHES OF SEPARATION FROM OTHER THIRD PARTY COMMUNICATION CONDUCTORS AND SHALL MAINTAIN AT LEAST 40" FOR DP (48" FOR PEPCO) OF SEPARATION FROM THE LOWEST SECONDARY CONDUCTOR FOR NEW POLE INSTALLATIONS AND 40 INCHES FOR EXISTING INSTALLATIONS.

5. AN ANTENNA MOUNTED BELOW PEPCO'S SECONDARY CONDUCTORS WILL MAINTAIN CLEARANCES OF NO LESS THAN 40" FOR DP (48" FOR PEPCO) BETWEEN THE LOWEST SUPPLY CONDUCTOR AND THE HIGHEST POINT OF THE ANTENNA.

6. WIRELESS CARRIER'S EQUIPMENT BOX MAY BE MOUNTED AS LOW TO GROUND LEVEL AS PRACTICAL (PER RECOMMENDATION BY PEPCO FIELD PERSONNEL) IF POLE IS AT LEAST 4.5' AWAY FROM THE CURB OR ROAD.

WIFI DEVICES:

1. WIFI REFERS TO DEVICES THAT MEET IEEE 802.11 STANDARDS.

2. IF MOUNTED ON A STREETLIGHT BRACKET, THE POWER VOLTAGE REQUIREMENTS OF THE RF DEVICE MUST MATCH THE EXISTING STREETLIGHT VOLTAGE. THE PHOTOCELL POWER TAP CONNECTOR SHALL BE PROVIDED BY THE CARRIER AND MUST MEET ANSI C136 REQUIREMENTS.

3. A MAXIMUM OF 1 WIFI DEVICE IS ALLOWED PER CANDIDATE POLE.

4. GROUNDING OF MOUNTING BRACKETS (INCLUDING STREETLIGHT BRACKET) SHALL BE AS SHOWN ON DRAWINGS. THE WIRELESS CARRIER SHALL SUPPLY THE WEIGHT OF THE PROPOSED EQUIPMENT. THE EXISTING BRACKET MUST BE STRUCTURALLY SUFFICIENT TO SUPPORT THE PROPOSED DEVICE. STREETLIGHT BRACKETS WILL NOT BE CHANGED TO ACCOMMODATE THE DEVICE.

5. NESC AND MAXIMUM RF EXPOSURE LIMIT CLEARANCES IN ALL DIRECTIONS SHALL BE MET.

**GROUNDING AND BONDING NOTE:**
**GENERAL CONTRACTOR SHALL FOLLOW ALL CONSTRUCTION GUIDELINES PER CROWN CASTLE'S GROUNDING AND BONDING REQUIREMENTS FOR STRAND MOUNT NODES (oDAS) – DOCUMENT 337910.**

NODE:
MNG-094M1 (478113)

ENGINEER:

NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092


OWNER/DEVELOPER:

CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044


TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

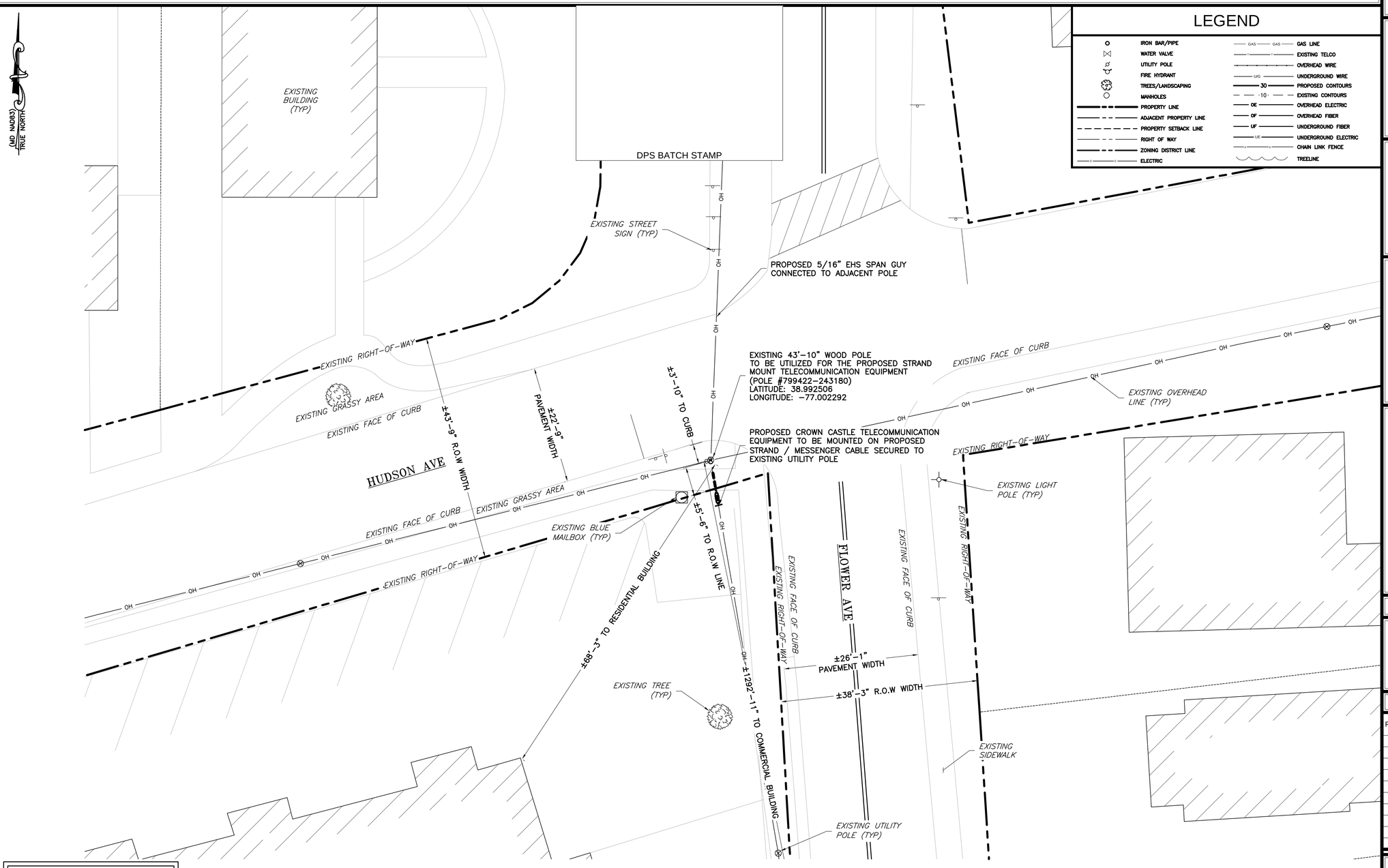
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| JED | SDR | PCQ |

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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
GN-2

# CROWN CASTLE FIBER LLC
## SITE PLAN




### LEGEND

| | |
|---|---|
| IRON BAR/PIPE | GAS LINE |
| WATER VALVE | EXISTING TELCO |
| UTILITY POLE | OVERHEAD WIRE |
| FIRE HYDRANT | UNDERGROUND WIRE |
| TREES/LANDSCAPING | PROPOSED CONTOURS |
| MANHOLES | EXISTING CONTOURS |
| PROPERTY LINE | OVERHEAD ELECTRIC |
| ADJACENT PROPERTY LINE | OVERHEAD FIBER |
| PROPERTY SETBACK LINE | UNDERGROUND FIBER |
| RIGHT OF WAY | UNDERGROUND ELECTRIC |
| ZONING DISTRICT LINE | CHAIN LINK FENCE |
| ELECTRIC | TREELINE |

THE CONSTRUCTION MANAGER SHALL COORDINATE POWER AND TELCO UTILITY ROUTING TO THE PROPOSED EQUIPMENT PRIOR TO CONSTRUCTION.

ANTENNA AZIMUTH SHALL BE SET TO 165°

**NOTE:**

EXISTING UTILITY INFORMATION SHOWN REPRESENTS THE BEST DATA AVAILABLE FROM EXISTING DOCUMENTATION AND FIELD EVIDENCE. ALL LOCATIONS SHOULD BE CONSIDERED APPROXIMATE, AND A FIELD INVESTIGATION MUST BE PERFORMED IN THE VICINITY OF ANY CONSTRUCTION ACTIVITIES. NOTE THAT THESE PLANS MAY NOT SHOW ALL UTILITIES THAT ARE PRESENT AT THE SITE.

1 / C-1 **SITE PLAN**
SCALE: 1" = 10' (22X34)
SCALE: 1" = 20' (11X17)

GRAPHIC SCALE
10 0 5 10 20 40
1 INCH = 10 FEET (22X34)
1 INCH = 20 FEET (11X17)

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10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

| REV | DATE | DESCRIPTION | BY |
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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

| | |
|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: C-1

CROWN CASTLE FIBER LLC
ENLARGED SITE PLAN

(NAD 1983)
TRUE NORTH

DPS BATCH STAMP

## LEGEND

| | |
|---|---|
| IRON BAR/PIPE | GAS GAS GAS LINE |
| WATER VALVE | T T EXISTING TELCO |
| UTILITY POLE | OVERHEAD WIRE |
| FIRE HYDRANT | UG UNDERGROUND WIRE |
| TREES/LANDSCAPING | 30 PROPOSED CONTOURS |
| MANHOLES | 10 EXISTING CONTOURS |
| PROPERTY LINE | OE OVERHEAD ELECTRIC |
| ADJACENT PROPERTY LINE | OF OVERHEAD FIBER |
| PROPERTY SETBACK LINE | UF UNDERGROUND FIBER |
| RIGHT OF WAY | UE UNDERGROUND ELECTRIC |
| ZONING DISTRICT LINE | CHAIN LINK FENCE |
| ELECTRIC | TREELINE |

HUDSON AVE

EXISTING FACE OF CURB

EXISTING GRASSY AREA

EXISTING RIGHT-OF-WAY

OH

PROPOSED 5/16" EHS SPAN GUY CONNECTED TO ADJACENT POLE

EXISTING 43'-10" WOOD POLE
TO BE UTILIZED FOR THE PROPOSED STRAND MOUNT TELECOMMUNICATION EQUIPMENT
(POLE #799422-243180)
LATITUDE: 38.992506
LONGITUDE: -77.002292

PROPOSED CROWN CASTLE CABLE DISCONNECT SWITCH (ALPHA MODEL #EPO/D-2-PR) MOUNTED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE CONVERTER UNIT (ALPHA MODEL #LPR48-300-IP68) MOUNTED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE SPLICE BOX MOUNTED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE BRACKET MOUNT SECURED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE ERICSSON 4402 RADIO MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON 4435 RADIO MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON DIPLEX FILTER B2+B66/B30 (4-2) DIPLEXER MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON 6525 SEMI-INTEGRATED PANEL ANTENNA MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON 6523 SEMI-INTEGRATED PANEL ANTENNA MOUNTED TO PROPOSED BRACKET MOUNT

591 AVE

FLOWER AVE

EXISTING FACE OF CURB
EXISTING GRASSY AREA
EXISTING RIGHT-OF-WAY

THE CONSTRUCTION MANAGER SHALL COORDINATE POWER AND TELCO UTILITY ROUTING TO THE PROPOSED EQUIPMENT PRIOR TO CONSTRUCTION.

NOTE:

EXISTING UTILITY INFORMATION SHOWN REPRESENTS THE BEST DATA AVAILABLE FROM EXISTING DOCUMENTATION AND FIELD EVIDENCE. ALL LOCATIONS SHOULD BE CONSIDERED APPROXIMATE, AND A FIELD INVESTIGATION MUST BE PERFORMED IN THE VICINITY OF ANY CONSTRUCTION ACTIVITIES. NOTE THAT THESE PLANS MAY NOT SHOW ALL UTILITIES THAT ARE PRESENT AT THE SITE.

1 / C-2 EQUIPMENT SITE PLAN
SCALE: 1" = 2' (22X34)
SCALE: 1" = 4' (11X17)

GRAPHIC SCALE

2 0 1 2 4 8

1 INCH = 2 FEET (22X34)
1 INCH = 4 FEET (11X17)

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
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8240 FLOWER AVE
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STATE OF MARYLAND
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ENGINEER OF RECORD

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MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

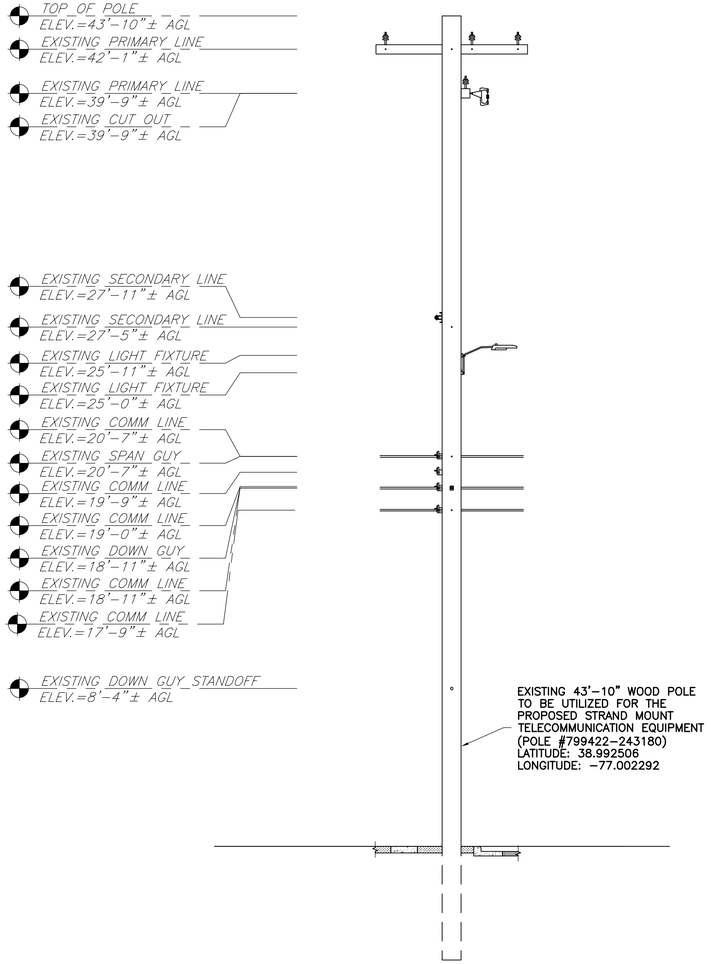
| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-2

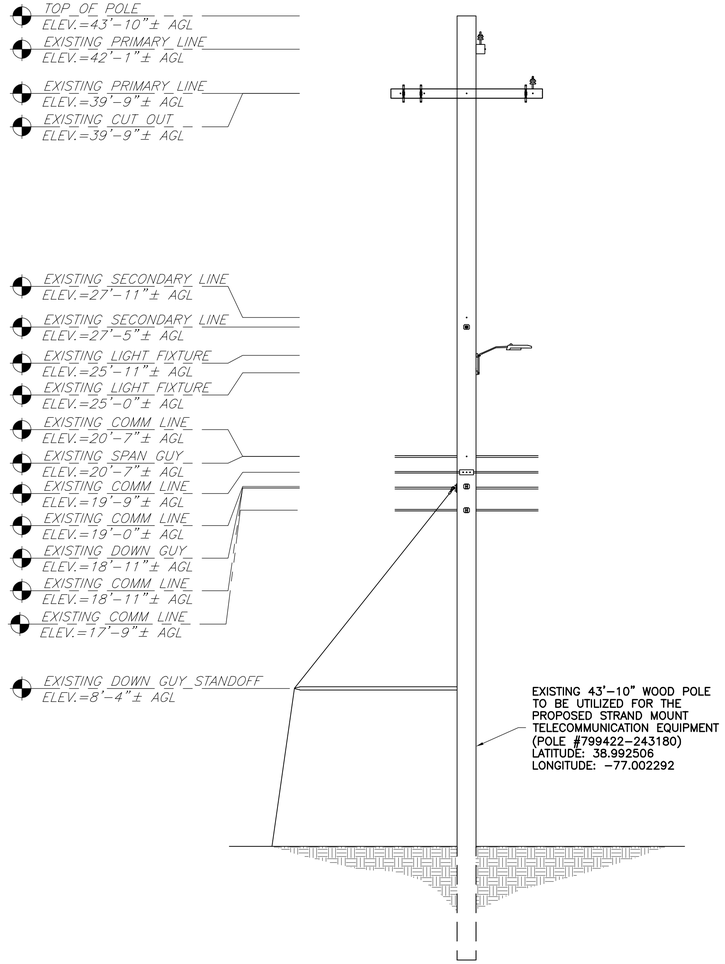
# CROWN CASTLE FIBER LLC
# EXISTING ELEVATIONS

DPS BATCH STAMP






1 C-3 EXISTING CONDITIONS
NOT TO SCALE




2 C-3 POLE ELEVATION (LOOKING NORTH)
SCALE: 3" = 1' (22X34)
SCALE: 1-1/2" = 1' (11X17)

GRAPHIC SCALE

1 0 0.5 1

3 INCHES = 1 FOOT (22X34)
1-1/2 INCHES = 1 FOOT (11X17)

**MOUNTING NOTE:**

IF FIELD CONDITIONS DO NOT ALLOW FOR INSTALLATION AS DIRECTED, CONTRACTOR IS TO CONTACT ENGINEER FOR FURTHER INSTRUCTION.

3 C-3 POLE ELEVATION (LOOKING WEST)
SCALE: 1/4" = 1' (22X34)
SCALE: 1/8" = 1' (11X17)

GRAPHIC SCALE

8 4 0 1 2 4 8

1/4 INCH = 1 FOOT (22X34)
1/8 INCH = 1 FOOT (11X17)

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
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LICENSE #55491

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| A | 08-24-22 | PRELIMINARY CDs | JED |

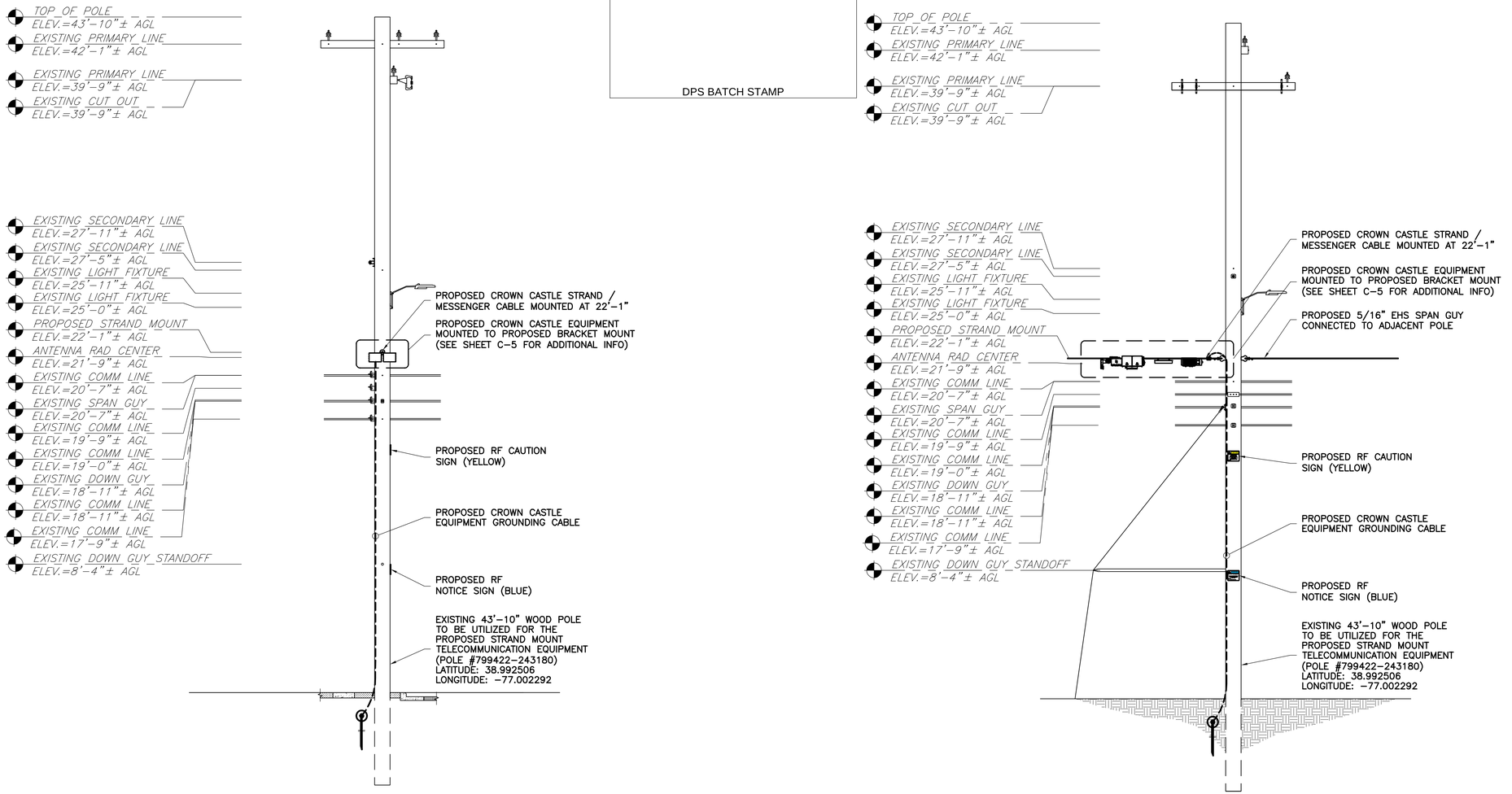
| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-3

CROWN CASTLE FIBER LLC
PROPOSED ELEVATIONS

DPS BATCH STAMP




**MOUNTING NOTE:**

- MAINTAIN 12" CLEARANCE FROM STRAND MOUNT TO STREETLIGHT DRIP LOOP (IF APPLICAPLE).
- MAINTAIN 48" CLEARANCE FROM STRAND MOUNT TO LOWEST SECONDARY LINE (IF APPLICABLE).

ANTENNA AZIMUTH SHALL BE SET TO 165°

**MOUNTING NOTE:**

IF FIELD CONDITIONS DO NOT ALLOW FOR INSTALLATION AS DIRECTED, CONTRACTOR IS TO CONTACT ENGINEER FOR FURTHER INSTRUCTION.

1 / C-4 POLE ELEVATION (LOOKING NORTH)
SCALE: 1/4" = 1' (22X34)
SCALE: 1/8" = 1' (11X17)

GRAPHIC SCALE
8 4 0 1 2 4 8
1/4 INCH = 1 FOOT (22X34)
1/8 INCH = 1 FOOT (11X17)

2 / C-4 POLE ELEVATION (LOOKING WEST)
SCALE: 1/4" = 1' (22X34)
SCALE: 1/8" = 1' (11X17)

GRAPHIC SCALE
8 4 0 1 2 4 8
1/4 INCH = 1 FOOT (22X34)
1/8 INCH = 1 FOOT (11X17)

RF SIGNAGE GUIDELINES

RF SIGNAGE SHOULD FOLLOW THE GUIDELINES BELOW. THESE GUIDELINES INCLUDE COLORS TO ALERT PEOPLE OF THE DANGER AND INFORMATION ABOUT SAFE DISTANCES. SIGNS SHOULD BE PLACED IN READABLE PLACES, IN AREAS WHERE A PERSON CAN READ THEM IN A SAFE LOCATION.

| GEN. POP. OK | OCCUP. POP. OK | COLOR | SIGN |
|---|---|---|---|
| YES | OK | GREEN | INFORMATION |
| NO | YES | BLUE | NOTICE |
| NO | YES | YELLOW | CAUTION |
| NO | NO | RED | WARNING |

1. INCLUDE GENERAL POPULATION STAND OFF DISTANCE.
2. INCLUDE BOTH GENERAL POPULATION AND OCCUPATIONAL POPULATION STAND OFF DISTANCE.
3. INCLUDE HEMISPHERIC STAND OFF DISTANCES. ALL WARNING SIGNS MUST BE REVIEWED WITH CROWN CASTLE NATIONAL RF FOR APPROVAL.

**INFORMATION**
RF EXPOSURE AT THIS SITE DOES NOT EXCEED THE FCC PUBLIC EXPOSURE STANDARD AND NO SPECIAL PRECAUTIONS ARE REQUIRED FOR WORK NEAR ANTENNAS.
FOR MORE INFORMATION CALL THE NUMBER BELOW.
Site ID #
888-632-0931

THE "INFORMATION" SIGN MUST BE POSTED ON OR NEAR THE ANTENNA WHENEVER THE GENERAL PUBLIC LIMIT IS NOT EXCEEDED. THIS SIGN SHOULD BE USED ALONE ON ALL SITES THAT HAVE NO AREAS WHERE THE GP LIMIT IS EXCEEDED.

**NOTICE**
POLE WORKERS
There is an antenna operation high on this pole. For more guidance on signs near the antenna or call the number below.
Site ID #
888-632-0931

THE NOTICE SIGN MUST BE POSTED NEAR THE BOTTOM OF THE POLE OR ON THE SHROUD ANY TIME THERE IS A ZONE NEAR THE ANTENNA THAT EXCEEDS THE GENERAL POPULATION (GP) LIMIT. IF THERE ARE NO ZONES THAT EXCEED THE GP LIMIT THAN THE "NOTICE" SIGN SHALL NOT BE USED.

**CAUTION**
Keep Back 4.5FT From This Antenna. FCC RF Public Exposure Limits May Be Exceeded Within This Distance. Call 8888888888 For More Options. Qualified Workers FCC Occupational Limits May Be Exceeded Within This Distance
Site ID #

THE "CAUTION" SIGN MUST BE POSTED ON THE ANTENNA ANY TIME THERE IS AN AREA THAT EXCEEDS THE GENERAL PUBLIC EXPOSURE LIMIT. THE KEEP-BACK DISTANCE FOR THE GP MUST BE FILLED IN ON THE SIGN. THE EME REPORT MUST CLEARLY STATE THAT THE GENERAL PUBLIC LIMIT KEEP BACK DISTANCE WHEN IT IDENTIFIES THIS SIGN FOR POSTING.

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C™
TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
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STATE OF MARYLAND
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55491
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ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

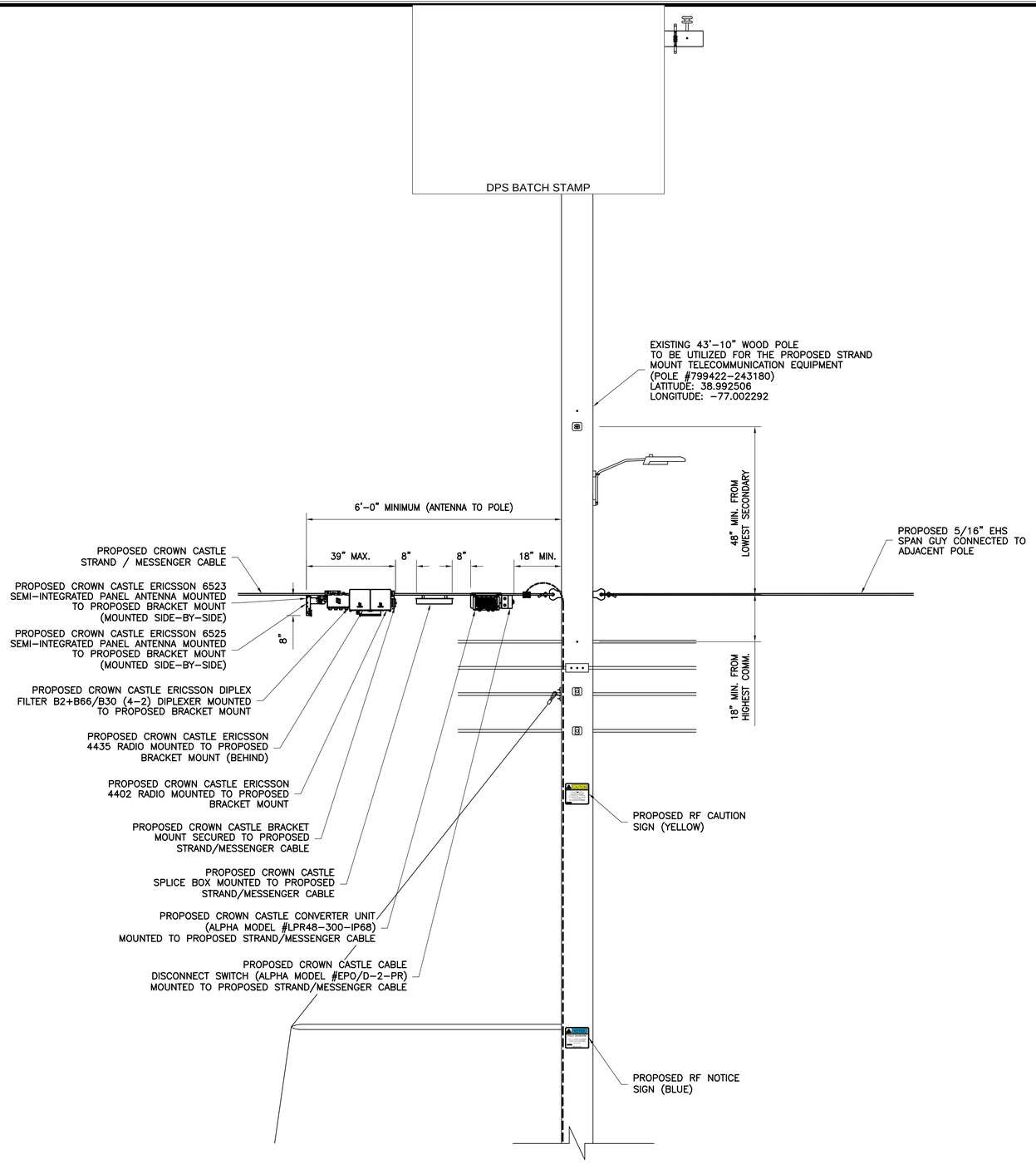
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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-4

CROWN CASTLE FIBER LLC
ENLARGED ELEVATION




1 / C-5 CARRIER ELEVATION
NTS

MOUNTING NOTE:

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NODE:
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| JED | SDR | PCQ |

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| SCALE: | AS SHOWN |

SHEET:
C-5

CROWN CASTLE FIBER LLC
PLUMBING DIAGRAM

DPS BATCH STAMP

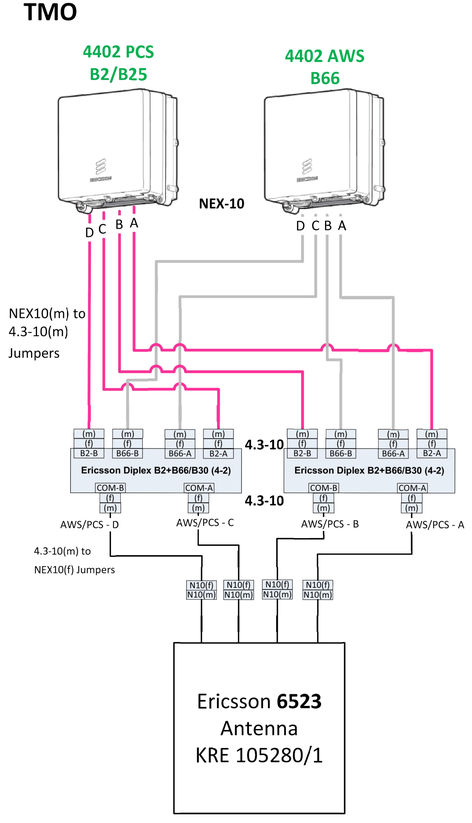
CROWN CASTLE

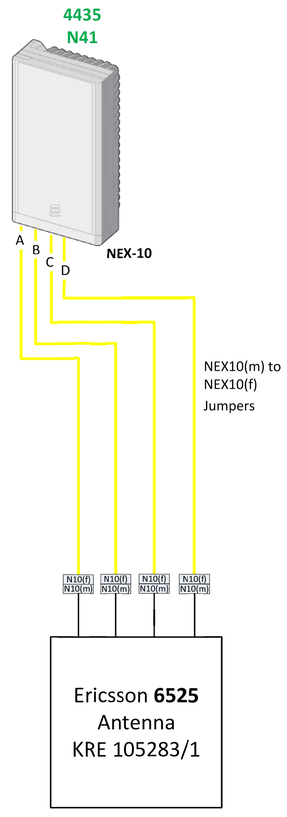
# Maryland/DC/Virginia

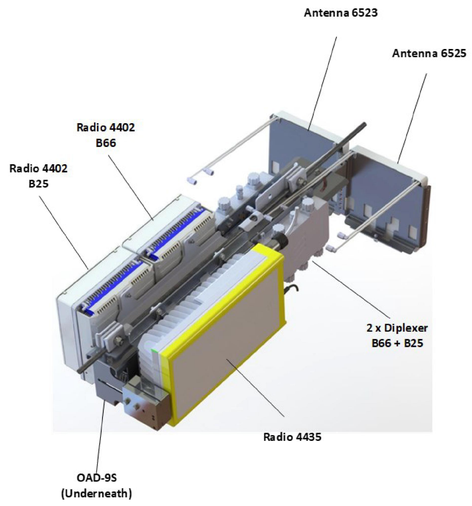
04/19/2022

**For TMO only Strand Nodes**

## TMO




**Proprietary and Confidential**

1 / D-1 PLUMBING DIAGRAM
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
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NB+C ENGINEERING SERVICES, LLC.
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CROWN CASTLE FIBER LLC
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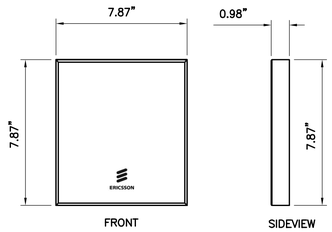
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| JED | SDR | PCQ |

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|---|---|
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| SCALE: | AS SHOWN |

SHEET: D-1

CROWN CASTLE FIBER LLC
EQUIPMENT & ANTENNA DETAILS

DPS BATCH STAMP

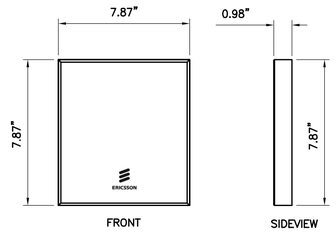



| NUMBER OF REQUIRED ANTENNAS |
|---|
| 1 |

| ERICSSON 6523 ANTENNA | |
|---|---|
| WEIGHT | 1.76 LBS. |
| DIMENSIONS (HxWxD) | 7.87"x7.87"x0.98" |
| VOLUME | .035 Cu.Ft. |

ANTENNA AZIMUTH SHALL BE SET TO 165°

1 D-2 ANTENNA DETAIL
NTS

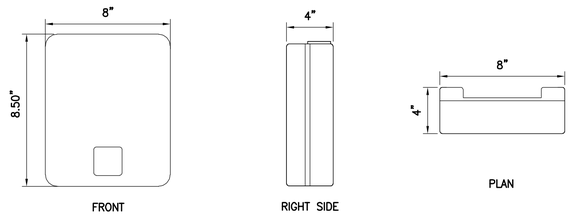



| NUMBER OF REQUIRED ANTENNAS |
|---|
| 1 |

| ERICSSON 6525 ANTENNA | |
|---|---|
| WEIGHT | 1.76 LBS. |
| DIMENSIONS (HxWxD) | 7.87"x7.87"x0.98" |
| VOLUME | .035 Cu.Ft. |

ANTENNA AZIMUTH SHALL BE SET TO 165°

2 D-2 ANTENNA DETAIL
NTS




SIZE AND WEIGHT TABLE, INCLUDING MOUNTING BRACKET AND ESTHETIC FRONT COVER

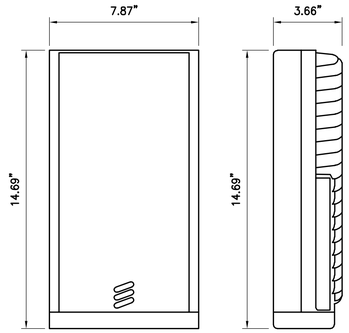
| RRU | LENGTH | WIDTH | DEPTH | WEIGHT W/O BRACKET |
|---|---|---|---|---|
| RADIO 4402 | 8.5" | 8" | 4" | ~11.2 LBS. |

| NUMBER OF REQUIRED RADIOS | VOLUME |
|---|---|
| 2 | .157 Cu.Ft. |

NOTES:

1. DO NOT PAINT THE RRU. RRU SOLAR SHIELD CAN BE PAINTED PER MANUFACTURER'S METHOD OF PROCEDURE.

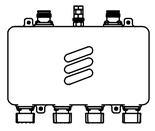
3 D-2 REMOTE EQUIPMENT HEAD DETAIL
NTS




| ERICSSON 4435 RRH | |
|---|---|
| WEIGHT | 2.2 LBS. |
| DIMENSIONS (HxWxD) | 14.69"x7.87"x3.66" |
| VOLUME | .245 Cu.Ft. |

| NUMBER OF REQUIRED RADIOS |
|---|
| 1 |

4 D-2 REMOTE EQUIPMENT HEAD DETAIL
NTS



| DIPLEXER | LENGTH | WIDTH | DEPTH | WEIGHT |
|---|---|---|---|---|
| DIPLEX B2+B66/B30 (4-2) | 8.27" | 4.57" | 1.71" | 5.07 LBS. |

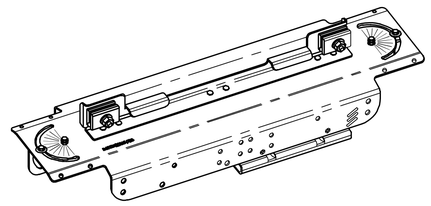
| NUMBER OF REQUIRED DIPLEXERS | VOLUME |
|---|---|
| 2 | .037 Cu.Ft. |

5 D-2 DIPLEXER DETAIL
NTS

BILL OF MATERIALS

| ITEM | PART NUMBER | DESCRIPTION |
|---|---|---|
| 1 | NTB 101 0450 | Material Kit |
| | SXK 125 3187/5 | KIT/SMALL CELL STRAND MOUNT, 3x 2203 |
| | TSR 899 277/31 | 4.3-10(M) PP-4.3-10(F), 24INCH |
| | TSR 899 277/32 | R/A4.3-109(M)PP TO 4.3-10(M)PP, 30INCH |
| | KRF 102 409/3 | DIPLEX B2+B66/B30, 4.3-10 |
| | 130C-1X15FT | LINERLESS RUBBER TAPE 3/4"x15' |
| | 1400-3/4x60FT | VINYL TAPE 3/4x60FT |
| 2 | | Panel Antenna |
| 3 | | Equipment Kit |

MECHANICAL PARTS (SXK 125 3187/6)



EQUIPMENT BRACKET ASSEMBLY (TOP VIEW)

6 D-2 DUAL ANTENNA STRAND BRACKET MOUNT DETAIL
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO: 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

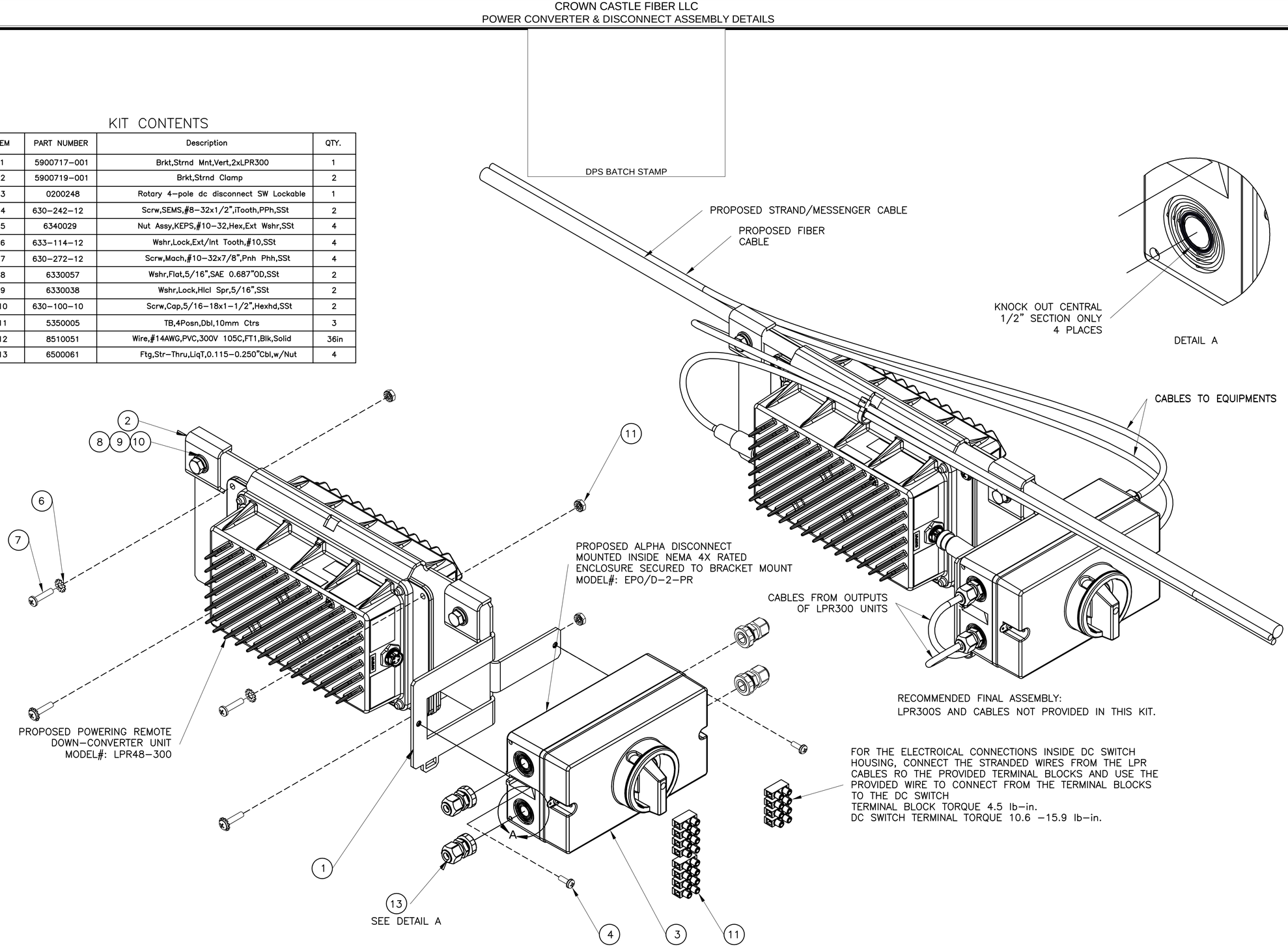
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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
D-2

CROWN CASTLE FIBER LLC
POWER CONVERTER & DISCONNECT ASSEMBLY DETAILS

## KIT CONTENTS

| ITEM | PART NUMBER | Description | QTY. |
|---|---|---|---|
| 1 | 5900717–001 | Brkt,Strnd Mnt,Vert,2xLPR300 | 1 |
| 2 | 5900719–001 | Brkt,Strnd Clamp | 2 |
| 3 | 0200248 | Rotary 4–pole dc disconnect SW Lockable | 1 |
| 4 | 630–242–12 | Scrw,SEMS,#8–32x1/2",iTooth,PPh,SSt | 2 |
| 5 | 6340029 | Nut Assy,KEPS,#10–32,Hex,Ext Wshr,SSt | 4 |
| 6 | 633–114–12 | Wshr,Lock,Ext/Int Tooth,#10,SSt | 4 |
| 7 | 630–272–12 | Scrw,Mach,#10–32x7/8",Pnh Phh,SSt | 4 |
| 8 | 6330057 | Wshr,Flat,5/16",SAE 0.687"OD,SSt | 2 |
| 9 | 6330038 | Wshr,Lock,Hlcl Spr,5/16",SSt | 2 |
| 10 | 630–100–10 | Scrw,Cap,5/16–18x1–1/2",Hexhd,SSt | 2 |
| 11 | 5350005 | TB,4Posn,Dbl,10mm Ctrs | 3 |
| 12 | 8510051 | Wire,#14AWG,PVC,300V 105C,FT1,Blk,Solid | 36in |
| 13 | 6500061 | Ftg,Str–Thru,LiqT,0.115–0.250"Cbl,w/Nut | 4 |




1 / D-3 POWER CONVERTER & DISCONNECT ASSEMBLY DETAILS
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C™
TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
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ENGINEER OF RECORD

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MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

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| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

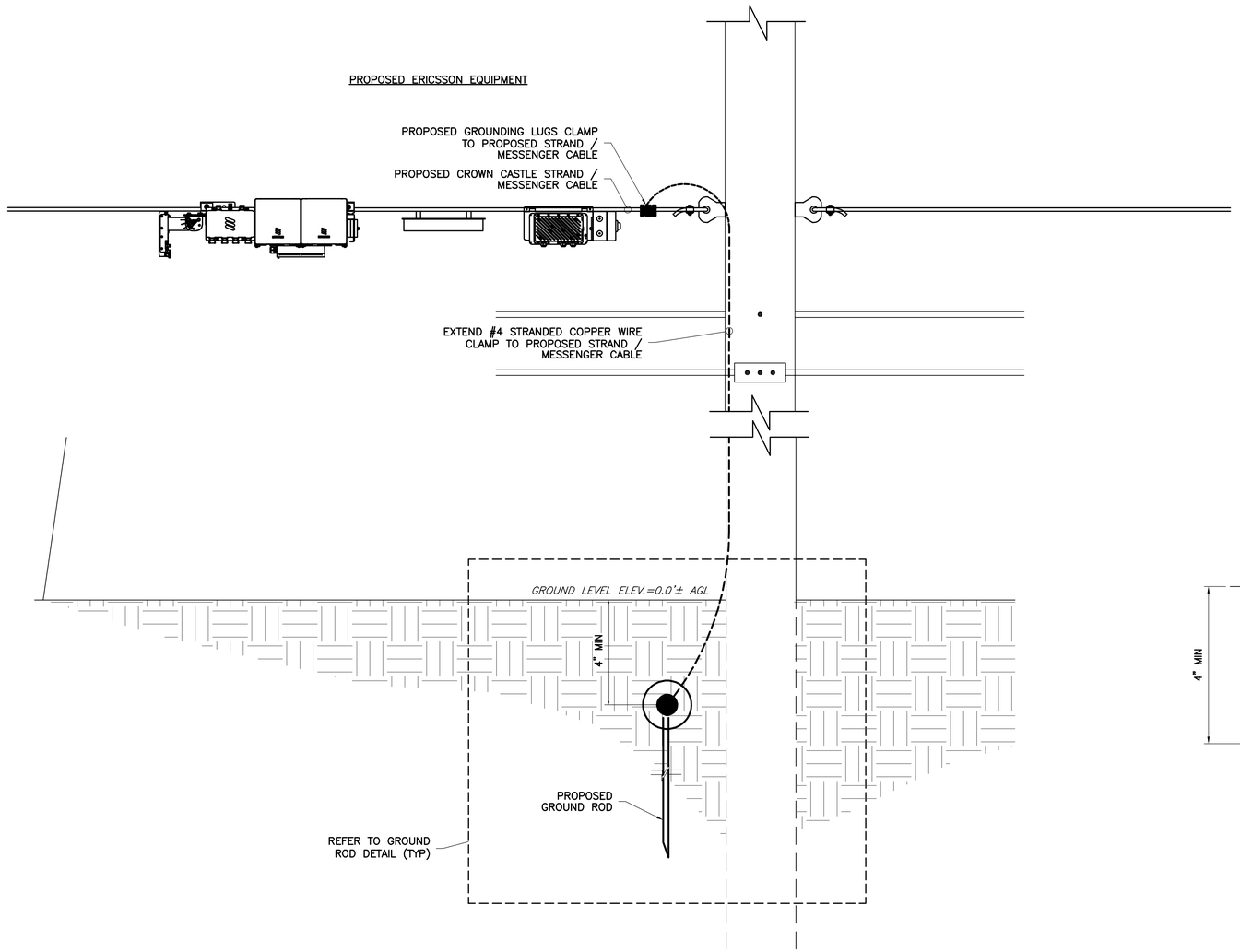
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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: D-3

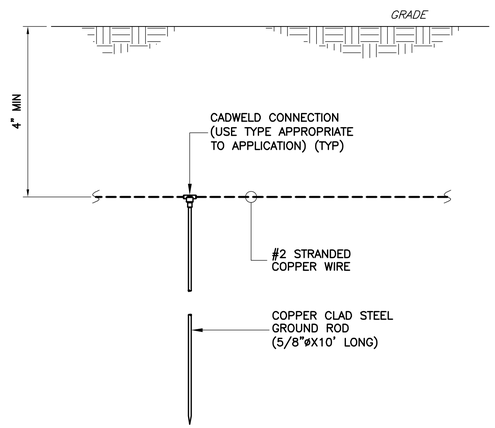
CROWN CASTLE FIBER LLC
GROUNDING DETAILS

**GROUNDING AND BONDING NOTE:**
GENERAL CONTRACTOR SHALL FOLLOW ALL CONSTRUCTION GUIDELINES PER CROWN CASTLE'S GROUNDING AND BONDING REQUIREMENTS FOR STRAND MOUNT NODES (oDAS) – DOCUMENT 337910.

DPS BATCH STAMP




1 G-1 GROUNDING RISER DIAGRAM
NOT TO SCALE




2 G-1 TYPICAL GROUND ROD DETAIL
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
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PROFESSIONAL ENGINEER

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ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

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| A | 08-24-22 | PRELIMINARY CDs | JED |

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|---|---|---|
| JED | SDR | PCQ |

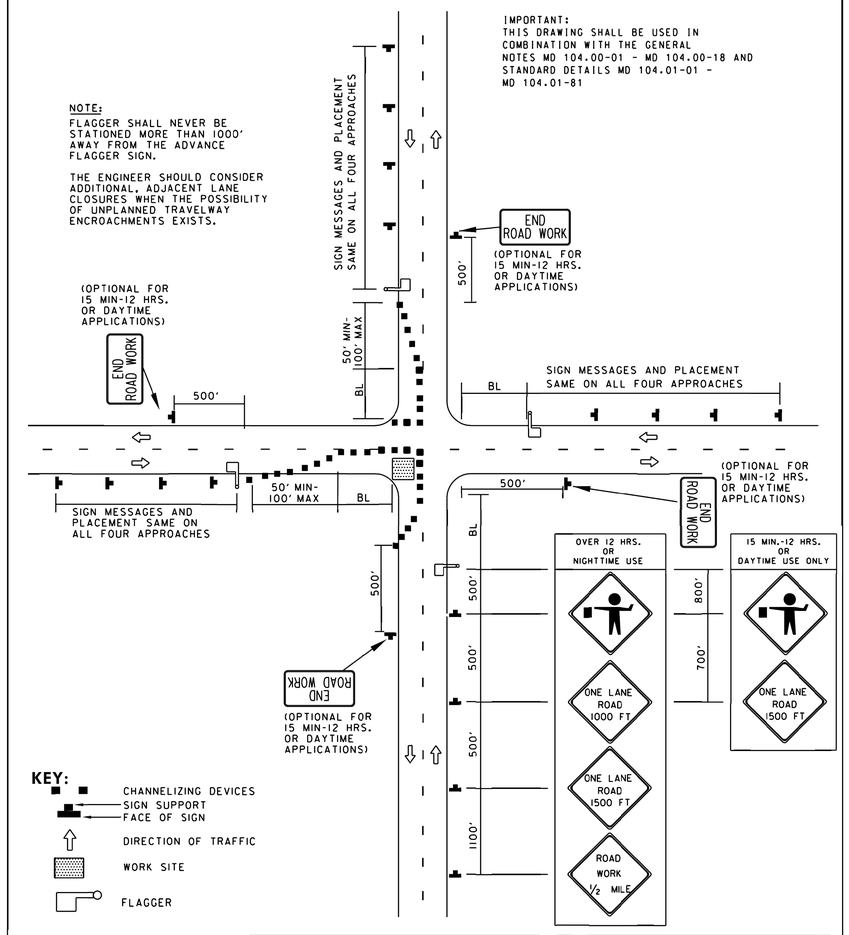
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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
G-1

CROWN CASTLE FIBER LLC
TRAFFIC CONTROL PLAN

DPS BATCH STAMP

## TEMPORARY TRAFFIC CONTROL TYPICAL APPLICATION




| SPECIFICATION | CATEGORY CODE ITEMS |
|---|---|
| 104 | |

APPROVED

DIRECTOR — OFFICE OF TRAFFIC AND SAFETY

| APPROVAL • SHA REVISIONS | | APPROVAL • FEDERAL HIGHWAY ADMINISTRATION | |
|---|---|---|---|
| APPROVAL | 8-20-03 | APPROVAL | 9-23-03 |
| REVISED | 8-11-10 | REVISED | 7-29-10 |
| REVISED | | REVISED | |
| REVISED | | REVISED | |

**Maryland Department of Transportation**
**STATE HIGHWAY ADMINISTRATION**
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

**INTERSECTION FLAGGING OPERATION**
**2-LANE,2-WAY EQL/LESS THAN 40 MPH**

**STANDARD NO. MD 104.02-14**

## SITE CONDITIONS

SPEED LIMIT 25

HUDSON AVE

## GENERAL NOTES

1. ALL PROPOSED LANE CLOSURES SHALL OCCUR BETWEEN THE HOURS OF 9 AM AND 3 PM, UNLESS OTHERWISE COORDINATED WITH THE PERMITTING AGENCY.
2. ROADWAY MUST BE FULLY RESTORED AT END OF EACH WORKDAY.
3. A MINIMUM OF 10' LANES MUST BE MAINTAINED THROUGH THE WORK ZONE.
4. ACCESS TO ALL DRIVEWAYS MUST BE MAINTAINED.
5. IF STEEL PLATES ARE USED TO TEMPORARILY RESTORE THE ROADWAY, THEN STEEL PLATE WARNING SIGNS SHALL BE INSTALLED ON ALL APPROACHES.
6. DURING THE PERIOD BETWEEN NOVEMBER 15 OF EACH YEAR AND MARCH 15 OF THE FOLLOWING YEAR, STEEL PLATES ARE NOT PERMITTED EXCEPT IN EMERGENCY CASES. WHEN ANY STEEL PLATE IS INSTALLED, THE PERMITTEE SHALL NOTIFY DPWT'S DISPATCHER BY PHONE, AT (301) 324-2710 AND THE DPIE INSPECTOR, WITHIN THE FIRST 4 HOURS OF INSTALLATION OF SAID PLATES. WHEN INSTALLED, STEEL PLATES SHALL BE APPROPRIATELY IDENTIFIED BY PERMITTEE FOR TRAFFIC AND PEDESTRIAN SAFETY. IN ADDITION, A MINIMUM OF FOUR 4-FOOT TALL WOODEN SURVEY STAKES (PAINTED BRIGHT PINK) PLACED BEHIND THE FACE OF CURB, OR IN RURAL TRAFFIC CONTROL DESIGN REVIEW CHECKLIST PAGE 5 OF 6 LAST EDITED JANUARY 17, 2017 AREAS, PLACED BEYOND ROAD SHOULDER, SHALL BE REQUIRED TO DENOTE BEGINNING AND END OF STEEL PLATES.
7. PEDESTRIAN FACILITIES MUST BE MAINTAINED OR A CLEAR, DETECTABLE, TRAVERSABLE, SAFE AND HANDICAP ACCESSIBLE ALTERNATIVE PATH MUST BE PROVIDED.
8. FLAGGERS SHALL BE MARYLAND STATE HIGHWAY ADMINISTRATION OR ATSSA APPROVED/CERTIFIED FLAGGERS. RADIO COMMUNICATION SHALL BE REQUIRED BETWEEN FLAGGERS IF THE FLAGGERS CANNOT SEE EACH OTHER OR IF THE LANE CLOSURE EXCEEDS 200 FEET.

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
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STATE OF MARYLAND — TRENT TRAVIS SNARR — 55491 — PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

| | |
|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: TCP-1

App No: 2023042144

## Application General Information

| | | | |
|---|---|---|---|
| Applicant Name | Crown Castle Fiber LLC | Received | 4/10/2023 |
| Application Type | New | Ann. Plan? | Yes |
| Carrier | T-Mobile | Will site be used to support government telecommunications facilities or other equipment for government use? | No |
| Solution Type | Small Cell | | |
| Existing | Existing | Gvt. Use Desc. | |

Application Description

-Strand Cable
-Ericsson 6523 semi-integrated panel antenna (1)
-Ericsson 6525 semi-integrated panel antenna (1)
-Ericsson Diplex Filter B2+B66/B30 (4-2) Diplexer (2)
-Ericsson 4402 Radio (2)
-Ericsson 4435 Radio (1)

## Site Information

| | | | |
|---|---|---|---|
| Site Id | | Zoning | R-10 |
| Structure Type | Utility Pole | Latitude | 38.992506 |
| Street Address | Corner Hudson Ave & Flower Ave | Longitude | -77.002292 |
| County Site Name | PEPCO 799422-243180 | Ground Elevation | 264 |
| Carrier Site Name | MNG-094m1 | City | Takoma Park |
| Site Owner | Takoma Park | Lease Status | Leased |
| Structure Owner | Pepco | Does the structure require an antenna structure registration under FCC Title 47 part 17? | No |
| Existing Structure Height | 43 | | |
| Provide the proposed height of the replacement structure without any antenna (New Apps Only) | | Distance to Residential Property (New, Colocation Only) | |
| | | Distance to Commercial Property (New, Colocation Only) | |

Justification of why this site was selected:

Nearby Sites (New Apps Only):

Monday, April 10, 2023
5:04:38 PM

App No: 2023042144

Screening considerations (New, Colocation Apps Only):

Monday, April 10, 2023

5:04:38 PM

App No: 2023042144

6409 Questions

Does this qualify as a 6409 application? (Minor Mod, Colocations Only)

For towers outside the public ROW will the proposed installation increase the height of the structure by: (1) more than 10% or (2) more than 20 feet, whichever is greater?

Will the proposed installation increase the width by adding appurtenance to the body of the structure that would protrude from the edge of the structure by more than 6 feet?

For towers outside the public ROW will the proposed installation increase the width by adding appurtenance to the body of the structure that would protrude from the edge of the structure by more than 20 feet?

Will the proposed installation require more the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets?YN

Will the proposed installation increase the height of the structure by: (1) more than 10% or (2) more than 10 feet, whichever is greater?

Does the structure or current installation have concealment elements/measures? Yes

Will the proposed installation require excavation or expansion outside the current boundaries of the site?

If yes, describe how the proposed installation does not defeat the existing concealment. Strand Mounted

Small Wireless Facility Information

Is this a Small Wireless Facility? Yes

Is the structure 10% taller than adjacent structures? No

Please list adjacent structure heights

Cumulative volume of the proposed wireless equipment(s) exclusive of antennas in cubic feet: 0.633

Cumulative volume of the proposed antenna(s) exclusive of equipment in cubic feet: 0.07

ROW Information

PROW? Yes

ROW owner Takoma Park

ROW width

Pole Number 799422-243180

Monday, April 10, 2023

5:04:38 PM

App No: 2023042144

Antenna Information

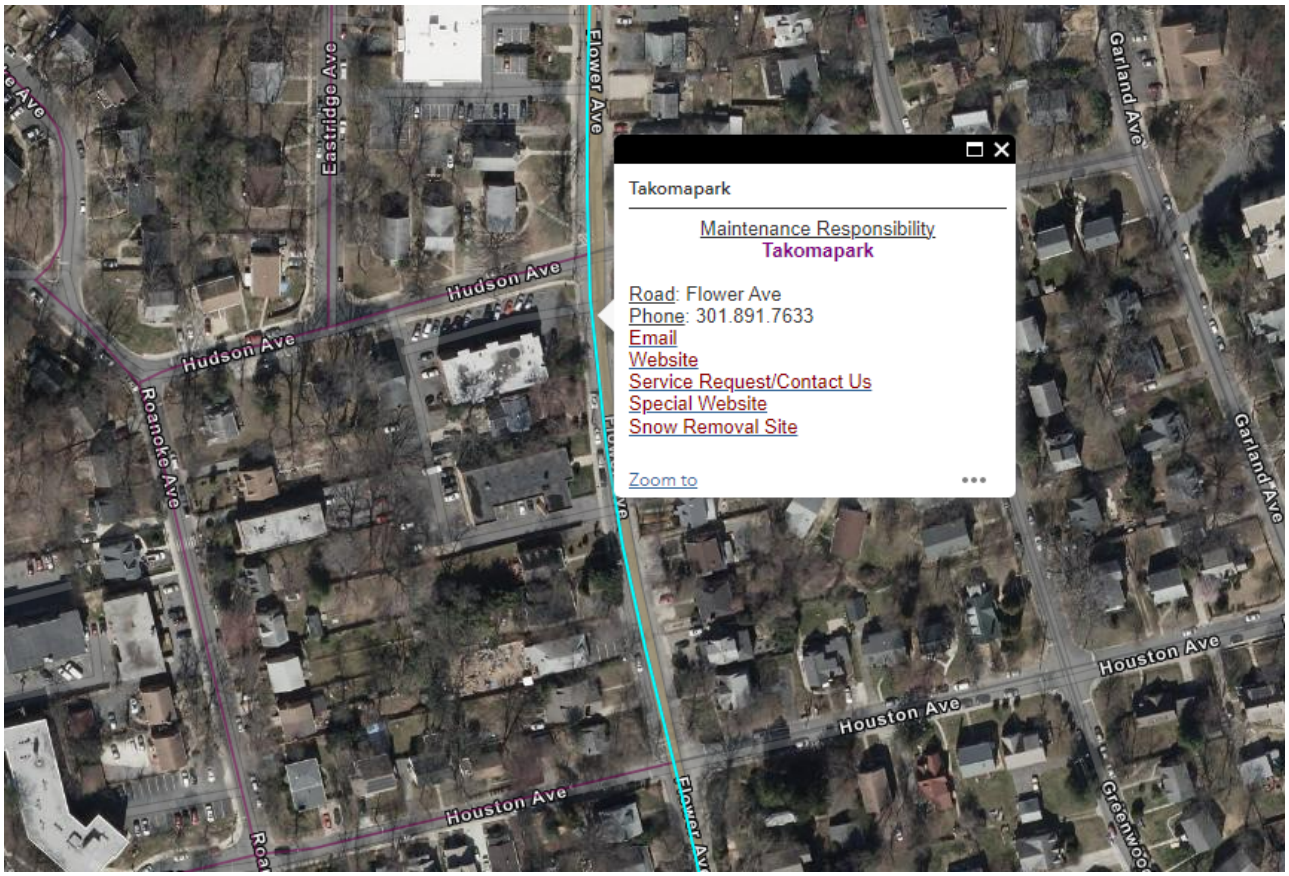
| | |
|---|---|
| Antenna Compliance | Yes |
| Compliance Desc | |
| Antenna Location | No |
| Antenna Loc. Desc. | |
| Env. Assessment | |
| Cat. Excluded? | checked |
| Routine Env. Evaluation | |

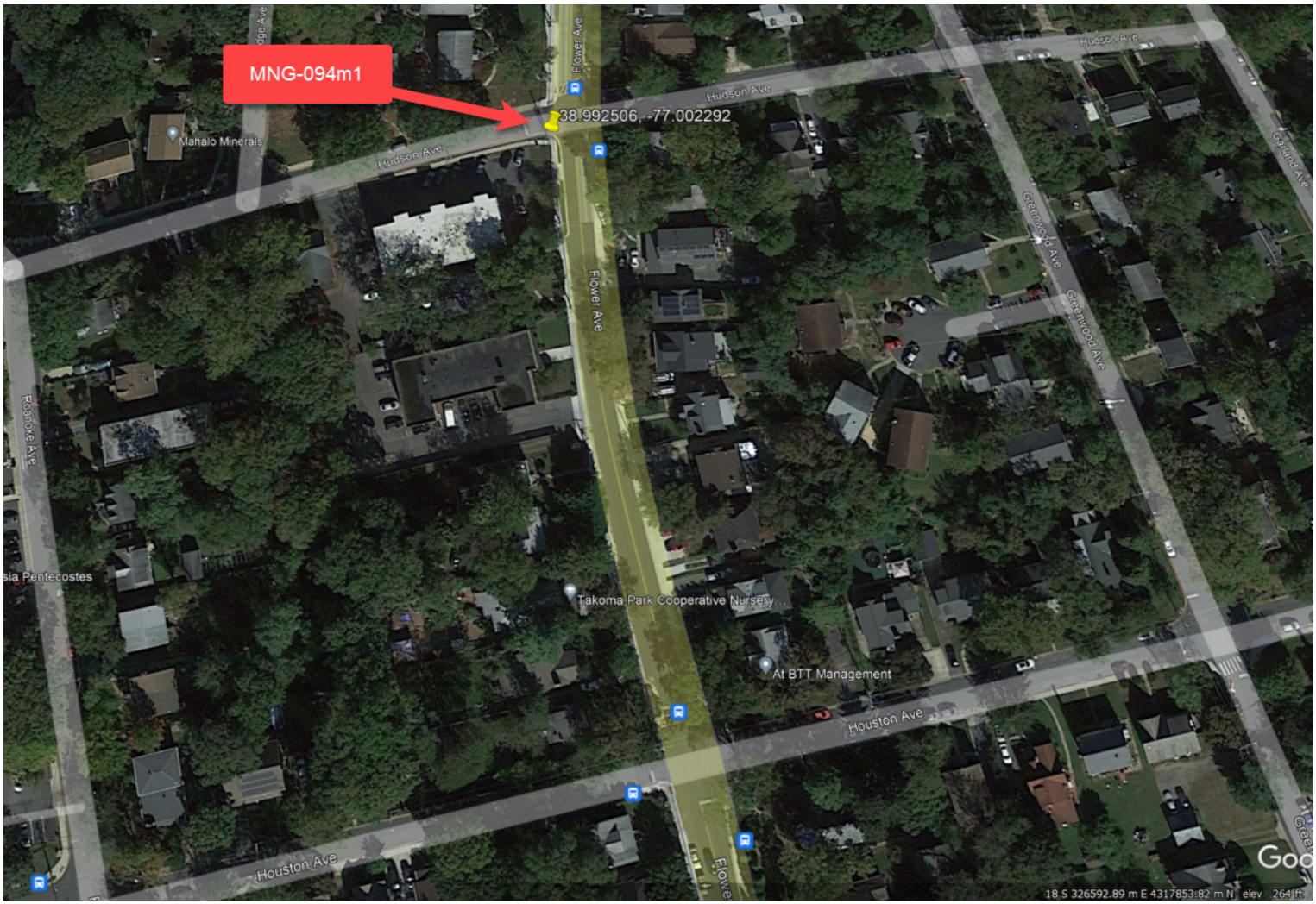
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna Model | Ericsson 6525 | | | | | | |
| Frequency | 2535-2552.5MHz, 2584-2590MHz | | | | | | |
| RAD Center | 21 | Max ERP | 387 | Antenna Dimension | 7.87"x7.87"x0.98" | Quantity | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antenna Model | Ericsson 6523 | | | | | | |
| Frequency | 1735-1755,1850 – 1865,1885 – 1895,1910 – 1915, 1930 – 1945, 1965 – 1975,1990-1995,2135-2155 | | | | | | |
| RAD Center | 21 | Max ERP | 86 | Antenna Dimension | 7.87"x7.87"x0.98" | Quantity | 1 |

Monday, April 10, 2023

5:04:38 PM


Takomapark
Maintenance Responsibility
Takomapark
Road: Flower Ave
Phone: 301.891.7633
Email
Website
Service Request/Contact Us
Special Website
Snow Removal Site
Zoom to
Hudson Ave
Hudson Ave
Eastridge Ave
Flower Ave
Garland Ave
Roanoke Ave
Houston Ave
Houston Ave
Houston Ave
Garland Ave


MNG-094m1
38.992506, -77.002292
Mahalo Minerals
Hudson Ave
Flower Ave
Greenwood Ave
Takoma Park Cooperative Nursery...
At BTT Management
Houston Ave
Roanoke Ave
18 S 326592.89 m E 4317853.82 m N elev 264 ft




# ANTENNA 6523

**Integrated Directional Antenna 6523**
The modular Micro Radio 4402 supports installations with an integrated directional antenna or external antenna systems.

Antenna 6523 is the integrated directional antenna for Radio 4402 for the 3GPP Band B1, B2/B25, B3 and B66A for Licensed Assisted Access usage and is mounted on the front of Radio 4402 and when used replaces the cover.

The antenna pattern, with a broad horizontal beam, is beneficial for small cell coverage. The fixed electrical tilt is -8 degrees. An optional mechanical down tilt bracket is also available.

Antenna 6523 is designed for optimal performance in all Radio 4402 configurations and integrated for very low visual impact in urban installations.

**Micro Radio 4402**
The Micro Radio 4402 is part of the Ericsson Radio System portfolio. Radio 4402 has best in class design, superior radio performance and power efficiency when it comes to medium range 3GPP radio products.

Radio 4402 has, by use of its small and smart dimensions, support for a wide range of mounting scenarios and has a pioneering flexibility within its product segment. With the Radio 4402, Ericsson evolves the micro radio portfolio to become even more flexible thus making it easier than ever to make small and efficient single and multi-band micro radio installations.

# Technical Specification Antenna 6523

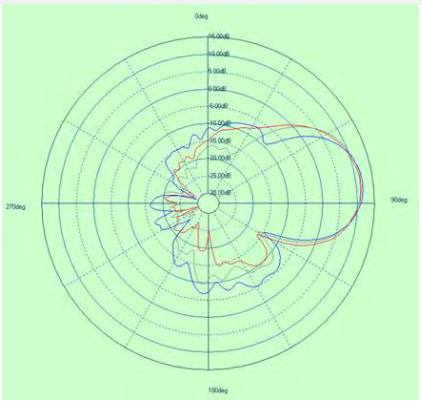
**PRODUCT NUMBER** KRE 105 280/1

| | |
|---|---|
| 3GPP Band: | B1 B2/B25 B3 B66A |
| Frequency range: | 1700 - 2200 MHz |
| Average gain: | 8.5 dBi |
| **Horizontal pattern** | |
| Beam width, 3 dB (0dBi) : | 82° (120°) |
| Beam tracking error ±60°: | ≤ 5 dB |
| Beam pointing error 0°: | ≤7° |
| **Vertical pattern** | |
| Beam width, 3 dB: | 43° |

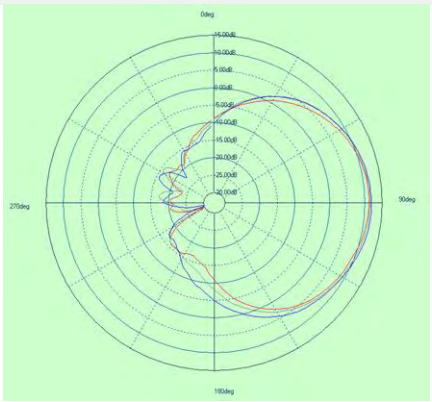
| | |
|---|---|
| Fixed electrical tilt: | -8° |
| Front-to-back 180 ± 30°: | > 15 dB |
| VSWR (Return loss): | < 1.57 (> 13dB) |
| Isolation | > 20 dB |
| Cross Polarization Ratio | > 10 dB(at boresight), > 5 dB(at sector) |
| Antenna pattern files: | Contact local Ericsson sales representative |

**Mechanical specification**

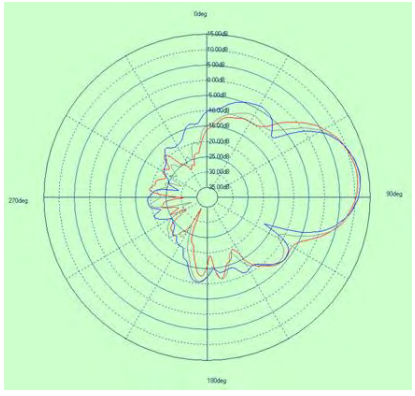
| | |
|---|---|
| Main Dimensions, WxDxH: | 200mm x 25mm x 200 mm |
| Weight: | < 800 g |
| Volume: | 1,0 l |
| Environmental: | IP55, Type 3R |



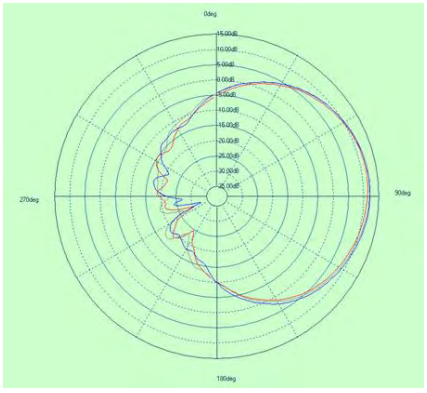
+45_V-Plane



+45_H-Plane



-45_V-Plane



-45_H-Plane

Telefonaktiebolaget LM Ericsson
SE-126 25 Stockholm, Sweden
www.ericsson.com

1/287 01-FGC 101 2900 Rev A
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# Antenna 6525

Integrated Directional Antenna 6525

The modular Micro Radio 4402 and Radio 4408 support installations with an integrated directional antenna or external antenna systems.

Antenna 6525 is the integrated directional antenna for Radio 4402 and Radio 4408 for the 3GPP Bands B7 B38A B40 B41 (2300 – 2690 MHz) and is mounted on the front of Radio 4402 and Radio 4408 and when used replaces the cover.

The antenna pattern, with a broad horizontal beam, is beneficial for small cell coverage. The fixed electrical tilt is -8 degrees. An optional mechanical down tilt bracket is also available.

Antenna 6525 is designed for optimal performance in all Radio 4402 and Radio 4408 configurations and integrated for very low visual impact in urban installations.

Micro Radio 4402/Micro Radio 4408

The Micro Radio 4402/4408 is part of the Ericsson Radio System portfolio. Radio 4402/4408 has best in class design, superior radio performance and power efficiency when it comes to medium range 3GPP radio products.

Radio 4402/4408 has, by use of its small and smart dimensions, support for a wide range of mounting scenarios and has a pioneering flexibility within its product segment. With the Radio 4402/4408, Ericsson evolves the micro radio portfolio to become even more flexible thus making it easier than ever to make small and efficient single and multi-band micro radio installations.

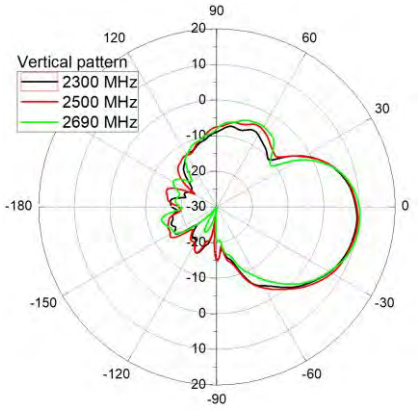
# Technical Specification Antenna 6525

| | |
|---|---|
| **PRODUCT NUMBER** | KRE 105283/1 |

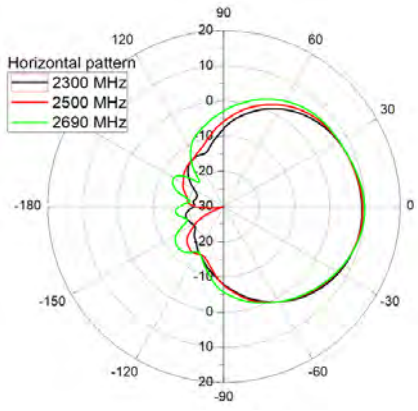
| | |
|---|---|
| 3GPP Band: | B7 B38A B40 B41 |
| Frequency range: | 2300 – 2690 MHz |
| Average gain: | 9 dBi |
| **Horizontal pattern** | |
| Beam width, 3 dB (0dBi) : | 82° (120°) |
| Beam tracking error ±60°: | ≤ 3 dB |
| Beam pointing error 0°: | ≤5° |
| **Vertical pattern** | |
| Beam width, 3 dB: | 43° |
| Fixed electrical down-tilt: | 8° |
| Front-to-back 180 ± 30°: | > 20 dB |
| VSWR (Return loss): | < 1.5 (> 14 dB) |
| Isolation | > 20 dB |
| Cross Polarization Ratio | > 15 dB(at boresight), > 10 dB(at sector) |
| Antenna pattern files: | Contact local Ericsson sales representative |

**Mechanical specification**

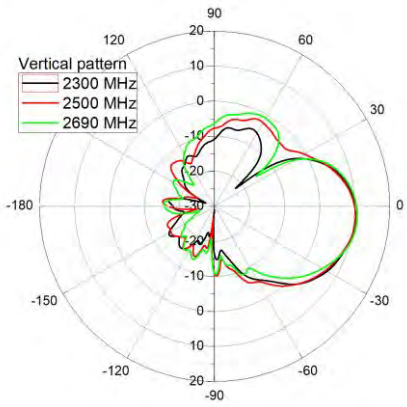
| | |
|---|---|
| Main Dimensions, WxDxH: | 200mm x 25mm x 200 mm |
| Weight: | 800 g |
| Volume: | 1,0 l |
| Environmental: | IP55, Type 3R |



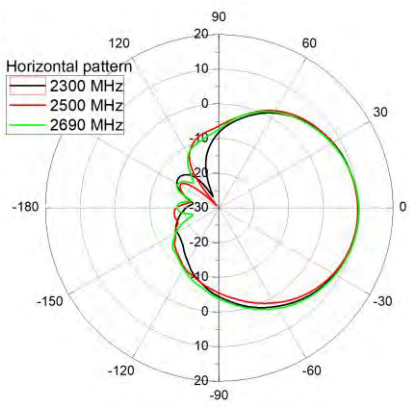

+45_V-Plane




+45_H-Plane




-45_V-Plane




-45_H-Plane

Telefonaktiebolaget LM Ericsson
SE-126 25 Stockholm, Sweden
www.ericsson.com

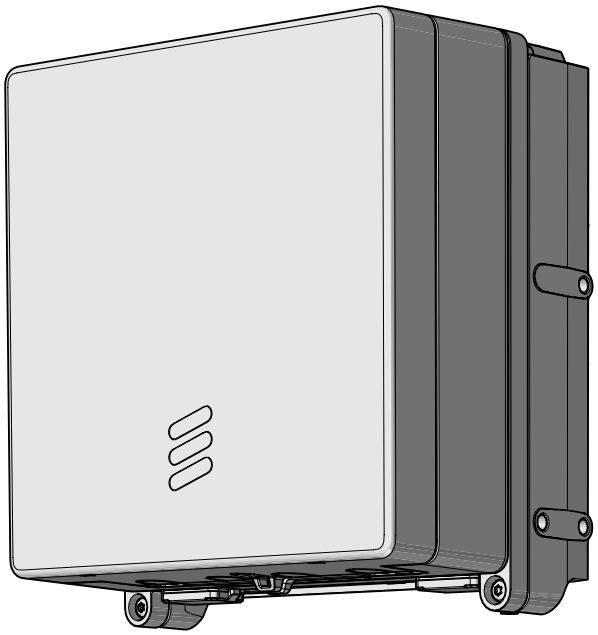
2/287 01-FGC 101 1844 Uen Rev D
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ERICSSON

# Radio Description

## Radio 4402

## Description



250/1551-LZA 701 6001/1 Uen H

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# 1 Introduction

## 1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

**Note:** Seals that have been implemented by Ericsson must not be broken or removed, as it otherwise voids warranty.

# 2 Product Overview

The radio expands coverage and performance in denser urban areas, where the use of small handheld devices demand high capacity on the operators networks. It is designed to be located in cities and in demanding radio environments.

The radio is part of a modular radio building concept that enables a variety of installation alternatives that is also easy to expand. Flexible mounting solutions are provided using rails and pole clamps. The small size of the radio together with the flexible mounting solutions reduces the site volume. The lower weight also improves the handling of the radio.

The radio can be connected in a star or cascade configuration using optical cable links. An optic cable connects the radio to the main unit, or to an expanded Radio System.

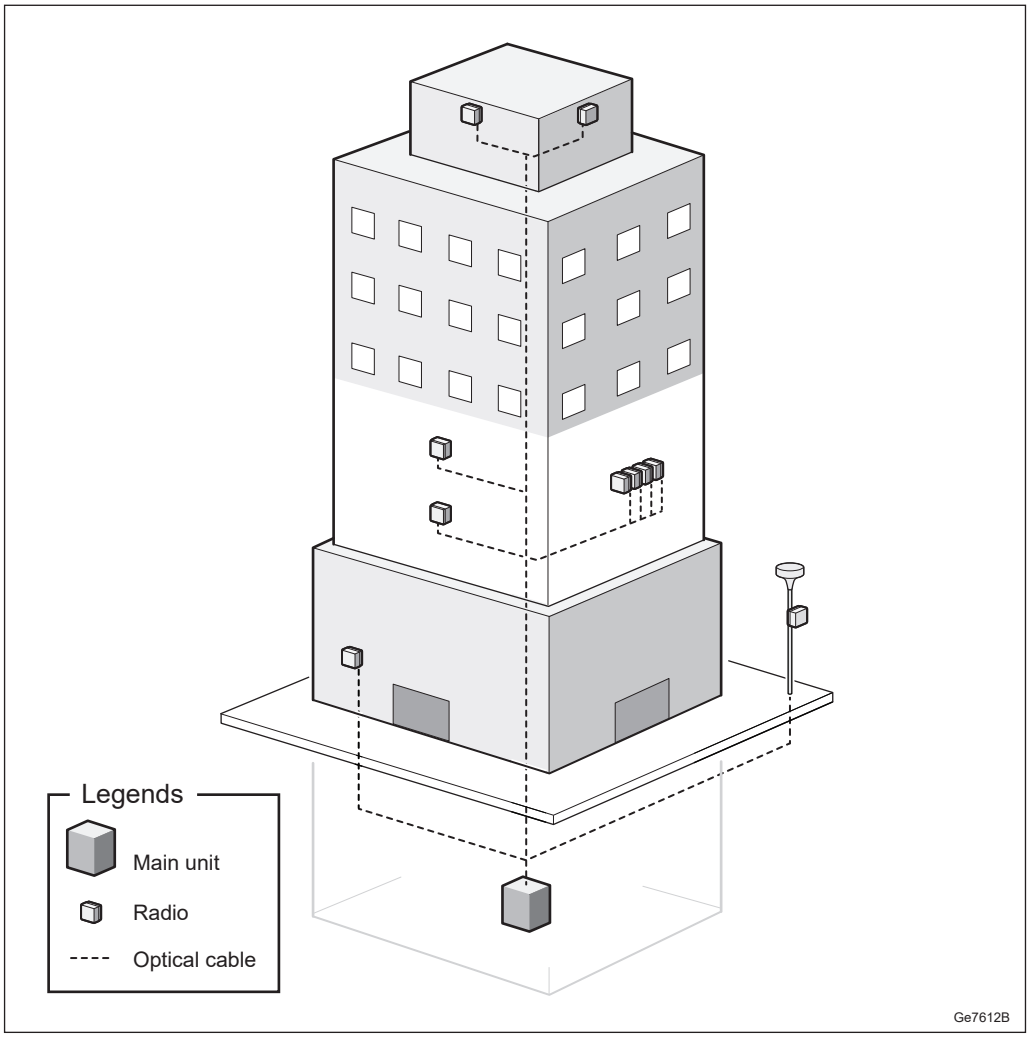



Figure 1 Radio Installations

## 2.1 Main Features

The following are the main features of the radio:

- WCDMA, LTE FDD, and NB-IoT
- Duplex transmitter/receiver (4TX/4RX) branches with 5 W per branch
- Up to 10.1 Gbps CPRI (optical)
- Complies with 3GPP base station classes Medium Range. For a list of relevant standards, see Radio Standards Compliance on page 33.

## 2.2 Optional Equipment

The optional equipment for the radio is the following:

— External antenna equipment

— Integrated directional antenna

— Rail installation equipment

# 3 Technical Data

Table 1 lists regulatory approved configurations. The listed standards on a specific frequency band may not be generally available on all markets. Contact the local Ericsson responsible for details.

Table 1 Radio 4402 Technical Data

| Description | Value |
|---|---|
| Maximum nominal output power(1) | 4 × 5 W |
| Number of carriers per branch | LTE: 6 downlink, 6 uplink<br>WCDMA: 6 downlink, 6 uplink<br>NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier<br>NB-IoT standalone mode: 1 carrier per RF port<br>NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier |
| Number of carriers per radio | LTE: 4 × 6 downlink, 4 × 6 uplink<br>WCDMA: 4 × 6 downlink, 4 × 6 uplink<br>NB-IoT in-band mode: 1 NB-IoT carrier per configured LTE host carrier<br>NB-IoT standalone mode: 4 × 1 carriers per RF port<br>NB-IoT guard band mode: 1 NB-IoT carrier per configured LTE host carrier |
| Frequency(2) | B66A for WCDMA, LTE, NB-IoT in-band mode, NB-IoT standalone mode, and NB-IoT guard band mode<br>1710–1780 MHz uplink<br>2110–2180 MHz downlink |
| **Dimensions with Cover, Single Radio** | |
| Height (A) | 213.5 mm |
| Width (B) | 200 mm |
| Depth (C) | 105 mm |
| **Dimensions with Antenna, Single Radio** | |
| Height (A) | 213.5 mm |
| Width (B) | 200 mm |
| Depth (C) | 125 mm |

| Description | Value |
|---|---|
| **Weight** | |
| Radio 4402 with Cover, Single Radio | 4.7 kg |
| Radio 4402 with Antenna, Single Radio | 5.1 kg |
| **Color** | |
| Body | NCS S 1002-B |

(1) For detailed information about licenses and HWAC, see the following:

WCDMA: Licenses and Hardware Activation Codes in Ericsson Software Model in the WCDMA RAN CPI library.

LTE: Manage Licenses and Hardware Activation Codes in the Radio Node libraries.

(2) For information about IBW, see RBS Configurations.

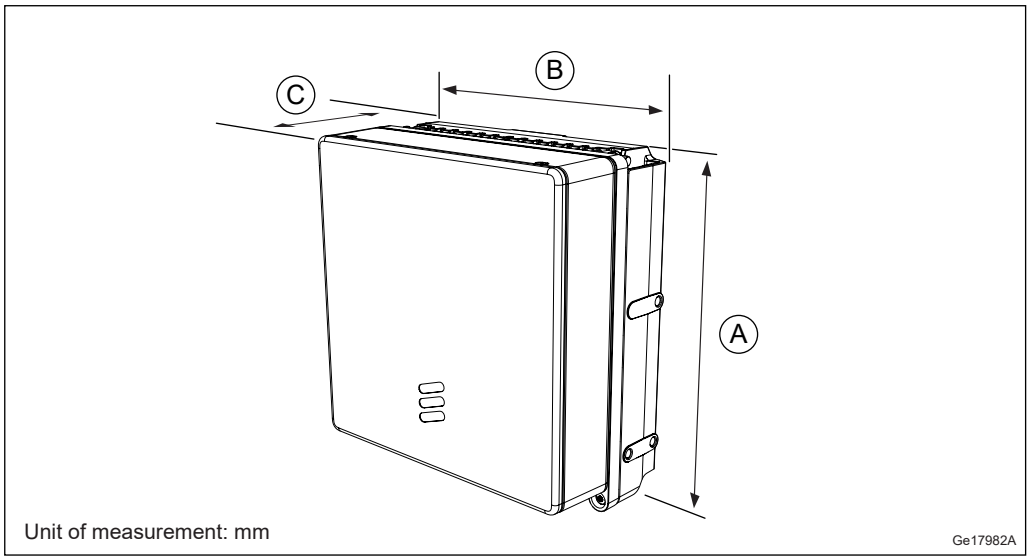



Figure 2 Radio 4402 Dimensions with Cover, Single Radio

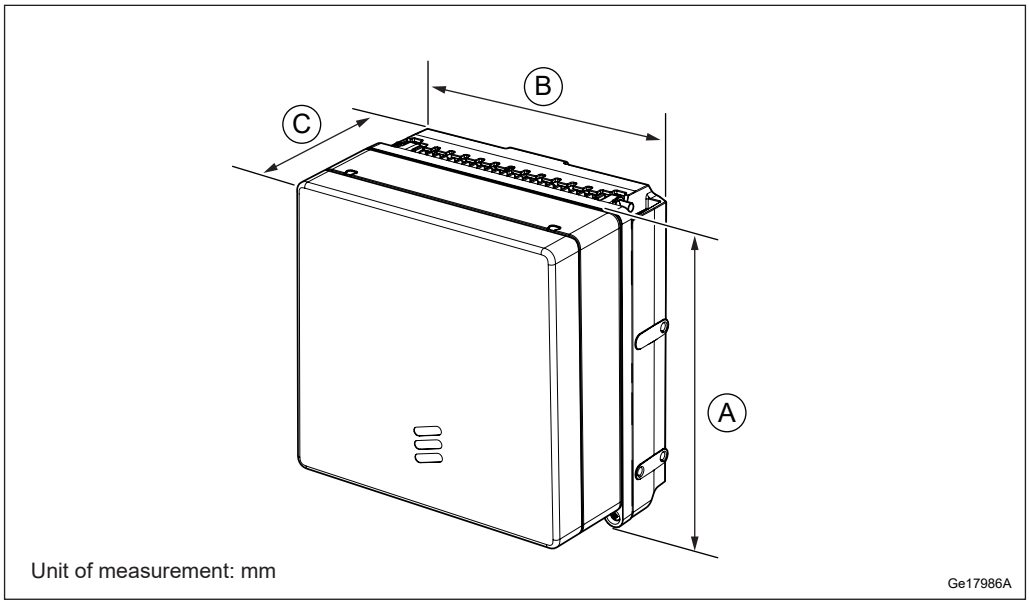



Figure 3 Radio 4402 Dimensions with Antenna, Single Radio

Table 2 Antenna Data

| Antenna | Frequency Band | Frequency |
|---|---|---|
| 6523 Directional | B1, B2/B25, B3, and B66A | 1710–2200 MHz |

## 3.1 Installation Recommendations

To ensure reliable operation and maximum performance, an appropriate installation location must be chosen.

When using the optional integrated directional antenna make sure the radio is not pointing at any elements that can disturb the radio signals.

### 3.1.1 Indoor Locations to Avoid

Although the unit is designed for outdoor use, it can be used indoors. For indoor locations Ericsson recommends to operate according to ETSI EN 300 019-1-3 class 3.1, 3.2, 3.3, and 3.6. This does not cover installation with heat traps or installation in lofts, where air ventilation does not exist. To ensure smooth performance, avoid installing the unit in a potential microclimate location, for example, places with unventilated lofts, with heat traps, or where the product is exposed to direct sunlight through windows. Avoid installing the equipment under glass covers or skylight windows without proper ventilation.

### 3.1.2 Outdoor Locations to Avoid

Although Ericsson declares this product suitable for outdoor environments, avoid installing the unit in a potential microclimate location. Typical examples of microclimate locations are sites where the product is not only exposed to the actual surrounding temperature, but additional temperature as heat coming from dark colored planes, for example, reflections from the floor or walls. The additional temperature can generate heat traps with temperatures up to 10°C higher than expected.

Avoid installing equipment in the following locations:

— Near the exhaust of building ventilation systems

— Near the exhaust of chimneys

— Opposite large surfaces made of glass or new concrete

If the unit is to be placed in an environment subjected to lightning strike, an external Surge Protection Device (SPD) is needed.

### 3.1.3 Other Considerations

Installing the radio close to other electronic equipment can cause interferences.

For sites with risk of ground fire, the recommended minimum installation height is 3 m.

### 3.1.4 Painting Disclaimer

Ericsson recommends to not paint the product as it can affect performance of the product.

Ericsson applies limitations to the warranty and service contract if the product is painted.

If the product is painted, the following commercial limitations apply:

— Failure modes directly related to overheating because of painting are not valid for repair within the scope of the warranty or standard service contract.

— Product failures related to paint contamination of components of the unit are not valid for repair within the scope of warranty or standard service contract.

— When a painted unit is repaired, it might be restored to the standard color before being returned to the market. It is not possible to guarantee that the same unit is sent back to the same place. This is also valid for units repaired under a service contract.

— For repairs within the warranty period or a standard service contract, the customer is charged the additional costs for replacing all painted parts of the unit or the complete unit.

If adaptations are required, contact Ericsson for information.

## 3.2 Installation Alternatives

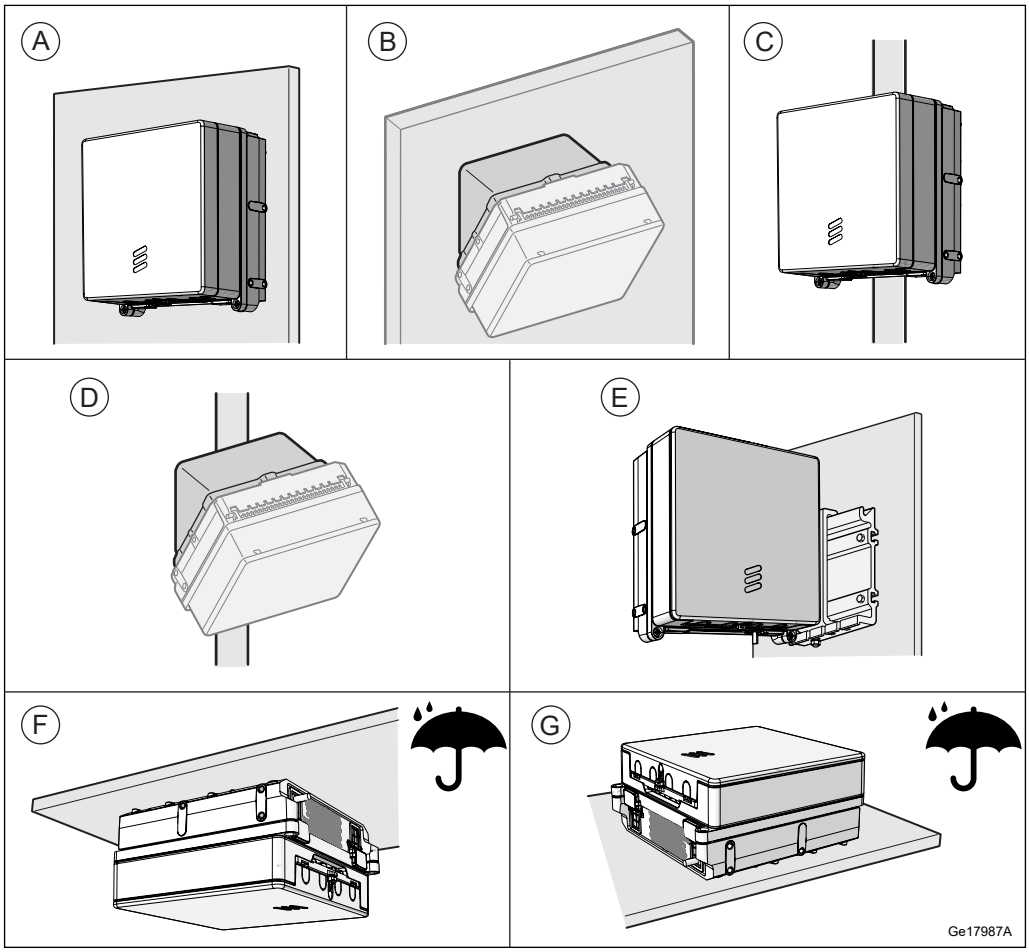



Figure 4 Alternative Installation Methods

Table 3 Key to Alternative Installation Methods

| Installation Method | Description |
|---|---|
| A | Wall installation |
| B | Wall installation with tilt installation kit |
| C | Pole installation |

| Installation Method | Description |
|---|---|
| D | Pole installation with tilt installation kit |
| E | Rail installation (Single Radio only) |
| F | Ceiling installation |
| G | Horizontal installation |

The integrated directional antenna is not applicable to installation alternatives E, F, and G.

For mounting direction F or G in an outdoor environment the Radio needs to be protected from direct rain.

## 3.3 Space Requirements

### 3.3.1 Generic Requirements

The radios can be placed directly against each other side by side. To ensure sufficient working space, allow adequate free space in front of the radio.

### 3.3.2 Wall Installation

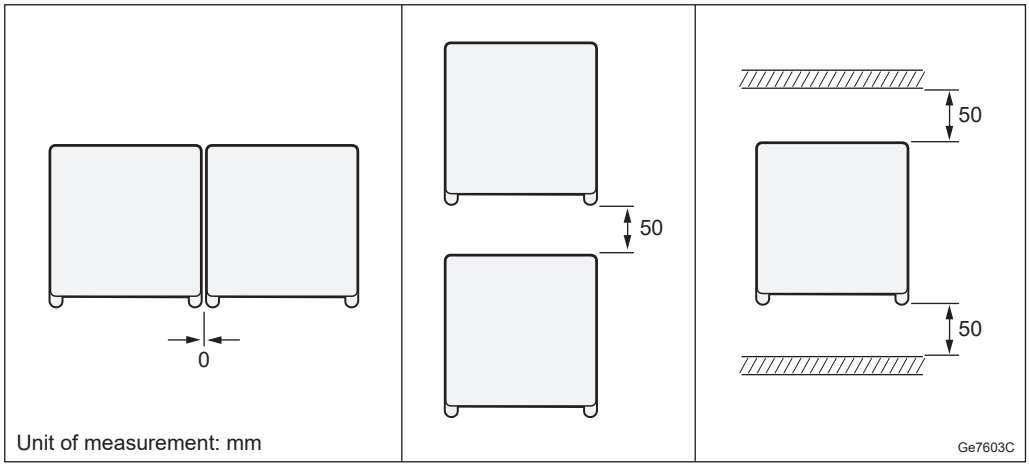



Figure 5 Wall Installation, Single Radio

To ensure adequate airflow between the units, allow a minimum of 50 mm free space between the radio and the roof, and between radios installed on a wall, on top of one another.

### 3.3.3 Wall or Pole Installation Using a Tilt Installation Kit

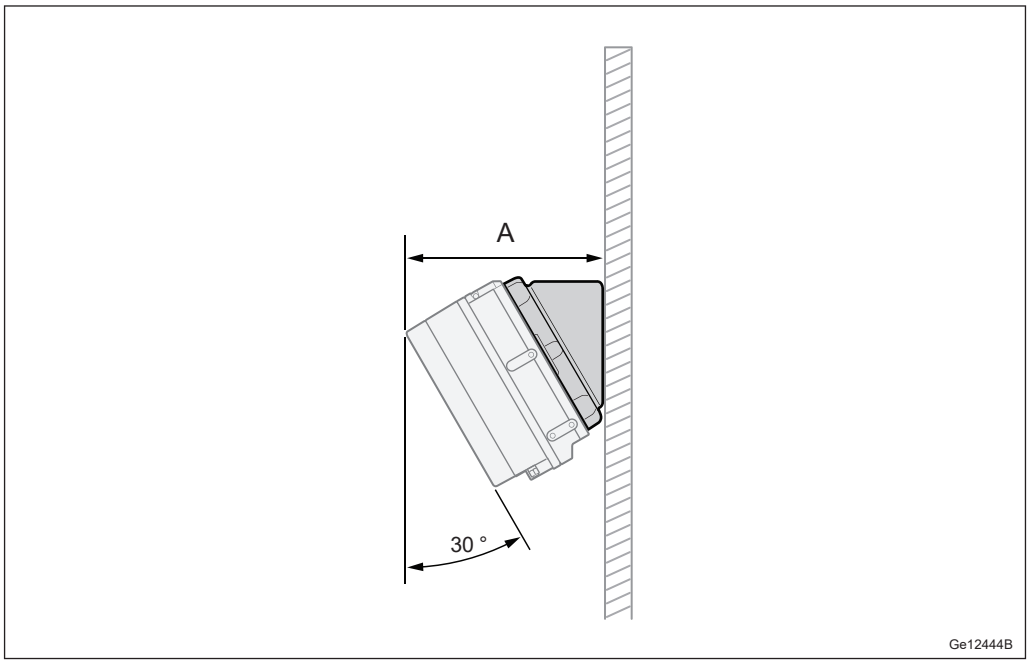



Figure 6 Tilt Installation Kit, Single Radio

Table 4 Tilt Installation Kit, Single Radio

| Description | Value A (mm) |
|---|---|
| Distance with cover | 198 |
| Distance with high-band antenna | 216 |
| Distance with low-band antenna | 224 |

### 3.3.4 Pole Installation

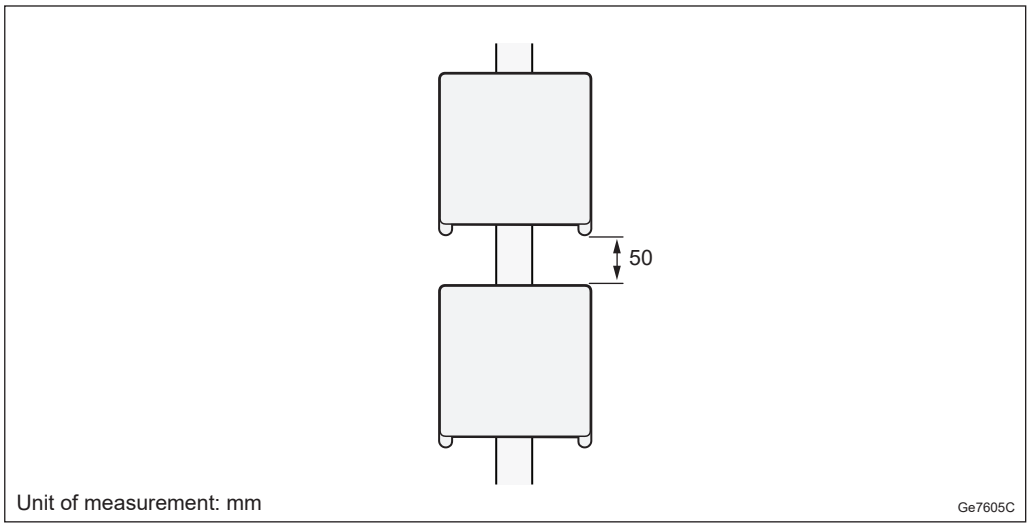



Figure 7 Pole Installation, Single Radio

To ensure adequate airflow between the units, allow a minimum of 50 mm free space above and below each radio.

Table 5 Pole Dimensions

| Pole Clamp Type | Minimum Dimension (mm) | Maximum Dimension (mm) |
|---|---|---|
| Hose clamp steel, Range 40-150 mm | Ø40 | Ø150 |
| Hose clamp steel, Range 140-300 mm | Ø140 | Ø300 |
| Hose clamp steel, Range 250-500 mm | Ø250 | Ø500 |

### 3.3.5 Rail Installation

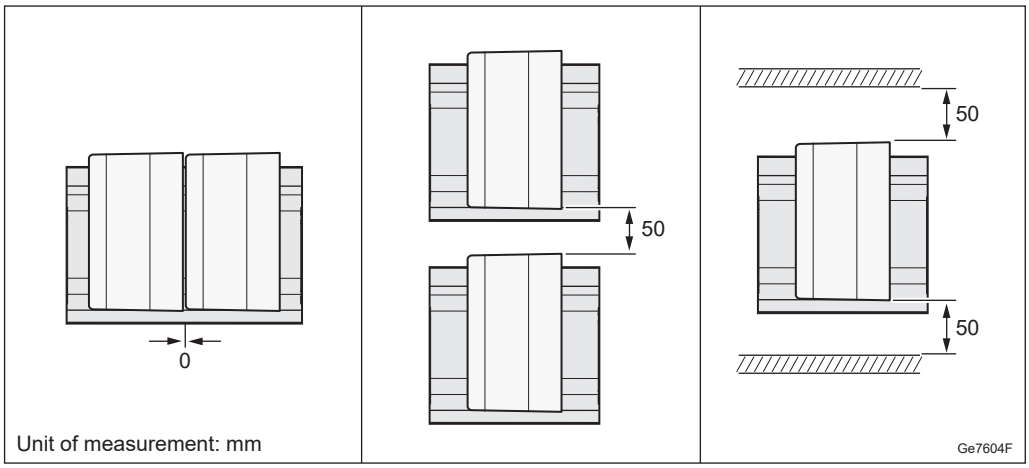



Figure 8 Rail Installation

To ensure adequate airflow between the units, allow a minimum of 50 mm free space above and below each radio, and between the radio and the wall.

### 3.3.6 Ceiling Installation

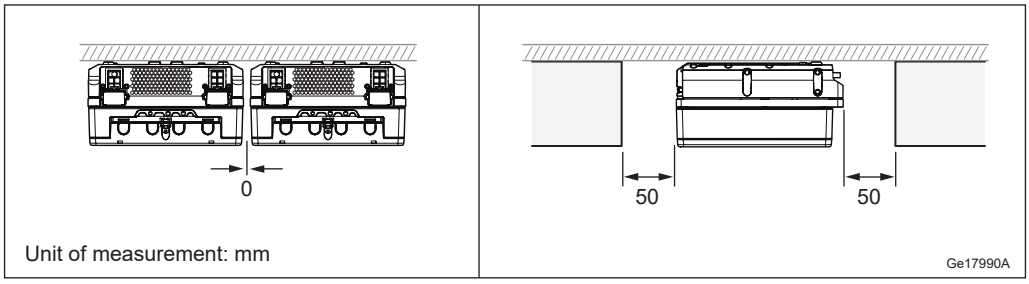



Figure 9 Ceiling Installation

To ensure adequate airflow between the units, allow a minimum of 50 mm free space between the radio and the wall, and 50 mm between radios installed on a roof beside one another.

### 3.3.7 Horizontal Installation

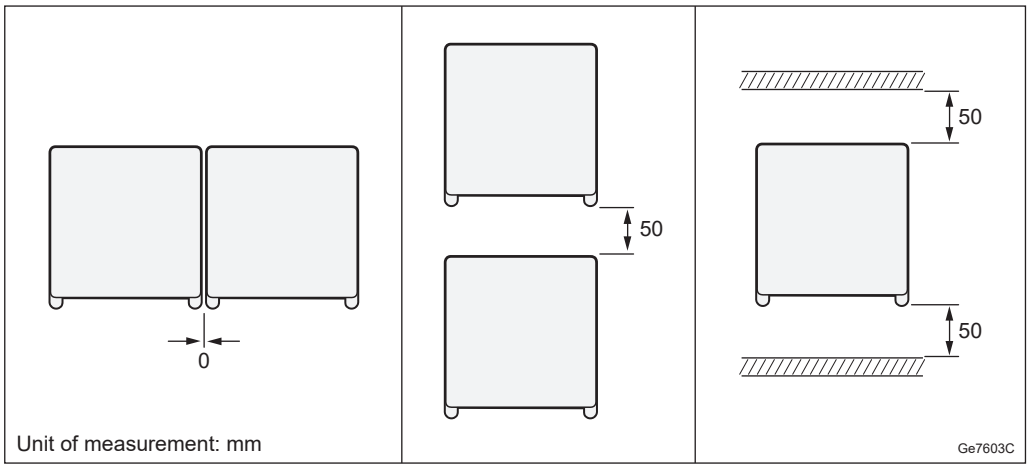



Figure 10 Horizontal Installation, Single Radio

To ensure adequate airflow between the units, allow a minimum of 50 mm free space between the radio and the roof, and between radios installed horizontally.

## 3.4 Acoustic Noise

With the fan, the acoustic noise is ambient temperature dependent, as listed below.

Table 6 Maximum Sound Pressure Level for Radio 4402 with Fan

| Temperature (°C) | Radio 4402 Sound Pressure Level (dB) |
|---|---|
| +20 | 49 |
| +30 | 52 |
| +40 | 55 |
| +55 | 60 |

## 3.5 Environmental Characteristics

This section contains operating environment data for the radio.

### 3.5.1 Operating Environment

The following are the values for the normal operating environment of the radio:

Temperature[(1)] −40°C to +55 °C

| | |
|---|---|
| Solar radiation | ≤ 1120 W/m² |
| Relative humidity | 5 – 100% |
| Absolute humidity | 0.26 – 40 g/m³ |
| Maximum temperature change | 0.5 °C/min |
| Maximum wind load at 150 km/h (pole installed single case) | Radio with cover: 55 N (front), 18 N (side)<br>Radio with antenna: 56 N (front), 24 N (side) |

(1) Depending on product variant, installation scenario, traffic load, and configuration, the product can, in the highest 10 °C temperature range, temporarily reduce the output power. This depends on the durations of the high ambient temperature.

### 3.5.2 Heat Dissipation

The radio is designed for outdoor installation.

Avoid indoor installation in a room without adequate ventilation and cooling.

Table 7 Radio Heat Dissipation

| Unit | Output Power (W) | Maximum Heat Dissipation (W) |
|---|---|---|
| Radio 4402 B66A | 4 × 5 | 120 |

Table 8 Support Heat Dissipation

| Unit | Heat Dissipation (W) |
|---|---|
| Support 6501 | 12 |
| Support 6502 | 12 |

### 3.5.3 Vibration

The radio operates reliably during seismic activity as specified by test method IEC 60068-2-57 Ff.

| | |
|---|---|
| Maximum level of Required Response Spectrum (RRS) | 50 m/s² within 2–5 Hz for DR=2% |
| Frequency range | 0.3–50 Hz |
| Time history signal | Verteq II |

The radio operates reliably during random vibration as specified by test method IEC 60068-2-64 Fh method 1

| | | | |
|---|---|---|---|
| Random vibration, normal operation | +12 m²/s³ | 0.3 m²/s³ | –12 m²/s³ |
| Frequency range | 5–10 Hz | 10–50 Hz | 50–150 Hz |

### 3.5.4 Materials

All Ericsson products fulfill the legal and market requirements regarding the following:

— Material declaration

— Materials' fire resistance, components, wires, and cables

— Recycling

— Restricted and banned material use

## 3.6 Power Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the radio.

The power for the radios can be provided from an AC or a DC power supply.

### 3.6.1 DC Power Characteristics

The power supply voltage for the radio is −48 V DC.

Table 9 Radio DC Power Supply Requirements

| Conditions | Values and Ranges |
|---|---|
| Nominal voltage | −48 V DC |
| Normal voltage range at radio input connector | −36.0 to −58.5 V DC |
| Non-destructive range | 0 to −60 V DC |

#### Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and do not provide information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60934.

Table 10 Radio Fuse or Circuit Breaker Recommendations

| Unit (DC powered) | Output Power (W) | Minimum Fuse Rating (A) | Maximum Allowed Fuse Rating[1] (A) |
|---|---|---|---|
| Radio 4402 B66A | 4 × 5 | 6 | 32 |

(1) The absolute maximum fuse class in accordance with radio design restrictions.

## 3.6.2 AC Power Characteristics

The normal voltage range for the radio is 100 to 250 V AC.

Table 11 Radio AC Power Supply Requirements

| Conditions | Values and Ranges |
|---|---|
| 100–250 V | 85–275 V AC |
| Connection | Line-neutral, line-line |
| Frequency range | 45–65 Hz |
| Voltage harmonics | ≤ 10% at full load(1) |
| Shut-off allowance | At undervoltage or overvoltage |
| Inrush current peak | < 10 A |
| Inrush current duration | < 100 ms |
| AC system | TN, TT and IT |

(1) Must comply with IEC 61000-3-2

### Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and do not provide information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60934.

When the radio connected Line-Line a 2-pole circuit breaker or dual fuses are required for interruption of both lines. This is also valid when the radio is used in an IT system.

Table 12 Radio Fuse or Circuit Breaker Recommendations

| Unit (AC powered) | Output Power (W) | Minimum Fuse Rating (A) | Maximum Allowed Fuse Rating(1) (A) |
|---|---|---|---|
| Radio 4402 B66A | 4 × 5 | 4 | 16 |

(1) The absolute maximum fuse class in accordance with radio design restrictions.

## 3.6.3 Power Consumption

For information on power consumption, see Power Consumption Calculations.

# 3.7 System Characteristics

This section describes the system characteristics of the Radio System.

## 3.7.1 RF Electromagnetic Exposure

For general information on RF EMF exposure, see Radio Frequency Electromagnetic Fields.

The following tables list the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Radio 4402 is below the limits applicable in:

— USA (47 CFR 1.1310)

— Canada (Health Canada Safety Code 6)

Table 13 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in the USA and Markets Employing the FCC RF Exposure Limits (Including 0.6 dB Output Power Tolerance)

| Mode and Output Power for Radio 4402 | | | | Dimensions of the Box-Shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance in Front of Radio | | Width | | Height | | Distance Behind Radio | |
| Band | Single/Dual Radio Version | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | GP | O | GP | O | GP | O | GP | O |
| B66A | Single | 4 × 5 W | E+ | 1.9 | 0.9 | 1.6 | 0.8 | 1.3 | 0.6 | 0.2 | 0.2 |

(1) The compliance boundaries are determined for maximum output power with power tolerance.

Table 14 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in Canada (Including 0.6 dB Output Power Tolerance)

| Mode and Output Power for Radio 4402 | | | | Dimensions of the Box-Shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Distance in Front of Radio | | Width | | Height | | Distance Behind Radio | |
| Band | Single/Dual Radio version | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | GP | O | GP | O | GP | O | GP | O |
| B66A | Single | 4 × 5 W | E+ | 2.7 | 1.1 | 2.3 | 1.0 | 1.8 | 0.8 | 0.2 | 0.2 |

(1) The compliance boundaries are determined for maximum output power with power tolerance.

## 3.7.2 Software

For information on software dependencies, see Radio Software Support.

### 3.7.3 Radio Configurations

For information about available radio configurations, see RBS Configurations.

# 4 Hardware Architecture

For a description of the supported radio configurations, refer to RBS Configurations.

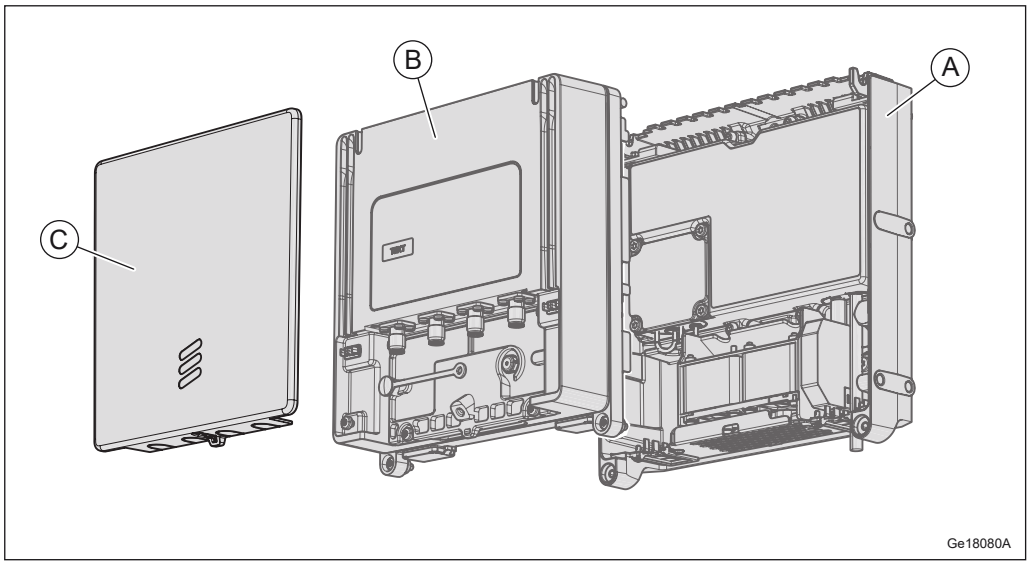



Figure 11 Radio Components, Single Radio

Table 15 Key to Radio Components, Single Radio

| Position | Component |
|---|---|
| A | Support(1) |
| B | Radio Core |
| C | Antenna or Cover |

(1) The Support has several variants. An example is shown in Figure 11.

## 4.1 Support

The Support provides the Radio Core with integrated mechanical attachment, power conversion and cooling. It consists of a mounting bracket, a fan unit, and a PSU.

### 4.1.1 Mounting Bracket

The mounting bracket provides integrated mechanical attachment for wall and pole mounting, and attachment points for the rail bracket.

### 4.1.2 Fan Unit

The fan unit operates autonomous against ambient temperature to cool the Radio Core.

For Single Radio, the fan unit of the Support is integrated with the mounting bracket and cannot be removed.

### 4.1.3 PSU

The PSU provides power to the Radio Core and the fan unit.

The PSU is available in two variants to support AC input and DC −48 V input. The DC variant handles both 2-wire (DC-C) and 3-wire (DC-I) connections.

Included in the PSU is also the external alarm interface and communication between PSU and Radio Core.

## 4.2 Radio Core

The Radio Core handles the radio communication in the unit and consists of a thermal radiator, TRX, and the Filter Unit (FU).

The Antenna Supervision can detect the following disconnected antennas:

— Ericsson Integrated Directional Antenna

— External antenna with feeder loss < 0.5 dB

Use the LTE AILG feature to ensure enough transmitted power.

### 4.2.1 Thermal Radiator

The thermal radiator provides cooling to the radio.

### 4.2.2 TRX

The Transmitter and Receiver (TRX) provides the following:

— Analog/Digital (A/D), Digital/Analog (D/A) conversion

— Channel filtering

— Delay and gain adjustment

— RF modulation and demodulation

— Optical cable interface termination

— Control and surveillance

### 4.2.3 Filter Unit

The Filter Unit consists of band-pass filters.

## 4.3 Antenna

The optional integrated directional Antenna provides directional RF coverage for the radio, and protects the Radio Core.

## 4.4 Cover

The esthetic Cover protects the Radio Core when the radio is connected to an external antenna.

## 4.5 Optical Indicators

The radio is equipped with optical indicators that show system status.

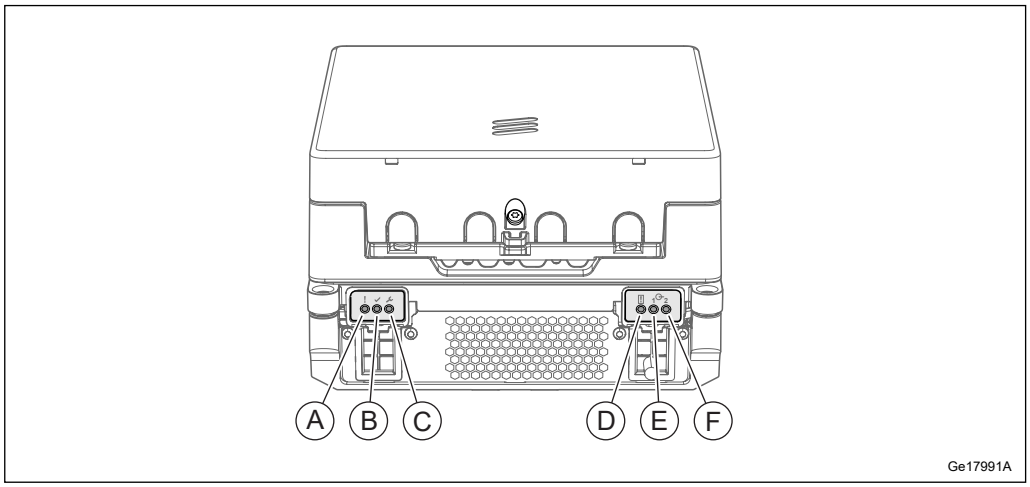



Figure 12 Optical Indicators for Single Radio

Table 16 Description of Optical Indicators for Single Radio

| Position | Name | Marking |
|---|---|---|
| A | Fault | ! |

| Position | Name | Marking |
|---|---|---|
| B | Operational | ✓ |
| C | Maintenance | |
| D | Support System Status | |
| E, F | Interface 1<br>Interface 2 | |

For more information about the behavior of the optical indicators and the maintenance button, refer to Indicators, Buttons, and Switches.

# 5 Connection Interfaces

This section contains information about the radio connection interfaces.

## 5.1 Support

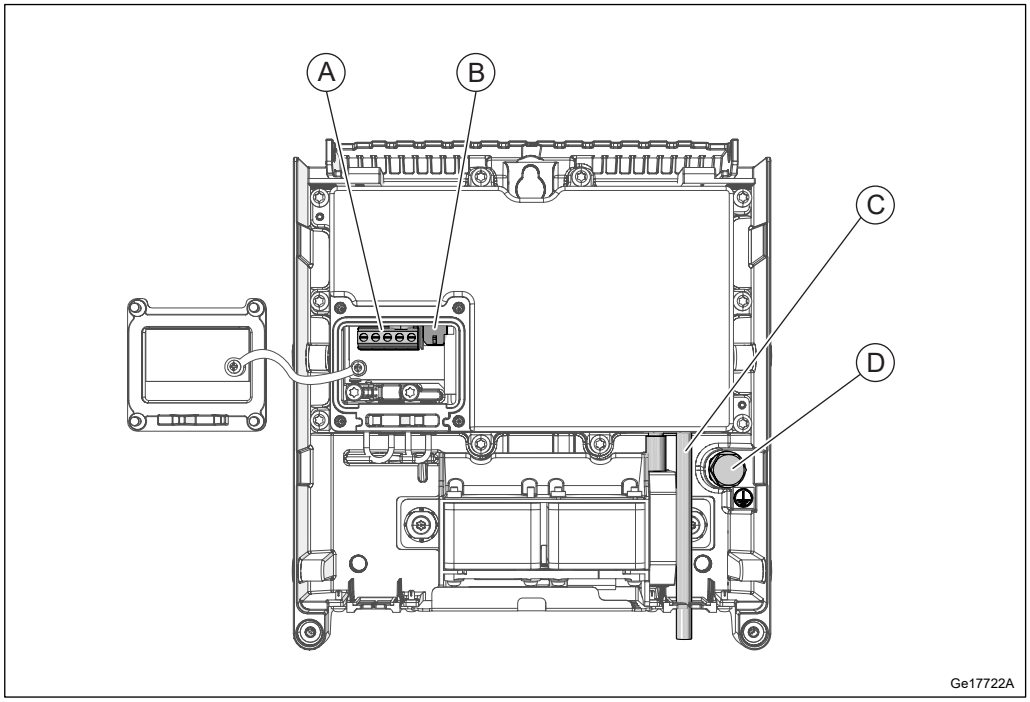
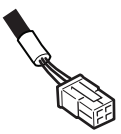
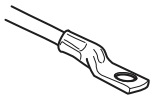



Figure 13 Connection Interfaces for Support, Single Radio

Table 17 Connection Interfaces for Support, Single Radio

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| A | −48 V DC power supply | −48V ⎓ | Screw terminal block | – |
| A | AC power supply | ~ | | |
| B | External alarm | 🔔 | PCB connector |  |
| C | PSU DC output, cable preinstalled | 36V ⎓ | – | – |

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| D | Grounding<br>(With DC power supply) | ⏚ | M8 bolt |  |
| D | Grounding<br>(With AC power supply) | ⏚ | | |

**Note:** Figure 13 shows an example of the Support for Single Radio. The actual product may differ.

For Single Radio, only 195 W Support can be used.

### 5.1.1 Fan Unit Interface

The fan unit provides cooling to the Radio Core.

### 5.1.2 External Alarm Interface

Two external alarms can be connected to the radio external alarm port.

### 5.1.3 AC/−48 V DC Power Interface

Depending on the version of the product, the power supply for the radio can be AC or DC.

#### 5.1.3.1 AC Power Interface

The AC power connection is made through a screw terminal.

Table 18 AC Power Supply Cable Diameter Tolerances

| Cable Length (m) | Cross-Sectional Area of Each Conductor ($mm^2$) | Outer Diameter over Sheath (mm) |
|---|---|---|
| 0–100 | 2.5 | 8–9 |

The power cable has a wire for Line (L), a wire for Line/Neutral (L/N), and a wire for Protective Earth (PE) conductors. The wire color code for wires is market dependent.

All cables must be shielded. The shield must be folded back over the outer jacket of the cable and properly connected to the PSU chassis in the PSU strain relief, otherwise the radio overvoltage protection does not function properly.

The AC cable temperature rating must be at least 70 °C.

### 5.1.3.2 DC Power Interface

The −48 V DC power connection is made through a screw terminal.

Table 19 −48 V DC Power Supply Cable Diameter Tolerances

| Cable Length (m) | Cross-Sectional Area of Each Conductor ($mm^2$) | Outer Diameter over Sheath (mm) |
|---|---|---|
| 0–60 | 2.5 | 8–9 |

For 3-wire power system, the power cable screw terminal has a wire for −48 V conductors, a wire for 0 V, and one wire for FE (Functional Earth). For 2-wire power system, the power cable screw terminal has a wire for −48 V conductors, and a wire for 0 V. The wire color code is market dependent.

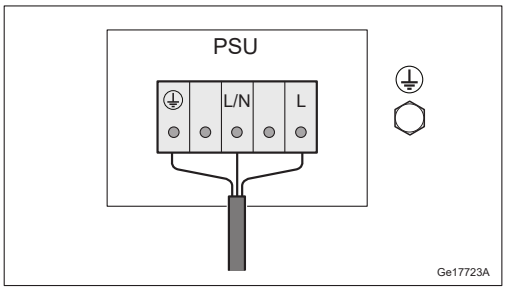
All cables must be shielded. The shield must be folded back over the outer jacket of the cable and properly connected to the PSU chassis in the PSU strain relief, otherwise the radio overvoltage protection does not function properly.

The DC cable temperature rating must be at least 70 °C.

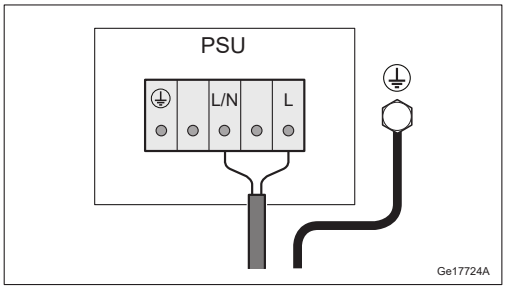
## 5.1.4 Grounding Interface

The possible grounding interface solutions for the radio are as follows:

**AC Grounding, Single Radio**

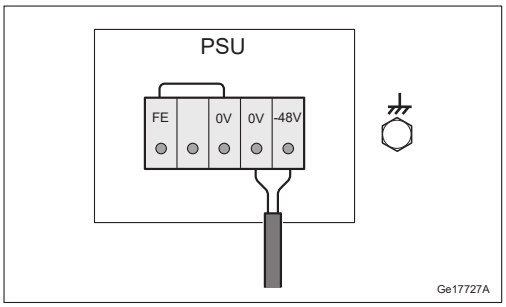



AC power with PE in PSU input terminal.

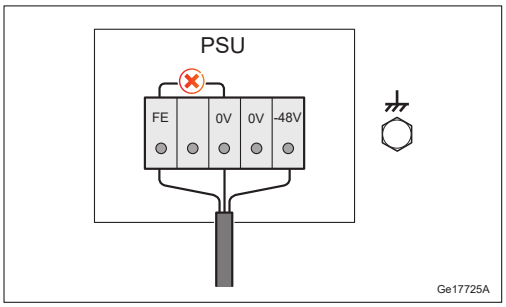



AC power with PE in the grounding interface on the mounting bracket.

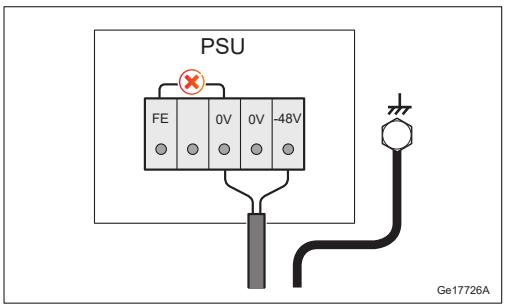
**DC Grounding, Single Radio**




Default 2-wire (DC-C) power system with FE in PSU input terminal.




3-wire (DC-I) power system with FE in PSU input terminal. Remove the jumper between 0V and FE.




3-wire (DC-I) power system with FE in the grounding interface on the mounting bracket. Remove the jumper between 0V and FE.

For more information about grounding principles, see Grounding Guidelines for RBS Sites.

## 5.1.5 PSU DC Power Interface

The PSU DC power connector supplies the radio with +36 V DC and internal communication to the radio.

## 5.2 Radio Core

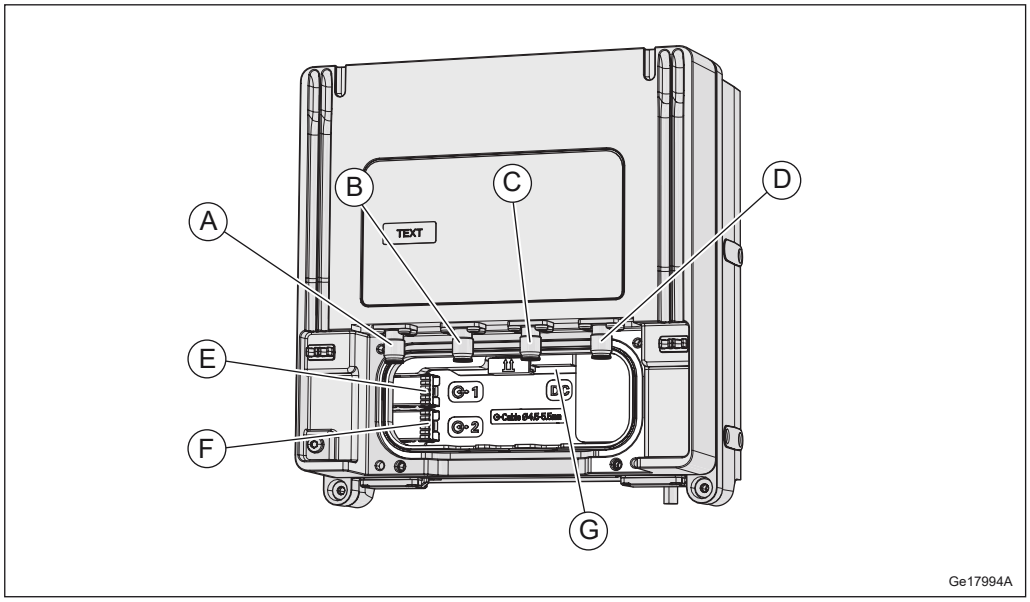
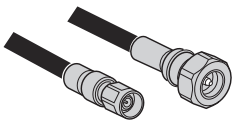
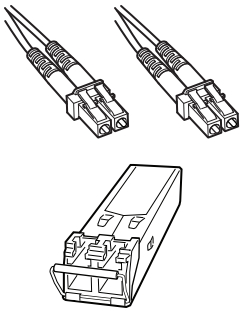



Figure 14 Radio Core Connection Interfaces

Table 20 Connection Interfaces

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| A | Antenna A | A | NEX10 |  |
| B | Antenna B | B | | |
| C | Antenna C | C | | |
| D | Antenna D | D | | |
| E | Optical cable 1 | 1 | LC (On SFP) |  |
| F | Optical cable 2 | 2 | | |
| G | DC power supply and internal communication | DC | – | – |

### 5.2.1 Antenna Interface

The antenna interfaces provide connections for the radio to the antennas. RF cables connect the radio to the antenna.

Table 21 Radio Antenna Connection Interface Characteristics

| Connector Type | Jumper Cable Type | RF Cable Type |
|---|---|---|
| NEX10 female | NEX10 male on one end and 4.3-10 female on the other end | 50 Ω 1/2-inch coaxial, 4.3-10 male |

Table 22 Radio Antenna Cable Connectors

| Radio Connectors | Antenna Connectors |
|---|---|
| A (Antenna A) | TX/RX |
| B (Antenna B) | TX/RX |
| C (Antenna C) | TX/RX |
| D (Antenna D) | TX/RX |

### 5.2.2 Interface for Optical Cable to Main Unit

The 1 and 2 interfaces provide connections to optical cables (with outer diameter 4.5–5.5 mm, and complies with standard G657A2) for traffic and timing signals between the radio and the main unit. An SFP+ is used to connect the optical cable to the radio.

**Note:** The radio uses SFP modules for optical transmission and optical radio interfaces on Data 1 and Data 2.

Only SFP+ modules approved and supplied by Ericsson are to be used. These modules fulfill the following:

— Compliance with Class 1 laser product safety requirements defined in standard IEC 60825-1

— Certification according to general safety requirements defined in standard IEC 60950-1

— Functional and performance verified to comply with Radio System specifications

Recommended SFP+ modules are obtained from the product packages for the Radio System and the Main Remote Installation products. For more information about SFP+ modules, see Spare Parts Catalog and Main-Remote Installation Products Overview.

### 5.2.3 DC Power Interface

The radio DC power connector supplies the radio with +36 V DC and internal communication from the PSU.

# 6 Standards and Regulations

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity for the radio.

## 6.1 Regulatory Approval

The Radio System complies with the following market requirements:

— North American market requirements.

— Products containing radio equipment outside North America and in countries not recognizing the CE-mark may be labeled according to national requirements or standards.

### 6.1.1 Environmental Standards Compliance

The product complies with the following environmental standard:

**Europe**

— Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU)

### 6.1.2 Safety Standards Compliance

In accordance with market requirements, the Radio System complies with the following product safety standards and directives:

**International**

— IEC 62368-1

**Europe**

— EN 50385

— EN 62368-1

**North America**

— FCC CFR 47 Part 1.1310

— FCC CFR 47 Part 2.1091

— Health Canada Safety Code 6

— IC RSS-102

— UL 62368-1

— CSA-C22.2 No. 62368-1

#### 6.1.2.1 Outdoor Specific Requirements

The Radio System complies with the following outdoor specific requirements:

**International**

— IEC 60529 (IP65, IP55 for Directional antenna)

— IEC 60950-22

**Europe**

— EN 60529 (IP65, IP55 for Directional antenna)

— EN 60950-22

**North America**

— CSA-C22.2 No. 60950-22

— UL 50E

— UL 60950-22

### 6.1.3 EMC Standards Compliance

The Radio System complies with the following Electromagnetic Compatibility (EMC) standards:

**International**

— 3GPP TS37.113

**North America**

— IC ICES-003 B

— FCC CFR 47 Part 15 B

#### FCC Compliance Statement

This device complies with Part 15 of the FCC CFR 47 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

### 6.1.4 Radio Standards Compliance

The Radio System complies with the following radio standards:

#### International

— 3GPP TS37.141

#### North America

— FCC CFR 47 Part 27 (USA frequency dependent)

— FCC CFR 47 Part 2 (USA)

— IC RSS-139 (Canada frequency dependent)

— IC RSS-Gen (Canada)

### 6.1.5 Marking

To show compliance with legal requirements, the product is marked with the following labels:

#### North America

— usETL/cETL

— FCC CFR 47 Part 15 Statement

— IC ICES-003 Statement

— FCC ID

— IC ID

## 6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory approved.

### 6.2.1 Spare Parts

The product adheres to the Ericsson Serviceability and Spare Part Strategy.

### 6.2.2 Surface Quality

The surface quality of the radio is in accordance with Ericsson standard class A3.

### 6.2.3 Vandal Resistance

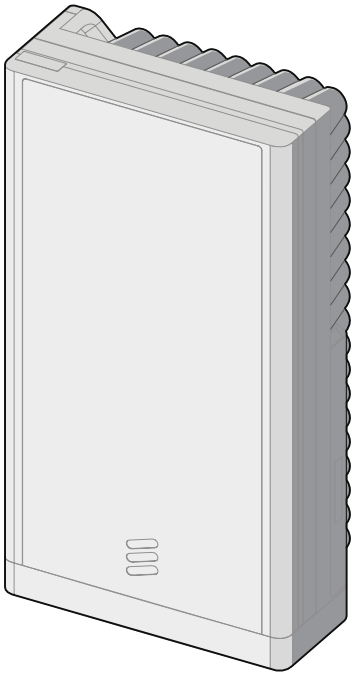
Unauthorized access is not possible without damaging the tamper proof warranty seal.

ERICSSON

# Radio Description

## Radio 4435

## Description



301/1551-LZA 701 6001/1 Uen B

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# 1 Introduction

## 1.1 Warranty Seal

The product is equipped with a warranty seal sticker.

**Note:** Seals that have been implemented by Ericsson must not be broken or removed, as it otherwise voids warranty.

# 2 Product Overview

The radio remotely extends the reach of the Radio System, and is designed to be located near the antenna. The radio is part of a modular radio building concept that enables a variety of installation alternatives that are also easy to expand. Flexible mounting solutions are provided using pole clamps and brackets.

An overview of different radio installations is shown in Figure 1.

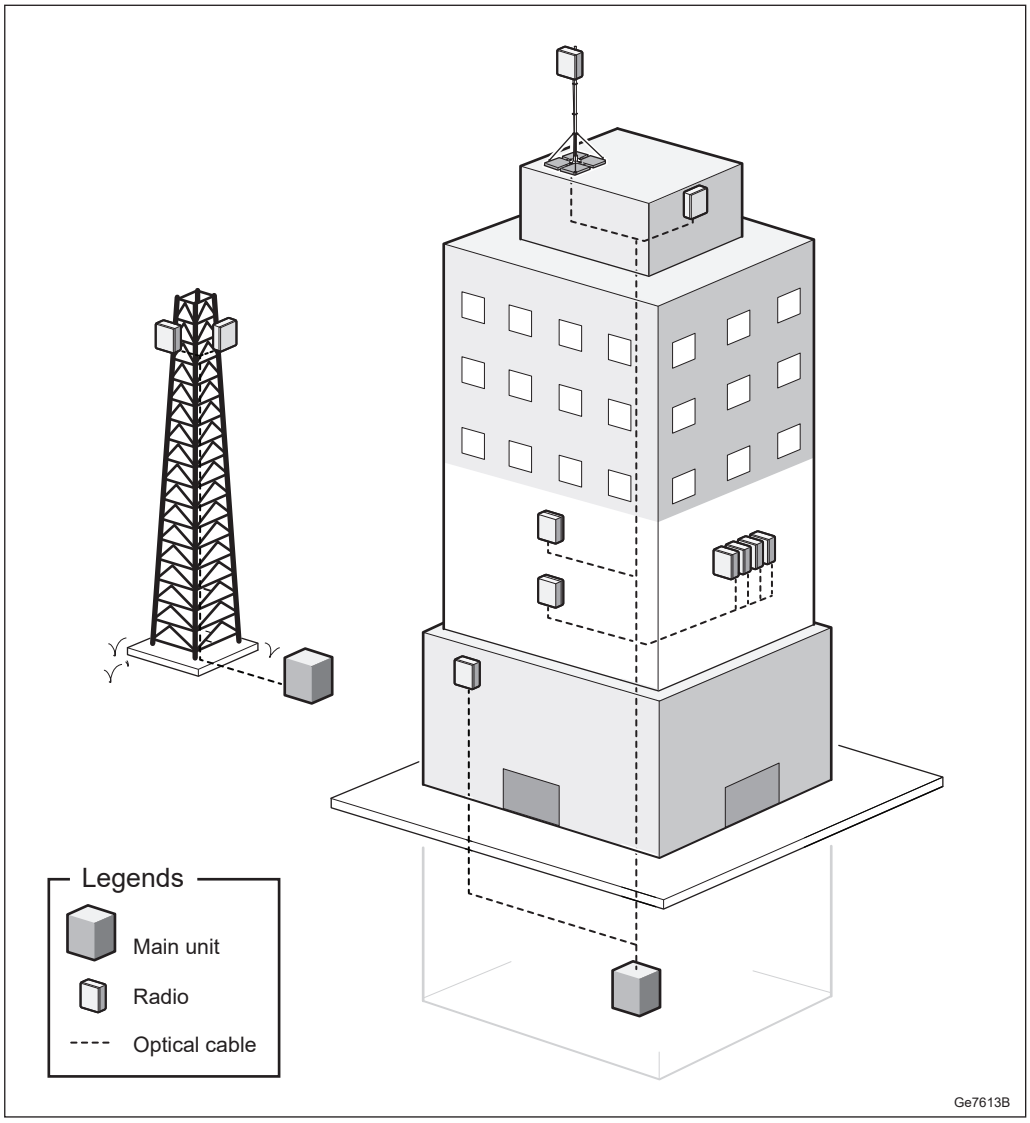



Figure 1 Radio Installations

## 2.1 Main Features

The following are the main features of the radio:

— AC power connection

— LTE TDD, NR TDD

— Mixed mode, for supported mixed mode configurations, see Supported Radio Capabilities.

— Duplex transmitter/receiver (4TX/4RX) branches

— Up to 2 × 10.1 Gbps CPRI (optical)

— Complies with 3GPP base station class Wide Area. For a list of relevant standards, see Radio Standards Compliance on page 25.

## 2.2 Required Installation Equipment

Table 1 Mounting Kit

| Mounting Kit | Product Name | Product Number |
|---|---|---|
| Tilt mounting kit | Streetmacro Wall & Pole Bracket with Tilt | SXK 109 2157/1 |
| Bracket expansion kit for SXK 109 2157/4 | Streetmacro Wall & Pole Bracket with tilt (Exp. kit) | SXK 109 2157/2 |
| Mounting kit without tilt | Streetmacro Wall & Pole Bracket without Tilt | SXK 109 2157/3 |
| Base bracket | Streetmacro Base Bracket | SXK 109 2157/4 |
| Triple bracket | Streetmacro Triple Bracket | SXK 109 2157/5 |
| Bracket for 140 mm pole diameter | Streetmacro 140mm pole dia bracket | SXK 109 2157/6 |

# 3 Technical Data

This section describes the physical characteristics, environmental data, and the power supply characteristics of the radio.

## 3.1 Bands, Carriers, and Output Power

For detailed information on available radio configurations, see Radio Node Configurations.

Table 2 Frequency Bands of Radio

| Radio Type | Value |
|---|---|
| Maximum nominal output power(1)(2) | 4 × 20 W<br>(Hardware Activation Codes (HWAC) are required for total output power over 20 W.) |
| Minimum configurable output power on an RF Port | 2.5 W |
| Number of carriers | For information about number of carriers, see Supported Radio Capabilities. |
| Frequency | B41 for LTE, NR, and mixed mode<br>2496–2690 MHz downlink<br>2496–2690 MHz uplink |

(1) For detailed information about licenses and HWAC, see:

NR: Manage Licenses and Hardware Activation Codes in the NR RAN library.

LTE: Manage Licenses and Hardware Activation Codes in the LTE RAN library.

(2) For detailed information about output power, see:

NR: Hardware-Related Capabilities in the NR RAN library.

LTE: Hardware-Related Capabilities in the LTE RAN library.

## 3.2 Physical Characteristics

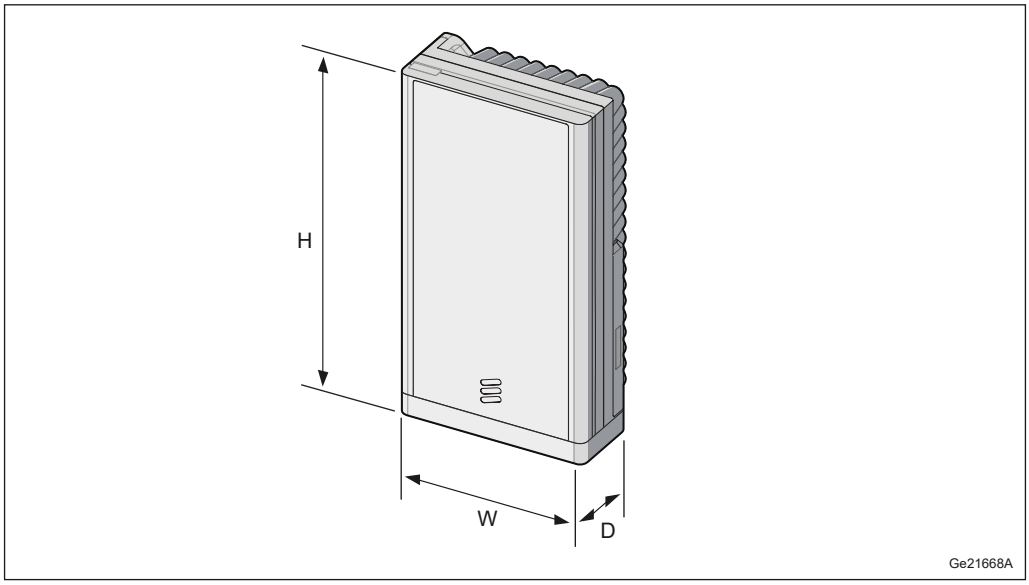



Figure 2 Radio Dimensions

Table 3 Radio Dimensions

| Radio Type | Height (H) × Width (W) × Depth (D) |
|---|---|
| Radio 4435 B41 | 373 × 200 × 93 mm |

Table 4 Radio Weight

| Radio Type | Weight(1) |
|---|---|
| Radio 4435 B41 | 6.7 kg |

(1) The weight is given with ±5% accuracy.

Table 5 Mounting Kit Weight

| Mounting Kit | Weight |
|---|---|
| SXK 109 2157/1 | 3.2 kg |
| SXK 109 2157/2 | 2.3 kg |
| SXK 109 2157/3 | 2.0 kg |
| SXK 109 2157/4 | 0.9 kg |
| SXK 109 2157/5 | 7.9 kg |
| SXK 109 2157/6 | 2.5 kg |

Table 6 Radio 4435 Color

| Part | Color Code |
|---|---|
| Body | NCS S 1002-B |

## 3.3 Installation Recommendations

To achieve reliable operation, and maximum performance, an appropriate installation location must be chosen.

### 3.3.1 Outdoor Locations to Avoid

Although Ericsson declares this product suitable for most outdoor environments, this does not cover installations where the planned installation site for the unit is a potential microclimate location. Typical examples of these microclimate locations are sites where the products are not only exposed to the actual temperature, but also additional temperature as heat coming from dark-colored planes, for example, reflections from the floor or walls. The additional temperature can generate heat traps with temperatures up to 10°C higher than expected.

Avoid installing equipment in the following locations:

— Near the exhaust of the building ventilation system.

— Near the exhaust of the chimney.

— Opposite large surfaces made of glass or new concrete.

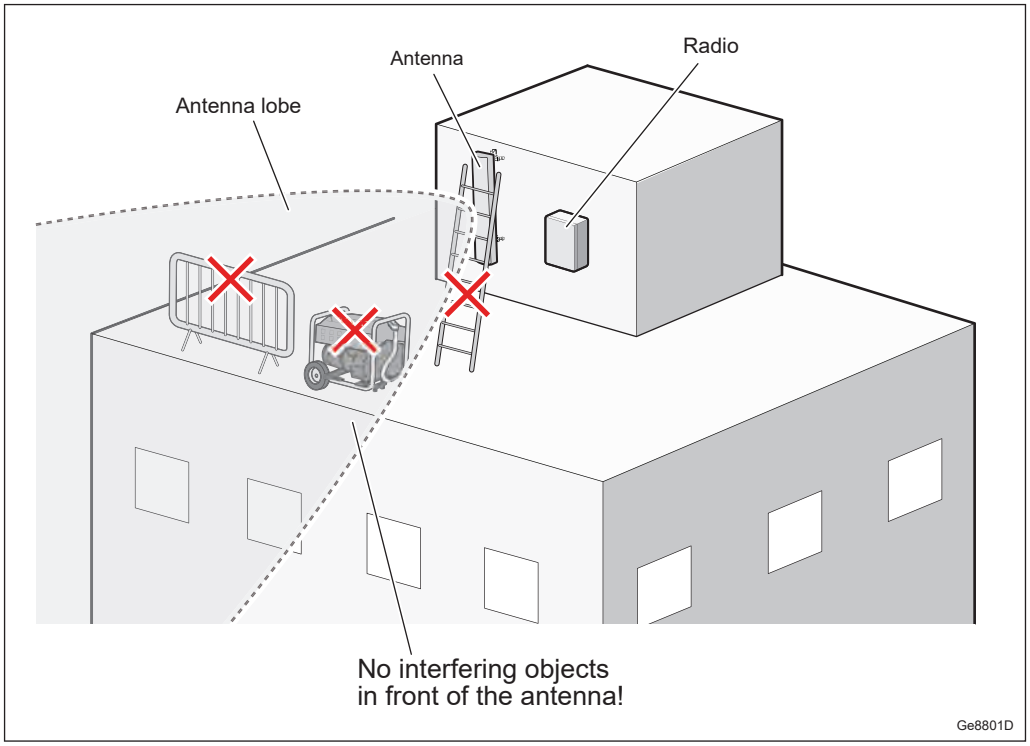
— Near overhanging structures such as roof overhangs.

Avoid radio interference by keeping the area directly in front of the antenna clear of the following:

— Metal surfaces or objects such as railings, ladders or chains

— Equipment generating electromagnetic fields, such as electric motors in air conditioners or diesel generators

— RBS equipment




### 3.3.2 Painting Disclaimer

Ericsson recommends to not paint the product as it can affect performance of the product.

Ericsson applies limitations to the warranty and service contract if the product is painted.

If the product is painted, the following commercial limitations apply:

— Failure modes directly related to overheating because of painting are not valid for repair within the scope of the warranty or standard service contract.

— Product failures related to paint contamination of components of the unit are not valid for repair within the scope of warranty or standard service contract.

— When a painted unit is repaired, it might be restored to the standard color before being returned to the market. It is not possible to guarantee that the same unit is sent back to the same place. This is also valid for units repaired under a service contract.

— For repairs within the warranty period or a standard service contract, the customer is charged the additional costs for replacing all painted parts of the unit or the complete unit.

If adaptations are required, contact Ericsson for information.

## 3.4 Installation Alternatives

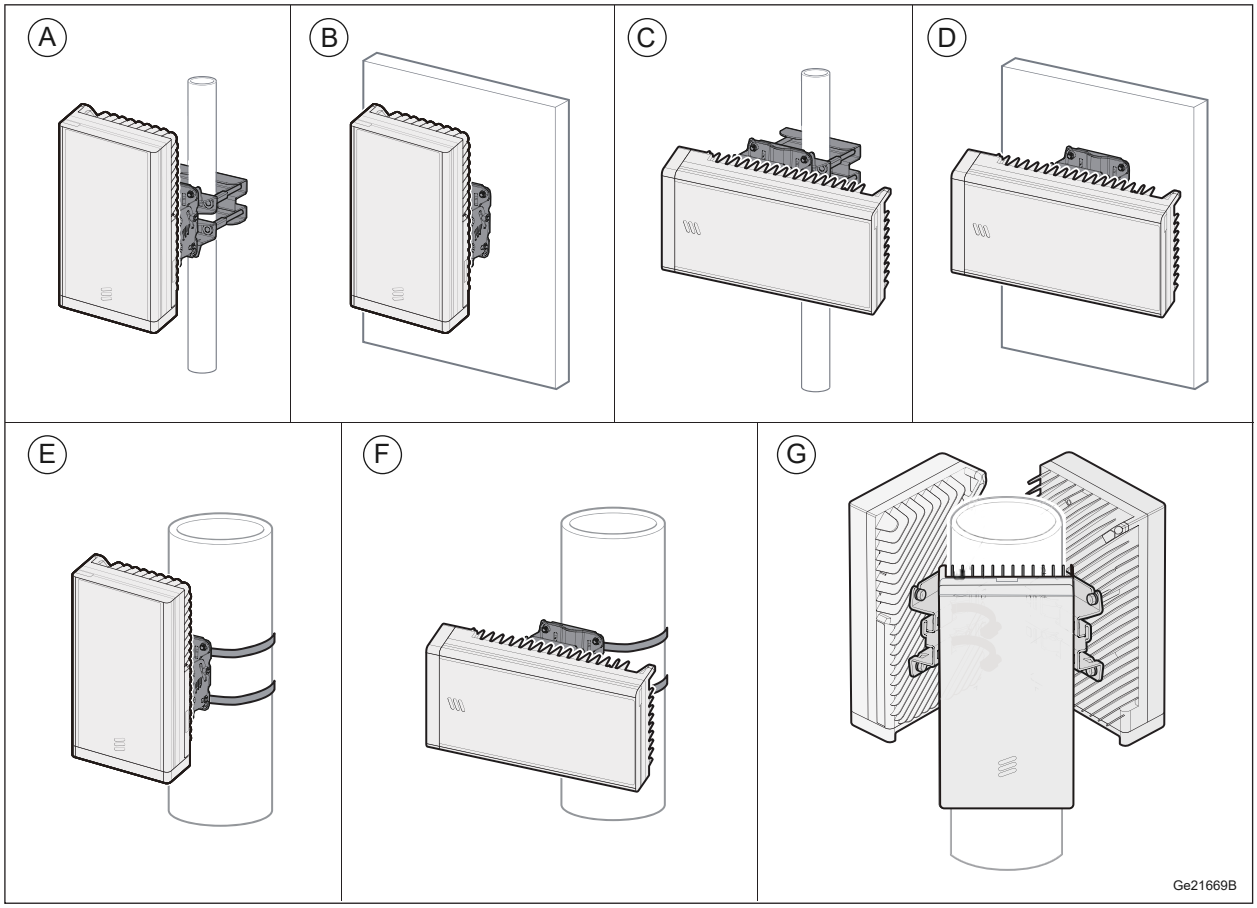



Figure 3 Installation Method Alternatives

Table 7 Key to Installation Alternatives

| Installation Method | Description |
|---|---|
| A | Pole installation (pole with circular, square, or 90° angle cross section) with vertical placement |
| B | Wall installation with vertical placement |
| C | Pole installation (pole with circular, square, or 90° angle cross section) with horizontal placement(1) |
| D | Wall installation with horizontal placement(1) |
| E | Utility pole installation with vertical placement(2)(3)(4) |
| F | Utility pole installation with horizontal placement(1) |
| G | Triple bracket pole installation |

(1) The PSU faces to the bottom.

(2) Steel bands for utility pole installations must be supplied locally.
(3) The strength and size of the steel bands used must be based on local requirements and environmental factors.
(4) For wooden utility poles, steel bands are not allowed. Use through bolt instead.

Table 8 Pole Mounting Range

| Pole | Circular | Square | 90° Angle |
|---|---|---|---|
| Minimum outer dimension(1) | Ø35 mm | 30 x 30 mm | 45 x 45 mm |
| Maximum outer dimension(1) | Ø300 mm | 80 x 80 mm | 80 x 80 mm |

(1) Depends on mounting kit used. For detailed information, see Site Installation Products Overview.

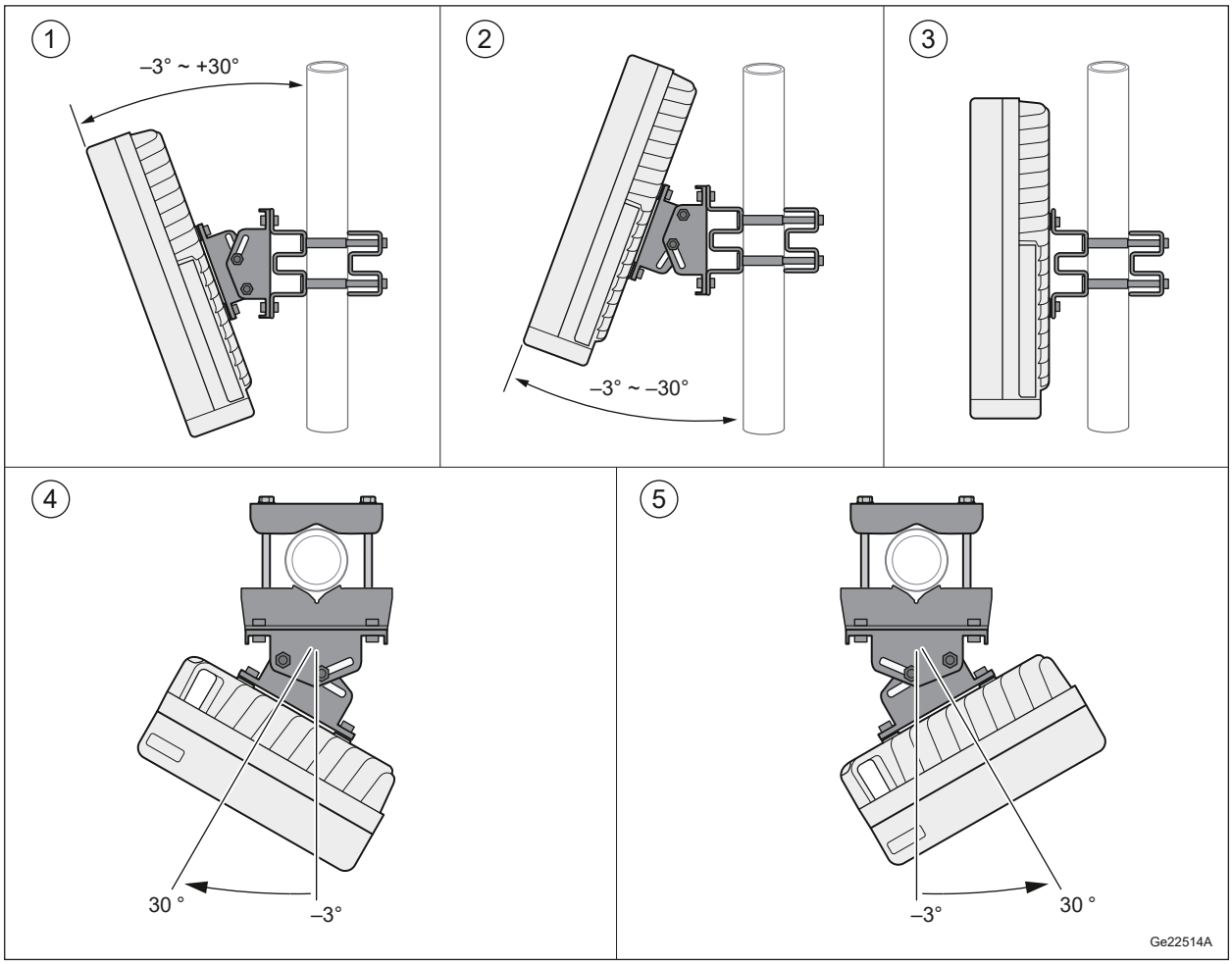



Figure 4 Tilt and Swivel Angle

# 3.5 Space Requirements

## 3.5.1 Generic Requirements

Parts of the radio can attain high temperatures during normal operation. Therefore the radio must be installed in a classified service access area. Exception applies when the radio is installed at a height that is not reachable from ground level.

Allow a sufficient working space in front of the radio.

It is recommended that the radio is installed below, or behind the antenna. Do not install the radio closer than 25 m from the main lobe of it its own antenna, or antennas belonging to other services or operators using the same site.

## 3.5.2 Pole or Mast Installation

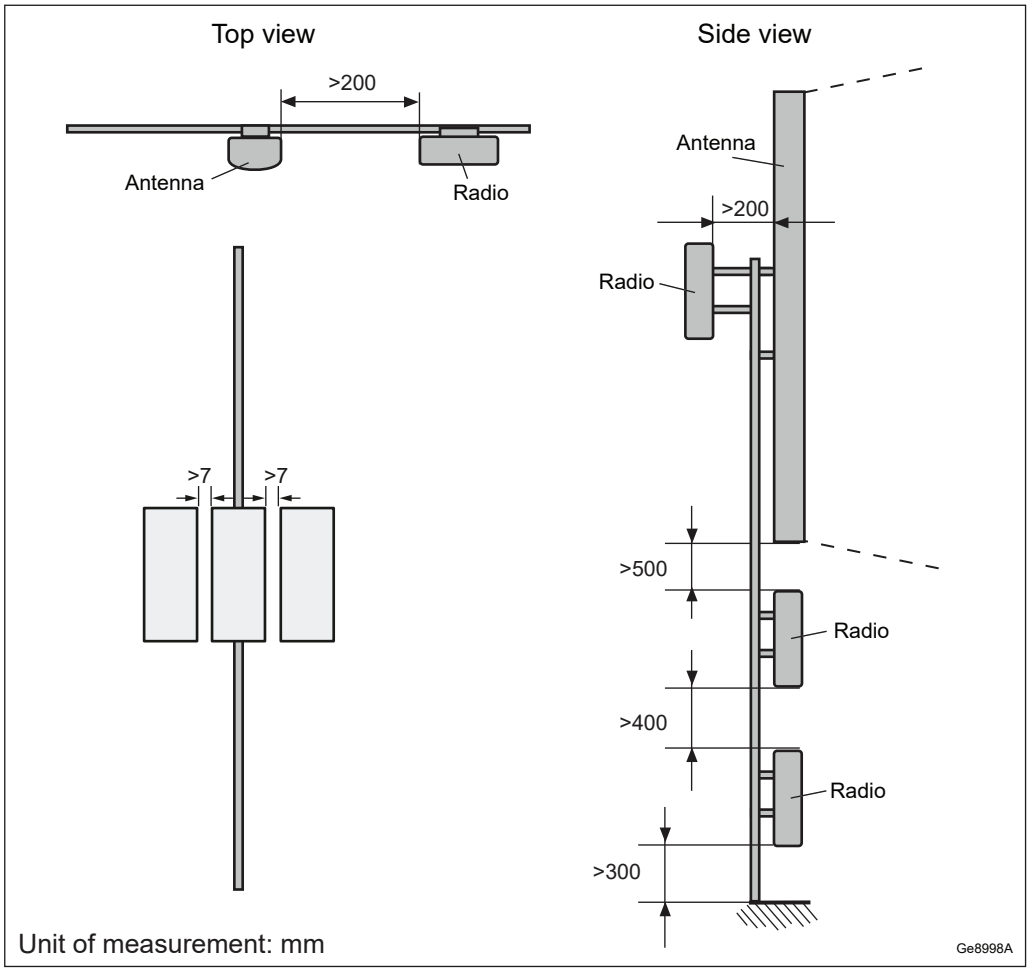



Figure 5 Radio Pole Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal bracket on a single pole, or a dual pole installation. Allow a minimum vertical distance of 500 mm between radio and antenna, if installed above or below an antenna. The minimum distance from the bottom of the radio to the floor is 300 mm for vertically installed radios.

Allow a minimum of 7 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be below +42°C.

Allow a minimum of 100 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be above +42°C and below +50°C. Only single radio installation on the bracket is supported when ambient temperature is expected to be above +50°C and below +55°C.

**Note:** A radio cannot be installed in the uppermost position of a pole or mast.

### 3.5.3 Radio Installation on Outdoor Wall

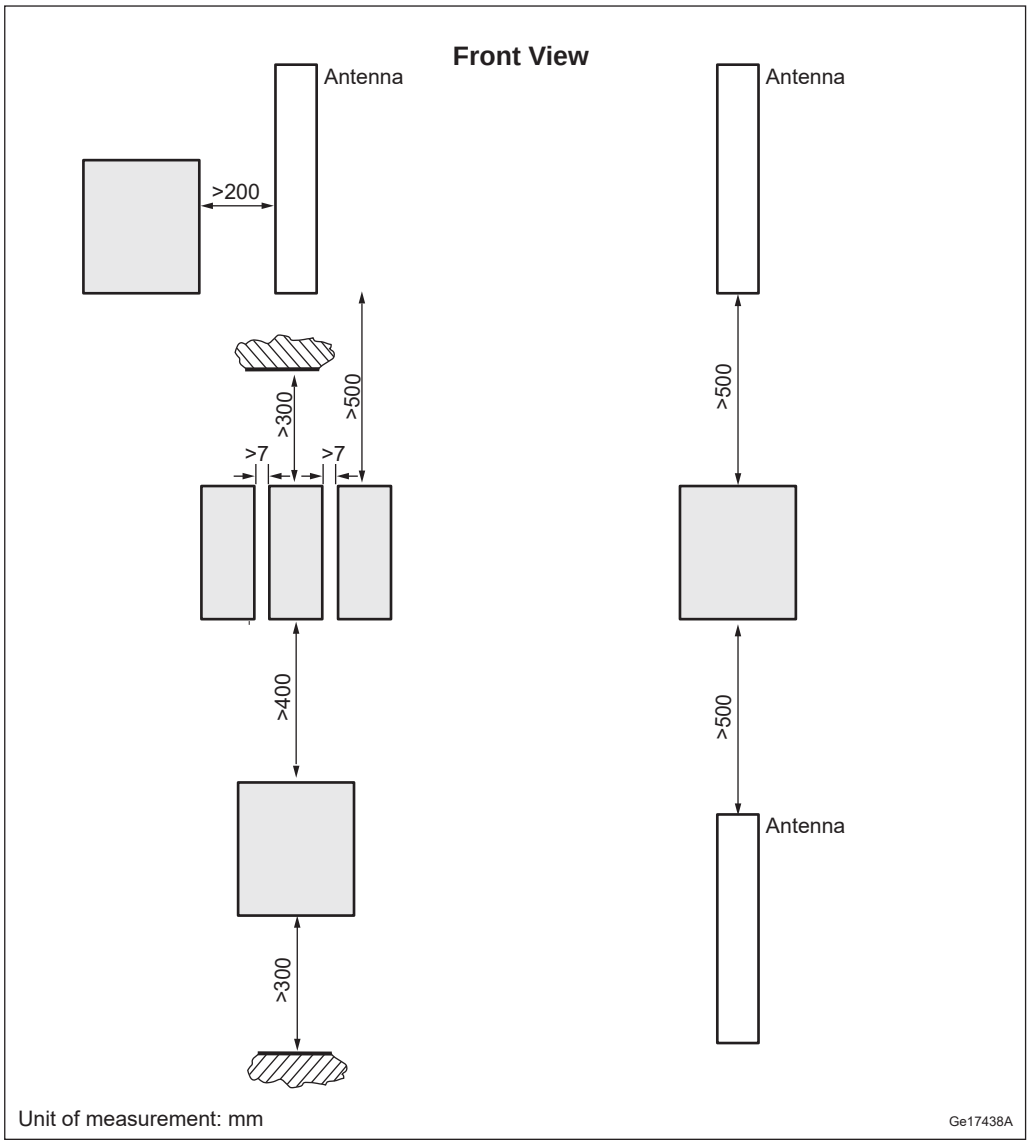



Figure 6 Radio Outdoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal bracket on a wall. Allow a minimum vertical distance of 500 mm between radio and antenna, if installed above or below an antenna.

Allow a minimum of 300 mm to any overhanging roof or other structure that may obstruct airflow and create a heat trap.

The minimum distance from the bottom of the radio to the floor is 300 mm for vertically installed radios.

Allow a minimum of 7 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be below +42°C.

Allow a minimum of 100 mm free space between radios installed side by side on the bracket when ambient temperature is expected to be above +42°C and below +50°C. Only single radio installation on the bracket is supported when ambient temperature is expected to be above +50°C and below +55°C.

## 3.6 Acoustic Noise

The radio does not have active cooling components. It can emit low levels of acoustic noise when operating on low capacity.

The sound pressure level when operating on low capacity is lower than 28 dBA at 1-meter distance and hemispherical distribution, and 25 dBA for spherical distribution.

## 3.7 Environmental Characteristics

This section contains operating environment data for the radio.

### 3.7.1 Operating Environment

The following are the values for the normal operating environment of the radio:

Table 9 Operating Environment

| Description | Value |
|---|---|
| Temperature(1) | −40 to +55 °C |
| Solar radiation | ≤ 1,120 W/m$^2$ |
| Relative humidity | 5–100% |
| Absolute humidity | 0.26–40 g/m$^3$ |
| Maximum temperature change | 6.0 °C/min |
| Maximum wind load at 42 m/s (pole installed single case) | B41: 121 N (front), 33 N (side) |

(1) Depending on installation scenario, traffic load, and configuration, the product can, in the highest 10 °C temperature range, temporarily reduce the output power. This depends on the durations of the high ambient temperature.

### 3.7.2 Heat Dissipation

The radio is convection cooled and designed for outdoor installation.

Avoid indoor installation in a room without adequate ventilation and cooling.

Max heat dissipation is calculated using the following formula:

```
Max Heat Dissipation = Max Power Consumption - Configured
Output Power
```

Heat dissipation can be calculated for different traffic loads using values from Power Consumption Data. For more information, see Power Consumption Calculations.

### 3.7.3 Vibration

This section describes how the Radio tolerates vibrations. The Radio operates reliably during seismic activity as specified by test method IEC 60068-2-57 Ff.

| | |
|---|---|
| Maximum level of RRS | 50 $m/s^2$ within 2–5 Hz for DR=2% |
| Frequency range | 1–35 Hz |
| Time history signal | Verteq II from earthquake standard ATIS 0600329.2014 |

The Radio operates reliably during random vibration as specified by test method IEC 60068-2-64.

Random vibration, normal operation:

| | |
|---|---|
| ASD-level | 0.3 $m^2/s^3$ on horizontal axes X and Y |
| | 0.2 $m^2/s^3$ on vertical axis Z |
| Frequency range | 2–200 Hz |
| Time per test direction | 30 minutes |

The Radio operates reliably during shock as specified by test method IEC 60068-2-27 Ea.

| | |
|---|---|
| Peak acceleration | 40 $m/s^2$ |
| Duration | 22 ms |

### 3.7.4 Materials

All Ericsson products fulfill the legal and market requirements regarding the following:

— Material declaration

— Materials' fire resistance, components, wires, and cables

— Recycling

— Restricted and banned material use

## 3.8 Power Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the radio.

Different power systems can supply power for multiple radios, if necessary.

### 3.8.1 AC Power Supply Characteristics

The AC power source must provide protection for overcurrent, short circuit, and grounding fault.

Voltage values and ranges are listed in Table 10.

Table 10 Radio AC Power Supply Requirements

| Conditions | Values and Ranges |
|---|---|
| Nominal Voltage | 100–250 V AC |
| Voltage Range including tolerance | 90–275 V AC |
| Connection | Line-Neutral, Line-Line |
| Operating frequency | 50/60 Hz |
| Voltage harmonics | < 10% at full load (1) |
| Shut-off allowance | At undervoltage or overvoltage |
| Inrush current peak | < 15 A |
| Inrush current duration | < 100 ms |
| AC system | TN, TT and IT |

(1) Must comply with IEC 61000-3-2

#### Fuse and Circuit Breaker Recommendations

The recommendations given in this section are based on peak power consumption and give no information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60947-2.

The PSU AC has a built-in Class 1 (Type 1) SPD to protect the equipment in case of lightning and network transients. The recommended fuse or circuit breaker rating is therefore dimensioned for not tripping the fuse or circuit breaker in case of SPD operation. The PSU AC is described in Table 11.

Table 11 Radio 4435 Fuse and Circuit Breaker Recommendations

| Unit (AC Powered) | Output Power | Nominal AC Input Voltage | Maximum AC Input Current(1) | Maximum Allowed Fuse Rating(2) |
|---|---|---|---|---|
| B41 | 4 × 20 W | 100–127 V | 5 A | 10 A |
| | | 200–250 V | 3 A | 6 A |

(1) The Maximum AC Input Current is calculated at a total tolerance of -10% of the nominal value.

(2) The Maximum Allowed Fuse Rating must be larger than the Maximum AC Input Current, yet still within a safety margin of 15%. This is to ensure reliable operation. However, it must not be larger than the standard value of the next or nearest higher fuse or circuit breaker. This is in order to minimize the cable cross-section area and comply with the relevant safety standard.

When the radio connected Line-Line a 2-pole circuit breaker or dual fuses are required for interruption of both lines. This is also valid when the radio is used in an IT system.

### 3.8.2 Power Consumption

For information on power consumption, see Power Consumption Calculations.

## 3.9 System Characteristics

This section describes the system characteristics of the Radio System.

### 3.9.1 RF Electromagnetic Field Exposure

For general information on RF EMF exposure, see Radio Frequency Electromagnetic Fields.

Table 12 and Table 13 list the compliance boundaries (exclusion zones), outside of which the RF EMF exposure from Radio 4435 is below the limits specified by the ICNIRP, and the limits applicable in:

— EU (1999/519/EC, 2013/35/EU, EN 50385)

— USA (47 CFR 1.1310)

Table 12 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in the EU and Markets Employing the ICNIRP RF Exposure Limits (Including 0.5 dB Transmission Loss and 0.6 dB Power Tolerance)

| Mode and Output Power for Radio 4435 | | | | | Dimensions of the Box-shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance in Front of Antenna | | Width | | Height | | Distance Behind Antenna | |
| Band | Standard | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | TDD DL Duty Cycle | GP | O | GP | O | GP | O | GP | O |
| B41 | LTE/NR | 4 × 20 W | E+ | 75% | 8.2 | 3.0 | 5.2 | 1.7 | 2.5 | 1.5 | <0.1 | <0.1 |

(1) The compliance boundaries are determined for maximum output power with transmission loss, output power tolerance, and TDD downlink duty cycle included using the antenna 80020622 for an electrical tilt of 2°.

Table 13 Dimensions of the Box-Shaped Compliance Boundary for General Public (GP) and Occupational (O) Exposure Applicable in the USA and Markets Employing the FCC RF Exposure Limits (Including 0.5 dB Transmission Loss and 0.6 dB Power Tolerance)

| Mode and Output Power for Radio 4435 | | | | | Dimensions of the Box-shaped Compliance Boundary(1) (m) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Distance in Front of Antenna | | Width | | Height | | Distance Behind Antenna | |
| Band | Standard | Nominal Peak Output Power from the Radio | IEC 62232 Installation Class | TDD DL Duty Cycle | GP | O | GP | O | GP | O | GP | O |
| B41 | LTE/NR | 4 × 20 W | E+ | 75% | 8.7 | 3.9 | 6.2 | 2.8 | 2.5 | 1.9 | 0.3 | 0.2 |

(1) For B41, the compliance boundaries are determined for maximum output power with transmission loss, output power tolerance, and TDD downlink duty cycle included using the antenna 80020622 for an electrical tilt of 2°.

### 3.9.2 Software

For information on software dependencies, see Supported Radio Capabilities.

### 3.9.3 Radio Configurations

For information about available radio configurations, see Radio Node Configurations.

# 4 Hardware Architecture

This section describes the radio hardware structure regardless of configuration or frequency. For a description of the currently available radio configurations, see RBS Configurations.

## 4.1 Radio Parts

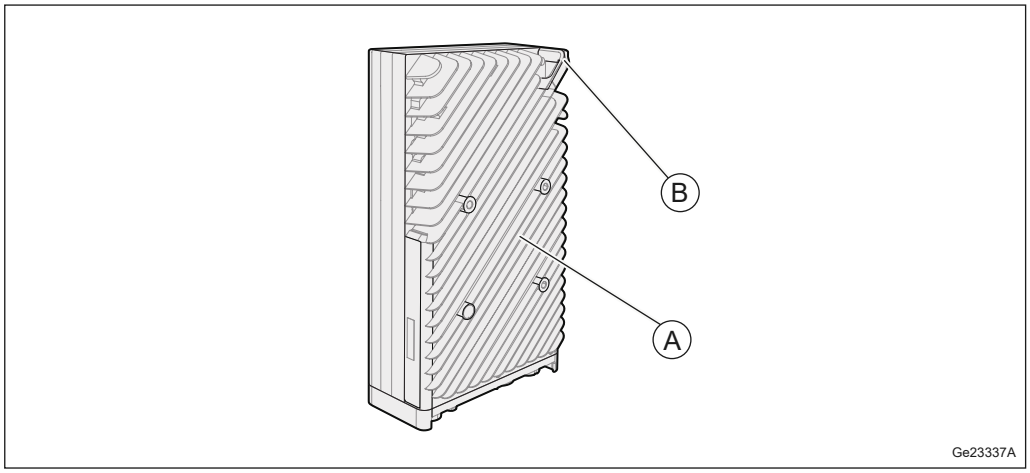



Figure 7 Radio Parts

Table 14 Key to Radio Parts

| Position | Component |
|---|---|
| A | Cooling fins |
| B | Lifting eye |

## 4.2 TRX

The Transmitter and Receiver (TRX) provides the following:

— Analog/Digital (A/D), Digital/Analog (D/A) conversion

— Channel filtering

— Delay and gain adjustment

— Digital predistortion

— RF modulation and demodulation

— Optical cable interface termination

— Four receivers for RX diversity

## 4.3 Optical Indicators and Maintenance Button

The radio unit is equipped with optical indicators and a maintenance button. The locations of the optical indicators and the maintenance button are shown in .

Table 15 describes how to interpret the optical indicators and maintenance button on the radio unit. For detailed information, refer to Indicators, Buttons, and Switches.

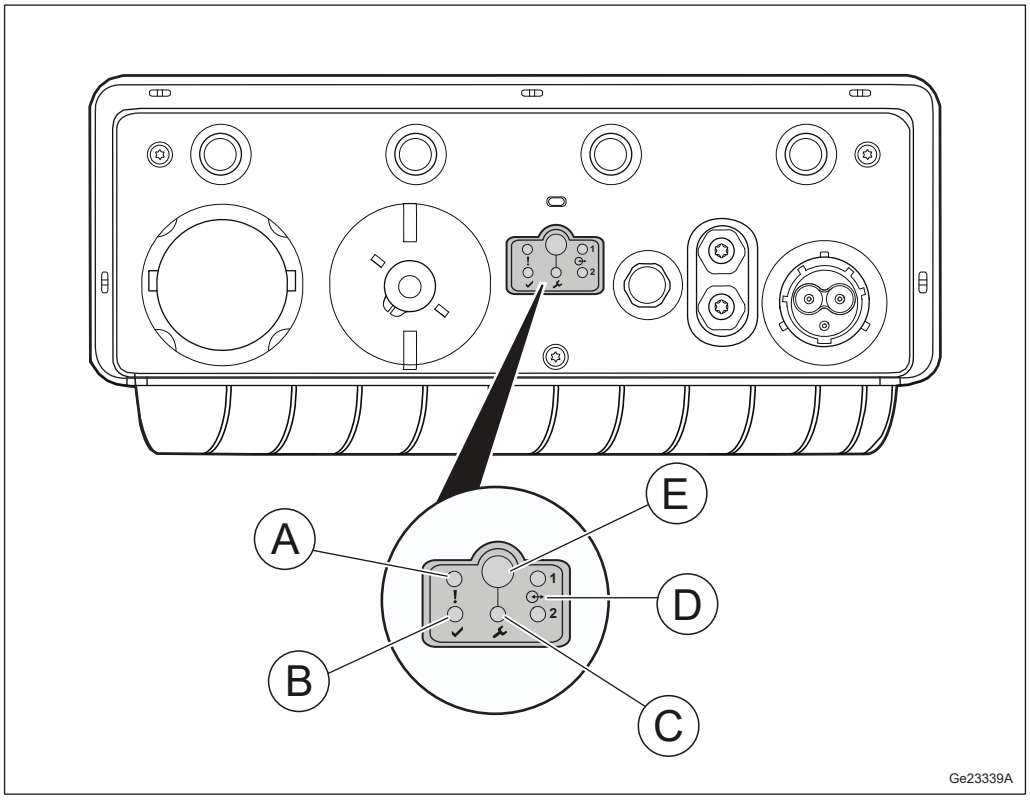



Figure 8 Optical Indicators and Maintenance Button

Table 15 Radio Unit Optical Indicators and Maintenance Button

| Position | Marking | Indicator | Color | Mode | Interpretation |
|---|---|---|---|---|---|
| A | ! | Fault | Red | Off | No fault detected in unit |
| | | | | On | Fault detected in unit |
| B | ✔ | Operational | Green | Off | No power |

| Position | Marking | Indicator | Color | Mode | Interpretation |
|---|---|---|---|---|---|
| | | | | On | Operational |
| | | | | Flashing Slowly (0.5 Hz) | Missing dependent resource |
| | | | | Flickering (16 Hz) | Transitory activity |
| | | | | Double flashing Off | Loading in progress<br>No ongoing traffic |
| | | | | Double flashing On | Loading in progress<br>Traffic is ongoing |
| C |  | Maintenance | Blue | Off | No ongoing maintenance activity<br>Traffic is ongoing |
| | | | | On | Maintenance mode<br>All traffic and alarms are suppressed |
| | | | | Flashing Slowly (0.5 Hz) | Maintenance mode is initiated<br>When traffic and alarms are removed, the indicator switches to **On** |
| D |  1,  2 | Interface | Green | Off | Disconnected |
| | | | | On | Connected |
| E | – | Maintenance button | – | – | – |

# 5 Connection Interfaces

This section contains information about the connection interfaces of the radio.

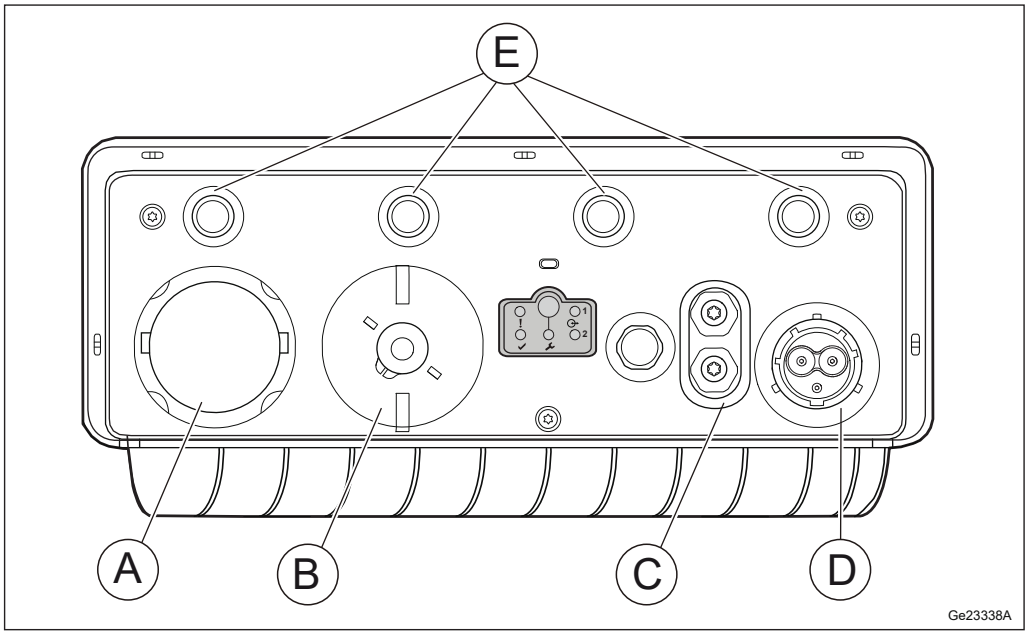
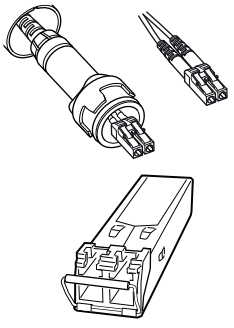
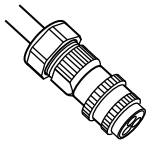
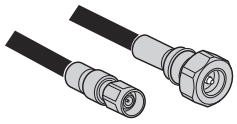



Figure 9 Connection Interfaces

Table 16 Connection Interfaces

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| A | Optical cable 1 | 1 | LC (On SFP+) with support for FullAXS |  |
| B | Optical cable 2 | 2 | | |
| C | Grounding | ⏚ | 2 × 6 mm dual lug |  |

| Position | Description | Marking | Connector Types | Cable Illustration |
|---|---|---|---|---|
| D | 100–250 V AC power supply | 100–250V ~ | Power connector |  |
| E | Antenna A–D (from left to right) | A<br>B<br>C<br>D | NEX10 |  |

## 5.1 Antenna Interface

The antenna interfaces provide connections for the radio to antennas. The jumper and RF cables connect the radio to the antenna.

Table 17 Radio Antenna Connection Interface Characteristics

| Connector Type | Jumper Cable Type | RF Cable Type |
|---|---|---|
| NEX10 female | NEX10 male on one end and 4.3-10 female on the other end | 50 Ω 1/2-inch coaxial, 4.3-10 male |

Table 18 Antenna Cable Connectors

| Radio Connectors | Antenna Connectors |
|---|---|
| (Antenna A–Antenna D) | TX/RX |

## 5.2 Interface for Optical Cable to Main Unit

The ⊶ 1 and ⊶ 2 interfaces provide connections to optical cables for traffic and timing signals between the radio and the main unit. An SFP+ is used to connect the optical cable to the radio.

**Note:** The radio uses SFP+ modules for optical transmission and optical radio interfaces on Data 1 (optical cable 1) and Data 2 (optical cable 2).

Only use SFP+ modules approved and supplied by Ericsson. These modules fulfill the following:

— Compliance with Class 1 laser product safety requirements defined in standard IEC 60825-1.

— Certification according to general safety requirements defined in standard IEC 62368-1.

— Functional and performance verified to comply with Radio System specifications.

Recommended SFP+ modules are obtained from the product packages for the Radio System and the Main Remote Installation products. For more information about SFP modules, see SFP Module Selector Guide and Site Installation Products Overview.

## 5.3 100-250 V AC Power Supply Interface

The AC power connection is made through a connector (RNT 447 31/03).

Table 19 AC Power Connector Capabilities

| Conditions | Values and Ranges |
|---|---|
| Cable outer diameter | 6 to 18 mm |
| Terminal size | 1.5 to 4.0 $mm^2$ |

Table 20 Minimum AC Power Supply Cable

| Cable Length | Cross-Sectional Area of Each Conductor |
|---|---|
| ≤ 100 m | 3 x 1.5 $mm^2$ |

The power cable has a wire for Line (L), a wire for Line/Neutral (L/N), and a wire for Protective Earth (PE) conductors. The wire color code for wires is market dependent.

All cables must be shielded. The shield must be folded back over the outer jacket of the cable and properly connected to the radio chassis, otherwise the radio overvoltage does not function properly.

The AC cable temperature rating must be at least 70 °C.

## 5.4 Grounding Interface

The unit must be grounded to protect it from overvoltage and lightning strikes.

For more information about grounding principles, see Grounding Guidelines for RBS Sites.

# 6 Standards and Regulations

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity for the radio.

This device complies with Part 15 of the FCC CFR 47 rules. Operation is subject to the following two conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation.

## 6.1 Regulatory Approval

### 6.1.1 Environmental Standards Compliance

The product complies with the following environmental standard:

**Europe**

— Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU)

### 6.1.2 Safety Standards Compliance

In accordance with market requirements, the product complies with the following product safety standards and directives:

**Europe**

— EN 50385

— EN 62368-1

**North America**

— Health Canada Safety Code 6

— UL 62368-1

— CSA-C22.2 No. 62328-1

#### 6.1.2.1 Outdoor Specific Requirements

The product complies with the following outdoor specific requirements:

**Europe**

— EN 60529 (IP65)

— EN 60950-22

**North America**

— UL 50E

— UL 60950-22

— CSA-C22.2 No. 60950-22-07

### 6.1.3 EMC Standards Compliance

The product complies with the following Electromagnetic Compatibility (EMC) standards:

**North America**

— FCC CFR 47 Part 15 B

— IC ICES-003 B

### 6.1.4 Radio Standards Compliance

The product complies with the following radio standards:

**North America**

— FCC CFR 47 Part: 2, 27 (US Band/Frequency Specific)

### 6.1.5 Marking

To show compliance with legal requirements, the product is marked with the following labels:

**North America**

— cETLus

— FCC CFR 47 Part 15 Statement

— IC ICES-003 Statement

— FCC ID Number

## 6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory approved.

### 6.2.1 Spare Parts

The product adheres to the Ericsson Serviceability and Spare Part Strategy.

### 6.2.2 Surface Quality

The surface quality of the radio is according to Ericsson standard class A5 for the top, front, and side covers, and A6 for the heat-sink.

### 6.2.3 Vandal Resistance

Unauthorized access is not possible without damaging the tamper proof warranty seal.

pepco holdings
AN EXELON COMPANY

ATLANTIC CITY ELECTRIC (ACE), DELMARVA POWER & LIGHT (DPL), and
POTOMAC ELECTRIC POWER (PEPCO)

# STANDARD AGREEMENT
## Notice to Proceed (NTP)

**Notice to Proceed (NTP) expires 6 months from issue Date** **Issue Date:** 03-22-2023

**[(CHECK ONE) [Licensor]**

☐ **ATLANTIC CITY ELECTRIC** ☐ **DELMARVA POWER & LIGHT** ☒ **POTOMAC ELECTRIC POWER COMPANY**

| LICENSEE NAME: | SITE ID: | LOCATION: |
|---|---|---|
| Crown Castle NG Atlantic LLC (formerly NextG Networks Atlantic Inc) | MNG-094m1 | 789 Hudson Avenue Takoma Park MD 20912 |

In regards to the site referenced above PHI give (Licensee) Crown Castle NG Atlantic LLC (formerly NextG Networks Atlantic Inc) Notice to proceed with the (Installation/Upgrade) of this site with the conditions outlines below.

**SCOPE OF WORK (SOW)**

| PHI WORK REQUEST: | PHI APPROVED CONTRACTOR IF APPLICABLE: |
|---|---|
| 16715823 PM20DF125/HP20PM347 | |

DESCRIPTION OF SOW: Specific node plan drawings are attached hereto and incorporated into this NTP by reference. Installation of the equipment set forth in these drawings is being permitted in this NTP.

Pole Loading - MNG-094m1 - P# 799427-250080 - 12-03-2019
Construction Drawing - MNG-094m1 - P# 799427-250080 - 04-02-2020

**CONDITIONS:**

| UTILITY POLE NUMBER: | |
|---|---|
| 799427-250080 | ☐ This pole does not support any primary Circuits and an outage is NOT necessary to complete this work safely.<br>☐ All above ground work within the "power space" must be done by PHI or PHI approved contractor. |

**This NTP must be presented to PHI field representative in order for work to commence.**
Each request installation workday may require confirmation and coordination at least 24 hours in advance with PHI field representative. Prior to Licensee installation, Licensee must obtain approval from local municipality /permitting entity to install wireless and/or strand mount equipment to any Pepco owned pole. A PHI representative must be present on site when the work is being performed. Licensee and its contractors must adhere to PHI construction protocol; Joint Use Department, Transmission Construction and Project Management PHI Standards Guideline No. 1722 Rev D, PHI's Safety Manual.

**POST INSPECTION**

Upon completion of Installation/Upgrade work, please contact the Joint Use Project Coordinator to schedule a Post Construction Inspection. Failing Post Construction inspection locations will not have a meter placed until any and all deficiencies are corrected.

**LICENSEE SIGNATURE**

By Signing below Licensee authorized representative hereby acknowledges receipt of the documents listed herein.

Name: Neil Begelman Date: 3/28/23

CROWN CASTLE FIBER LLC
TITLE SHEET

## CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND 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 THE LATEST EDITIONS OF THE FOLLOWING CODES.

- COMAR 9.12.53, ADAAG & FHAG
- 2018 ICC INTERNATIONAL BUILDING CODE INCORPORATING MONTGOMERY COUNTY AMENDMENTS PUBLISHED PER ER #31-19
- 2018 ICC INTERNATIONAL RESIDENTIAL CODE
- 2018 ICC INTERNATIONAL EXISTING BUILDING CODE
- MBRC MARYLAND BUILDING REHABILITATION CODE
- 2012 IGCC GREEN BUILDING CODE
- 2018 ICC INTERNATIONAL ENERGY CONSERVATION
- 2018 ICC INTERNATIONAL FUEL/GAS CODE
- 2018 ICC INTERNATIONAL MECHANICAL CODE
- 2017 NFPA 70 NATIONAL ELECTRICAL CODE
- 2013 NFPA 72
- 2013 COMAR NFPA 72
- 2015 NFPA 1 & 101
- WSSC PLUMBING CODE
- WSSC FUEL GAS CODE
- 2013 NFPA 13D
- 2013 COMAR NFPA 13D
- 2013 NFPA 13/13R
- 2013 COMAR NFPA 13/13R
- TIA-222-H-2016

## SCOPE OF WORK

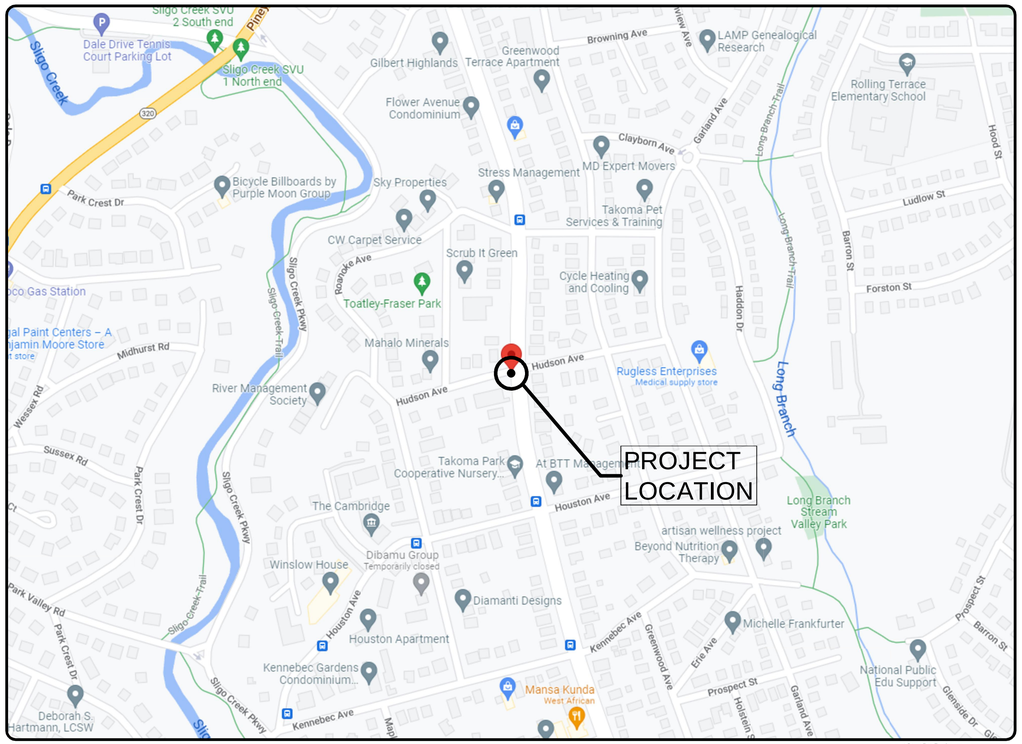
SCOPE OF WORK CONSISTS OF INSTALLING A NEW STRAND MOUNT AND AUXILIARY EQUIPMENT ON NEW STRAND / MESSENGER CABLE. STRAND / MESSENGER CABLE WILL BE ATTACHED TO EXISTING WOODEN UTILITY POLE. NEW ANTENNA, DIPLEXER, AND RADIO SHALL BE MOUNTED ON A PROPOSED BRACKET MOUNT AND THE BRACKET MOUNT, SPLICE BOX, AND POWER CONVERTER WILL ALL BE MOUNTED ON NEW STRAND / MESSENGER CABLE.

DPS BATCH STAMP

# CROWN CASTLE FIBER LLC
# SITE NAME: MNG-094M1
# 8240 FLOWER AVE
# TAKOMA PARK, MD 20912
# JURISDICTION: MONTGOMERY COUNTY
# PROPOSED STRAND MOUNT INSTALLATION

## INDEX OF SHEETS

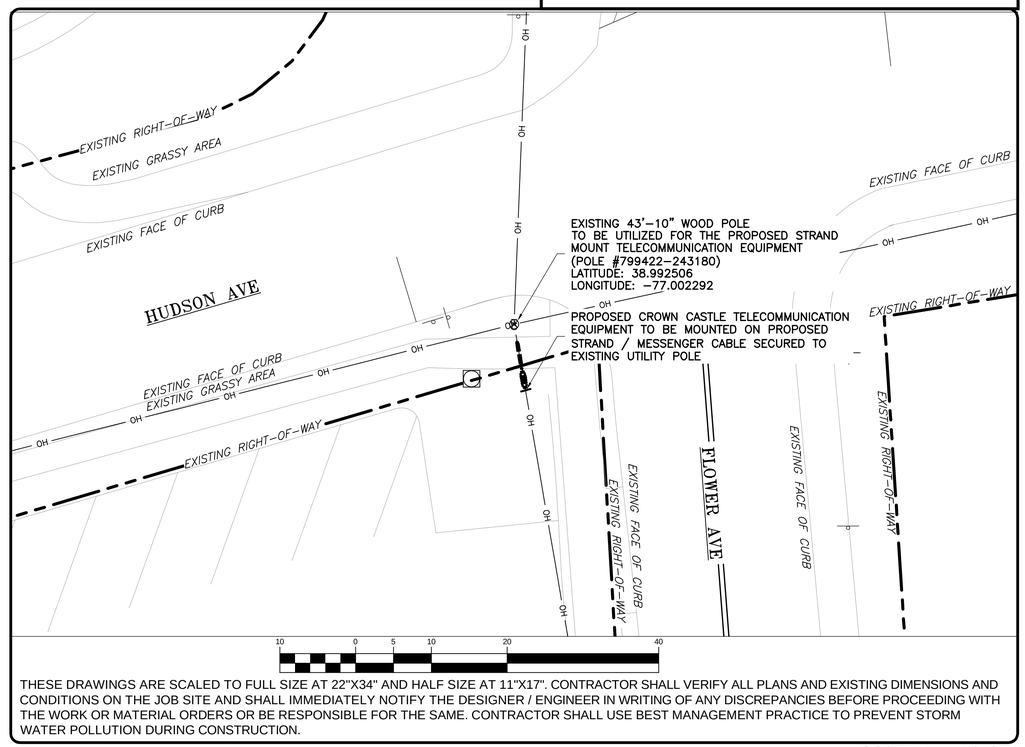

| | |
|---|---|
| T-1 | TITLE SHEET |
| GN-1 | GENERAL NOTES |
| GN-2 | GENERAL NOTES |
| C-1 | SITE PLAN |
| C-2 | ENLARGED SITE PLAN |
| C-3 | EXISTING ELEVATIONS |
| C-4 | PROPOSED ELEVATIONS |
| C-5 | ENLARGED ELEVATION |
| D-1 | PLUMBING DIAGRAM |
| D-2 | EQUIPMENT & ANTENNA DETAILS |
| D-3 | POWER CONVERTER & DISCONNECT ASSEMBLY DETAILS |
| G-1 | GROUNDING DETAILS |
| TCP-1 | TRAFFIC CONTROL PLANS |


NO SCALE

## LOCATION MAP

NODE LOCATION:
LATITUDE: 38.992506° (N 38° 59' 33.021")
LONGITUDE: -77.002292° (W -77° 0' 8.2506")




THESE DRAWINGS ARE SCALED TO FULL SIZE AT 22"X34" AND HALF SIZE AT 11"X17". CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE DESIGNER / ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR MATERIAL ORDERS OR BE RESPONSIBLE FOR THE SAME. CONTRACTOR SHALL USE BEST MANAGEMENT PRACTICE TO PREVENT STORM WATER POLLUTION DURING CONSTRUCTION.

SCALE: 1" = 10'-0"

MARYLAND ONE CALL SYSTEM, INC. 1-800-257-7777 STOP. CALL BEFORE YOU DIG!

MARYLAND LAW REQUIRES THREE WORKING DAYS NOTICE PRIOR TO ANY EARTH MOVING ACTIVITIES

811 Know what's below. Call before you dig.

## NODE PLACEMENT

8240 FLOWER AVE
POLE TAG ID: 799422-243180
PEPCO FACILITY ID: 799422-243180
ZONING CLASSIFICATION = R-10

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1
8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY
LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND TRENT TRAVIS SNARR 55491 PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

| | |
|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: T-1

# CROWN CASTLE FIBER LLC
# GENERAL NOTES

## GENERAL NOTES:

1. THE CONTRACTOR SHALL GIVE ALL NOTICE AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY, MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, AND LOCAL AND STATE JURISDICTIONAL CODES BEARING ON THE PERFORMANCE OF THE WORK. THE WORK PERFORMED ON THE PROJECT AND THE MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES.
2. THE ARCHITECT/ENGINEER HAS MADE EVERY EFFORT TO SET FORTH IN THE CONSTRUCTION AND CONTRACT DOCUMENTS THE COMPLETE SCOPE OF WORK. THE CONTRACTOR BIDDING THE JOB IS NEVERTHELESS CAUTIONED THAT MINOR OMISSIONS OR ERRORS IN THE DRAWINGS AND SPECIFICATIONS SHALL NOT EXCUSE SAID CONTRACTOR FROM COMPLETING THE PROJECT AND IMPROVEMENTS IN ACCORDANCE WITH THE INTENT OF THESE DOCUMENTS.
3. THE CONTRACTOR OR BIDDER SHALL BEAR THE RESPONSIBILITY OF NOTIFYING (IN WRITING) THE CROWN CASTLE CONSTRUCTION MANAGER OF ANY CONFLICTS, ERRORS, OR OMISSIONS PRIOR TO THE SUBMISSION OF CONTRACTOR'S PROPOSAL OR PERFORMANCE OF WORK. IN THE EVENT OF DISCREPANCIES THE CONTRACTOR SHALL PRICE THE MORE COSTLY OR EXTENSIVE WORK, UNLESS DIRECTED IN WRITING OTHERWISE.
4. THE SCOPE OF WORK SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, LABOR AND ALL OTHER MATERIALS AND LABOR DEEMED NECESSARY TO COMPLETE THE WORK/PROJECT AS DESCRIBED HEREIN, EXCEPT FOR FIBER OPTIC CABLE AND OTHER MATERIALS IDENTIFIED BY CROWN CASTLE.
5. THE CONTRACTOR SHALL VISIT THE JOB SITE PRIOR TO THE SUBMISSION OF BIDS OR PERFORMING WORK TO FAMILIARIZE HIMSELF WITH THE FIELD CONDITIONS AND TO VERIFY THAT THE PROJECT CAN BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
6. THE CONTRACTOR SHALL OBTAIN AUTHORIZATION TO PROCEED WITH CONSTRUCTION PRIOR TO STARTING WORK ON ANY ITEM NOT CLEARLY DEFINED BY THE CONSTRUCTION DRAWING/CONTRACT DOCUMENTS.
7. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS ACCORDING TO THE MANUFACTURE'S/VENDOR'S SPECIFICATION UNLESS NOTED OTHERWISE OR WHERE LOCAL CODES OR ORDINANCES TAKE PRECEDENCE.
8. THE CONTRACTOR SHALL PROVIDE A FULL SET OF CONSTRUCTION DOCUMENTS AT THE SITE UPDATED WITH THE LATEST REVISIONS AND ADDENDUMS OR CLARIFICATIONS AVAILABLE FOR THE USE BY ALL PERSONNEL INVOLVED WITH THE PROJECT.
9. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE PROJECT DESCRIBED HEREIN. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTIONS MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING, AND KEEPING A COPY ON SITE, ALL PERMITS AND INSPECTIONS WHICH MAY BE REQUIRED FOR THE ARCHITECT/ENGINEER, THE STATE, COUNTY OR LOCAL GOVERNMENT AUTHORITY.
11. THE CONTRACTOR SHALL MAKE NECESSARY PROVISIONS TO PROTECT EXISTING IMPROVEMENTS, EASEMENTS, PAVING, CURBING, ETC. DURING CONSTRUCTION. UPON COMPLETION OF WORK, THE CONTRACTOR SHALL REPAIR ANY DAMAGE THAT MAY HAVE OCCURRED DUE TO CONSTRUCTION ON OR ABOUT THE PROPERTY TO ORIGINAL OR BETTER CONDITION.
12. THE CONTRACTOR SHALL KEEP THE GENERAL WORK AREA CLEAN AND HAZARD FREE DURING CONSTRUCTION AND DISPOSE OF ALL DIRT, DEBRIS, RUBBISH AND REMOVE EQUIPMENT NOT SPECIFIED AS REMAINING ON THE PROPERTY. PREMISES SHALL BE LEFT IN CLEAN CONDITION AND FREE FROM PAINT SPOTS, DUST, OR SMUDGES OF ANY NATURE.
13. THE CONTRACTOR SHALL COMPLY WITH ALL OSHA REQUIREMENTS AS THEY APPLY TO THIS PROJECT.
14. THE CONTRACTOR SHALL NOTIFY THE CROWN CASTLE CONSTRUCTION MANAGER WHERE A CONFLICT OCCURS ON ANY OF THE CONTRACT DOCUMENTS. THE CONTRACTOR IS NOT TO ORDER MATERIAL OR CONSTRUCT ANY PORTION OF THE WORK THAT IS IN CONFLICT UNTIL IS RESOLVED BY THE CROWN CASTLE CONSTRUCTION MANAGER.
15. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, PROPERTY LINES, ETC. ON THE PROJECT.
16. OWNER/CONTRACTOR SHALL CONTACT ONE CALL MINIMUM 72 HOURS PRIOR TO THE START OF CONSTRUCTION FOR LOCATION OF EXISTING UNDERGROUND UTILITIES.
17. SUBMITTAL OF BID INDICATES THAT THE CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
18. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.
19. CONTRACTOR SHALL COORDINATE ALL WORK BETWEEN TRADES AND ALL OTHER SCHEDULING AND PROVISIONARY CIRCUMSTANCES SURROUNDING THE PROJECT.
20. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR COMPLETE AND FUNCTIONALLY OPERATING SYSTEMS ENERGIZED AND READY FOR USE THROUGHOUT AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
21. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION. LEGALLY DISPOSE OF ALL REMOVED, UNUSED AND EXCESS MATERIAL GENERATED BY THE WORK OF THIS CONTRACT. DELIVER ITEMS INDICATED ON THE DRAWINGS TO THE OWNER IN GOOD CONDITION. OBTAIN SIGNED RECEIPT UPON DELIVERY.
22. AFTER COMPLETION OF CONSTRUCTION, RED LINED AS-BUILT PLANS SHALL BE PROVIDED TO CROWN CASTLE CONSTRUCTION MANAGER.

## GROUNDING NOTES:

1. GROUNDING SHALL COMPLY WITH ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE.
2. ALL GROUNDING DEVICES SHALL BE U.L. APPROVED OR LISTED FOR THEIR INTENDED USE.
3. ALL WIRES SHALL BE AWG THHN/THWN COPPER UNLESS NOTED OTHERWISE.
4. GROUNDING CONNECTIONS TO GROUND RODS, GROUND RING WIRE AND POLE BASE, SHALL BE EXOTHERMIC ("CADWELDS") UNLESS NOTED OTHERWISE. CLEAN SURFACES TO SHINY METAL WHERE GROUND WIRES ARE CADWELDED TO GALVANIZED SURFACES, SPRAY CADWELD WITH GALVANIZING PAINT.
5. GROUNDING CONNECTIONS TO GROUND BARS ARE TO BE TWO-HOLE BRASS MECHANICAL CONNECTORS WITH STAINLESS STEEL HARDWARE (INCLUDING SCREW SET) CLEAN GROUND BAR TO SHINY METAL AFTER MECHANICAL CONNECTION, TREAT WITH PROTECTIVE ANTIOXIDANT COATING.
6. ROUTE GROUNDING CONDUCTORS THE SHORTEST AND STRAIGHTEST PATH POSSIBLE. BEND GROUNDING LEADS WITH A MINIMUM 12" RADIUS.
7. INSTALL #2 AWG GREEN-INSULATED STRANDED WIRE FOR ABOVE GRADE GROUNDING AND #2 TINNED SOLID COPPER WIRE FOR BELOW GRADE GROUNDING UNLESS OTHERWISE NOTED.
8. REFER TO GROUNDING PLAN FOR GROUND BAR LOCATIONS. GROUNDING CONNECTIONS SHALL BE EXOTHERMIC TYPE ("CADWELDS") TO ANTENNA MOUNTS AND GROUND RING. REMAINING GROUNDING CONNECTIONS SHALL BE COMPRESSION FITTINGS. CONNECTIONS TO GROUND BARS SHALL BE MADE WITH TWO-HOLE LUGS.
9. THE GROUND ELECTRODE SYSTEM SHALL CONSIST OF DRIVEN GROUND RODS POSITION ACCORDING TO GROUNDING PLAN. THE GROUND RODS SHALL BE 5/8"X10'-0" COPPER CLAD STEEL INTERCONNECTED WITH #2AWG BARE, TINNED SOLID COPPER WIRE BURIED 36" BELOW GRADE. BURY GROUND RODS A MAXIMUM OF 15' APART, AND A MINIMUM OF 6' APART.
10. IF ROCK IS ENCOUNTERED GROUND RODS SHALL BE PLACED AT AN OBLIQUE ANGLE NOT TO EXCEED 45°.
11. EXOTHERMIC WELDS SHALL BE MADE IN ACCORDANCE WITH ERICO PRODUCTS BULLETIN A-AT OR EQUAL.
12. CONSTRUCTION OF GROUND RING AND CONNECTIONS TO EXISTING GROUND RING SYSTEM SHALL BE DOCUMENTED WITH PHOTOGRAPHS PRIOR TO BACKFILLING SITE. PROVIDE PHOTOS TO THE CROWN CASTLE CONSTRUCTION MANAGER.
13. ALL GROUND LEADS EXCEPT THOSE TO THE EQUIPMENT ARE TO BE #2 TINNED SOLID COPPER WIRE. ALL EXTERIOR GROUND BARS TINNED COPPER.
14. PRIOR TO INSTALLING LUGS ON GROUND WIRES, APPLY THOMAS & BETTS KOPR-SHIELD (TM OF JET LUBE INC.), PRIOR TO BOLTING GROUND WIRE LUGS TO GROUND BARS, APPLY KOPR-SHIELD OR EQUAL.
15. ENGAGE AN INDEPENDENT ELECTRICAL TESTING FIRM TO TEST AND VERIFY THAT IMPEDANCE DOES NOT EXCEED FIVE OHMS TO GROUND BY MEANS OF "FALL OF POTENTIAL TEST". TEST SHALL BE WITNESSED BY A CROWN CASTLE REPRESENTATIVE, AND RECORDED ON THE "GROUND RESISTANCE TEST" FORM.
16. WHERE BARE COPPER GROUND WIRES ARE ROUTED FROM ANY CONNECTION ABOVE GRADE TO GROUND RING, INSTALL WIRE IN 3/4" PVC SLEEVE, FROM 1' BELOW GRADE AND SEAL TOP WITH SILICONE MATERIAL.
17. PREPARE ALL BONDING SURFACES FOR GROUNDING CONNECTIONS BY REMOVING ALL PAINT AND CORROSION DOWN TO SHINY METAL. FOLLOWING CONNECTION, APPLY APPROPRIATE ANTI-OXIDIZATION PAINT.

## GROUNDING GUIDELINES:

ALL EQUIPMENT THAT IS INSTALLED AND MAY CAUSE ANY KIND OF ELECTRICAL CHARGE OR BUILD UP MUST HAVE PROPER AND ADEQUATE GROUNDING IN PLACE TO PREVENT FROM EQUIPMENT DAMAGE AND SHOCK HAZARDS.

RRH'S

MUST BE GROUND TO A MAIN BUSS BAR OR HOME RUN GROUND FROM THE GROUND PIN OR STUD THAT IS ON THE CHASSIS. IF ANY EQUIPMENT HAS A GROUND POINT ON IT, IT SHOULD BE GROUND. THE GROUNDING CABLE SIZE SHOULD FOLLOW LOCAL GUIDELINES ON EQUIPMENT GROUNDING. NORMALLY THE STANDARD IS 6 UV RATED STRANDED GROUND CABLE TO BE USED ON RRH'S. THE LUG NEEDS TO FIT THE PROPER CABLE SIZE AS WELL AS THE HOLE SIZE FOR THE STUD. IF IT'S A SINGLE STUD IT SHOULD BE A ONE HOLE LUG, IF IT HAS A PLACE FOR TWO HOLE LUG THEN THAT SHOULD BE USED. (I.E. COMMSCOPE ION M HAS A SINGLE STUD GROUND, TE PRISM HAS A GROUND FOR A 2 HOLE LUG.) DO NOT CUT THE LUGS TO FIT. THEY MAKE LUGS IN ALL SHAPES AND SIZES. ORDER THE CORRECT ONE AND ATTACH IT PROPERLY.

SURGE ARRESTORS

IF IT HAS A PLACE FOR A GROUND – GROUND IT.

MAST PIPES

ALL MAST PIPES SHOULD BE GROUND WITH BEAR METAL ON THE PLACE THE GROUND IS ATTACHED AND THEN COLD GALVANIZATION OVER THE BARE METAL TO PREVENT RUST. THE GROUND CAN BE ATTACHED MECHANICALLY OR AN EXOTHERMIC WELD (CAD WELD) MAY BE USED. IF THE MAST PIPE IS THE TALLEST POINT ON A BUILDING IT SHOULD ALSO HAVE A LIGHTNING ROD ATTACHED TO IT AS WELL.

DIPLEXERS/DUPLEXERS/SPLITTERS/PASSIVE COMPONENTS

IF IT HAS A PLACE FOR A GROUND TO BE INSTALLED – INSTALL IT.

ANY STRUCTURE OR FRAME SHOULD HAVE #2 GROUND WIRE, I.E. MAST PIPES, OUTDOOR ENCLOSURES, SHROUDS, BUSS BAR HOME RUN TO EARTH GROUND. ALL EQUIPMENT HAS #6 TO BUSS BARS.

DPS BATCH STAMP

ALL BUSS BARS NEED TO HAVE A LINK TO AN EARTH GROUND SYSTEM AND MUST BE ISOLATED IF MOUNTED ON ANYTHING THAT MAY RETAIN AN ELECTRIC CHARGE. NO EXCEPTIONS. ALL EQUIPMENT SHOULD RUN TO BUSS BARS. LUGS ON BUSS BARS SHOULD HAVE FRONT AND BACK FLAT WASHERS SANDWICHING THE LUG(S) TO THE BAR AND NOT OVERLAPPING CAUSING IT TO HOLD OR PIN DOWN OTHER LUGS ON THE BAR. THERE SHOULD ALWAYS BE A LOCK WASHER CLOSEST TO THE NUT ON THE BOLT FOR A LUG. NEVER IS IT OK TO STACK LUGS ON TOP OF EACH OTHER. IF THERE IS NOT ENOUGH SPACE, GET A BIGGER BUSS BAR. THEY SHOULD ALL HAVE A DIRECT CONTACT TO A BUSS BAR WITH NO-OX COATED BETWEEN THE LUG AND THE BUSS BAR. ALL GROUNDS SHOULD HAVE HEAT SHRINK OVER THE LUG (UNLESS IT'S NON-JACKETED WIRE). ALL LUGS NEED TO BE CRIMPED ON SECURELY WITH THE PROPER DYE AND TOOL (NOT CHANNEL LOCK CRIMPED). THERE SHOULD BE NO MORE THAN 1/16 INCH BARE CABLE SHOWING (SHINER) BETWEEN THE JACKET AND THE LUG. INSIDE LUGS SHOULD HAVE CLEAR HEAT SHRINK TO INSPECT THE CRIMPS AND SHINERS. INSIDE LUGS SHOULD HAVE INSPECTION WINDOWS TO SHOW THE GROUND WIRE IS INSERTED INTO THE LUG ALL THE WAY AND IS PROPERLY INSTALLED. OUTDOOR LUGS MAY HAVE BLACK OR GREEN HEAT SHRINK.

## WEATHER SEAL GUIDELINES:

BUTYL

1. PRE WRAP ALL CONNECTIONS WITH BLACK ELECTRICAL TAPE TO COVER ALL METAL SHOWING TO PREVENT DAMAGE TO CONNECTOR WHEN WEATHER SEAL IS TO BE REMOVED. 3/4 INCH OR 2 INCH TAPE CAN BE USED FOR THIS PROCESS.
2. WRAP CONNECTIONS WITH BUTYL WEATHER SEALANT WITH TWO LAYERS TO FORM A CONE LIKE SHAPE, OVER LAPPING THE LAYERS BY AT LEAST 50%. MOLD SEALANT TO PROPER SHAPE. THIS STEP IS CRUCIAL OR THE BUTYL WILL LEAK OVER TIME.
3. WRAP SEALANT WITH 2 LAYERS OF 2 INCH TAPE, (YOU CAN CUT INTO STRIPS IN TIGHT AREAS). FIRST WRAP SHOULD BE PULLED SMOOTH TO MAKE FINAL WRAPS CLEAN AND CRISP. 2ND WRAP SHOULD BE PULLED TIGHTER THAN FIRST TO HOLD SEALANT INTO PROPER (CONE LIKE) SHAPE. OVER LAPPING TAPE SHOULD COVER AT LEAST 50% OF EACH LAYER OF TAPE PRIOR.
4. UPON COMPLETION OF 2 LAYERS OF 2 INCH TAPE FINALIZE WITH AT LEAST 3 LAYERS OF 3/4 INCH TAPE. EACH WRAP OF TAPE SHOULD BE PULLED TIGHTER THAN WRAP BEFORE TO SQUEEZE SEALANT INTO A MOLD AND WILL PREVENT ANY SEALANT FROM LEAKING OUT THE SIDES OVER TIME. EACH LAYER SHOULD COVER PRIOR LAYERS AT LEAST 50%.
5. OVERLAP THE TAPE 50% OF THE PREVIOUS LAYER.
6. ALWAYS FINISH THE LAST WRAP OF TAPE GOING UP TO CREATE A SHINGLING OF THE TAPE SO IN THE WEATHER ANYTHING THAT RUNS DOWN THE CABLE WILL NOT LEAK INTO THE SEALANT. CUT THE END OF THE TAPE AND LAY IT ONTO THE FINISH. DO NOT STRETCH THE END OF THE TAPE. THIS WILL CAUSE THE TAPE TO PULL OFF OVER TIME AND CREATE A FLAGGING AFFECT.

FUSION TAPE

1. CHECK TO MAKE SURE ALL CONNECTORS ARE TORQUED TO PROPER SPECIFICATIONS BEFORE YOU BEGIN.
2. NOTE: THIS STEP DOES NOT NEED A CURTSY WRAP BECAUSE THE TAPE DOES NOT ACTUALLY ADHERE TO THE CONNECTOR ITSELF BUT BINDS TO ITSELF. ALSO KNOWN AS "SELF-AMALGAMATING TAPE.
3. WRAP CONNECTIONS FUSION TAPE SEALANT WITH TWO LAYERS TO FORM A CONE LIKE SHAPE. FUSION TAPE MUST OVER LAP AT LEAST 50% TO FORM A PROPER SEAL. COVER ALL OF THE BARE METAL SHOWING (AT LEAST 1-1/2 INCH PAST END OF CONNECTOR.)
4. IF THIS "TAPE" IS NOT PULLED TIGHT WHILE WRAPPING YOU WILL NOT CREATE A PROPER SEAL, IT MUST BE STRETCHED TO CREATE BOND TO ITSELF.
5. WRAP AT LEAST 2 LAYERS OF 3/4 INCH TAPE. EACH LAYER SHOULD COVER AT LEAST 50% OF PREVIOUS TAPE WRAP.
6. ALWAYS FINISH THE LAST WRAP OF TAPE GOING UP TO CREATE A SHINGLING OF THE TAPE SO IN THE WEATHER ANYTHING THAT RUNS DOWN THE CABLE WILL NOT LEAK INTO THE SEALANT. CUT THE END OF THE TAPE AND LAY IT ONTO THE FINISH. DO NOT STRETCH THE END OF THE TAPE. THIS WILL CAUSE THE TAPE TO PULL OFF OVER TIME AND CREATE A FLAGGING AFFECT.

HEAT SHRINK

1. PRE WRAP ALL CONNECTIONS WITH BLACK ELECTRICAL TAPE TO COVER ALL METAL SHOWING TO PREVENT DAMAGE TO CONNECTOR WHEN WEATHER SEAL IS TO BE REMOVED. 3/4 INCH OR 2 INCH TAPE CAN BE USED FOR THIS PROCESS.
2. USE ONLY OUTDOOR RATED HEAT SHRINK THAT HAS THE SELF-ADHESIVE WHEN HEATED PROPERLY. THIS IS WHAT WILL CREATE THE SEAL TO THE CONNECTOR.
3. MAKE SURE HEAT SHRINK COVERS ALL OF THE COUPLERS AND CONNECTIONS. HEAT THE HEAT SHRINK TO SHRINK TIGHTLY TO THE CONNECTIONS AND CABLE. MAKE SURE THE HEAT SHRINK IS SEALED TOP AND BOTTOM OF THE CONNECTIONS. ALSO CHECK TO MAKE SURE HEAT SHRINK WAS NOT OVER HEATED AND THERE ARE NO BREAKS IN SEAL THROUGH-OUT THE SHRINK TUBING.

ANDREWS CLAM SHELL

1. PROPERLY TORQUE CONNECTOR TO SPECIFICATION.
2. APPLY ONE LAYER OF 3/4 INCH BLACK TAPE AROUND ENTIRE CONNECTOR ENDING AT LEAST 1-1/2 INCHES PAST TOP AND BOTTOM OF CONNECTOR TO PREVENT ANY MOISTURE FROM STICKING TO THE CONNECTOR.
3. INSPECT THE DEVICE TO MAKE SURE IT IS NOT CHIPPED, CRACKED OR ANY SIGNS OF NEGLECT THAT WILL TAKE AWAY FROM MAKING A FULL SEAL AROUND THE CONNECTOR.
4. USE ONLY CORRECT SIZE PER CABLE AND CONNECTOR TYPE – I.E: 1/2 INCH FOR 1/2 INCH NOT 7/8TH FOR 1/2 INCH.
5. FOLLOW DIRECTIONS THAT COME WITH PRODUCT – MOST CLAM SHELL TYPE SEALANT DEVICES WRAP AROUND OR CLAMP AROUND A CONNECTION POINT.

**GROUNDING AND BONDING NOTE:**
**GENERAL CONTRACTOR SHALL FOLLOW ALL CONSTRUCTION GUIDELINES PER CROWN CASTLE'S GROUNDING AND BONDING REQUIREMENTS FOR STRAND MOUNT NODES (oDAS) – DOCUMENT 337910.**

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C™
TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1
8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY
LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
GN-1

# CROWN CASTLE FIBER LLC
# GENERAL NOTES

6. BE CAREFUL WHEN SETTING LOCKING DEVICE INTO PLACE ON CLAM SHELL STYLE SEALANTS (THEY ARE PLASTIC AND TEND TO BREAK OR CRACK IN EXTREME WEATHER CONDITIONS WHEN LOCKING DEVICE IS CLOSED TO CREATE THE SEAL.) IF THE LOCKING MECHANISM CRACKS OR BREAKS, REPLACE IT. DO NOT TAPE THE CLAMP CLOSED OR TRY TO RE-ENGINEER IT.

7. ONCE THE CLAMP IS ON AND LOCKED AROUND THE CONNECTOR THE PROCESS IS COMPLETE.

PPC BOOT

1. PLACE BOOT OVER CABLE BEFORE CONNECTOR IS ATTACHED TO CABLE. THIS IS ONLY RATED FOR PPC TYPE CONNECTORS. (NOTE: IF THIS STEP IS SKIPPED OR NOT COMPLETED BEFORE MAKING A CONNECTOR THE SUBCONTRACTOR WILL NOT BE ABLE TO USE THE BOOT STYLE DEVICE TO SEAL THE CONNECTOR. IT IS NOT RECOMMENDED TO WASTE A CONNECTOR AND CUT IT OFF AND START AT STEP NO. 1 AGAIN. SINCE PPC CONNECTORS ARE NOT REUSABLE AND CAN GET QUITE EXPENSIVE. DO NOT TRY TO STRETCH THE BOOT TO SLIDE IT OVER THE CONNECTION.)

2. PLACE THE BOOT OVER THE CABLE, AND THEN MAKE THE CONNECTOR.

3. TORQUE THE CONNECTION TO PROPER SPECIFICATIONS.

4. SLIDE BOOT UP TO COVER THE ENTIRE CONNECTOR, FOLLOWING THE PPC GUIDELINES.

5. THIS PROCESS IS COMPLETE AT THIS TIME.

## ELECTRICAL NOTES

1. SUBMITTAL OF BID INDICATES THAT THE CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.

2. CONTRACTOR SHALL PERFORM ALL VERIFICATIONS, OBSERVATION TESTS, AND EXAMINATION WORK PRIOR TO ORDERING OF ANY EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A WRITTEN NOTICE OF ALL FINDINGS TO THE PROJECT MANAGER LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT AND DISCREPANCIES.

3. VERIFY HEIGHTS WITH PROJECT MANAGER PRIOR TO INSTALLATION.

4. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.

5. CONTRACTOR SHALL COORDINATE ALL WORK BETWEEN TRADES AND ALL OTHER SCHEDULING AND PROVISIONARY CIRCUMSTANCES SURROUNDING THE PROJECT.

6. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR COMPLETE AND FUNCTIONALLY OPERATING SYSTEMS ENERGIZED AND READY FOR USE THROUGHOUT AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.

7. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. ELECTRICAL MATERIALS SHALL BE LISTED AND APPROVED BY UNDERWRITER'S LABORATORIES AND SHALL BEAR THE INSPECTION LABEL "J" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF ALL GOVERNING BODIES HAVING JURISDICTION OVER THE CONSTRUCTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH ALL CURRENT APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA AND NBFU. ALL MATERIALS AND EQUIPMENT SHALL BE APPROVED FOR THEIR INTENDED USE AND LOCATION.

8. ALL WORK SHALL COMPLY WITH ALL APPLICABLE GOVERNING STATE, COUNTY AND CITY CODES AND OSHA, NFPA, NEC & ASHRAE REQUIREMENTS.

9. ENTIRE JOB SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF JOB ACCEPTANCE. ALL WORK, MATERIAL AND EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.

10. PROPERLY SEAL ALL PENETRATIONS. PROVIDE UL LISTED FIRE-STOPS WHERE PENETRATIONS ARE MADE THROUGH FIRE-RATED ASSEMBLIES. WATER-TIGHT USING SILICONE SEALANT.

11. LOCATE ALL PENETRATIONS SUCH THAT ALL REINFORCEMENT CONTAINED WITHIN THE EXISTING BUILDING CONSTRUCTION REMAINS INTACT AND UNDISTURBED. SUBMIT LOCATING METHOD TO THE PROJECT MANAGER FOR APPROVAL PRIOR TO EXECUTION.

12. DELIVER ALL BROCHURES, OPERATING MANUALS, CATALOGS AND SHOP DRAWINGS TO THE PROJECT MANAGER AT JOB COMPLETION. PROVIDE MAINTENANCE MANUALS FOR MECHANICAL EQUIPMENT. AFFIX MAINTENANCE LABELS TO MECHANICAL EQUIPMENT.

13. ALL CONDUCTORS SHALL BE COPPER. MINIMUM CONDUCTOR SIZE SHALL BE #12 AWG., UNLESS OTHERWISE NOTED. CONDUCTORS SHALL BE TYPE THHW, RATED IN ACCORDANCE WITH NEC 110-14(C).

14. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING RATING NOT LESS THE MAXIMUM INTERRUPTING CURRENT TO WHICH THEY MAY BE SUBJECTED.

15. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE; ARTICLES 250 & 810 AND THE UTILITY COMPANY STANDARDS.

16. CONDUIT: ALL ABOVE GRADE CONDUITS SHALL BE RIGID & LFMC TO 6' AS STATED BELOW:

   A. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS, IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3.

   B. ELECTRICAL METALLIC TUBING SHALL HAVE U.L. LABEL, FITTINGS SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.

   C. LIQUID-TIGHT FLEXIBLE METAL CONDUIT SHALL BE U.L. LISTED AND SHALL BE USED AT FINAL CONNECTIONS TO MECHANICAL EQUIPMENT & RECTIFIERS AND WHERE PERMITTED BY CODE. ALL CONDUIT IN EXCESS OF SIX FEET IN LENGTH SHALL CONTAIN A FULL-SIZE GROUND CONDUCTOR.

   D. CONDUIT RUNS SHALL BE SURFACE MOUNTED ON CEILINGS OR WALLS UNLESS NOTED OTHERWISE. ALL CONDUIT SHALL RUN PARALLEL OR PERPENDICULAR TO WALLS, FLOOR, CEILING, OR BEAMS. VERIFY EXACT ROUTING OF ALL EXPOSED CONDUIT WITH THE PROJECT MANAGER PRIOR TO INSTALLING.

   E. PVC CONDUIT MAY BE PROVIDED ONLY WHERE SHOWN, OR IN UNDERGROUND INSTALLATIONS. PROVIDE UV-RESISTANT CONDUIT WHERE EXPOSED TO THE ATMOSPHERE. PROVIDE GROUND CONDUCTOR IN ALL PVC RUNS; EXCEPT WHERE PERMITTED BY CODE TO OMIT.

17. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PHENOLIC PLASTIC NAMEPLATES. METER, DISCONNECT, ETC. BACKGROUND SHALL BE BLACK WITH WHITE LETTERS; EXCEPT AS REQUIRED BY CODE TO FOLLOW A DIFFERENT SCHEME.

18. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUNDING TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. GROUNDING SYSTEM RESISTANCE SHALL NOT EXCEED 5 OHMS. IF THE RESISTANCE VALUE IS EXCEEDED, NOTIFY THE PROJECT MANAGER FOR FURTHER INSTRUCTION ON METHODS FOR REDUCING THE RESISTANCE VALUE.

19. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION. LEGALLY DISPOSE OF ALL REMOVED, UNUSED AND EXCESS MATERIAL GENERATED BY THE WORK OF THIS CONTRACT. DELIVER ITEMS INDICATED ON THE DRAWINGS TO THE OWNER IN GOOD CONDITION. OBTAIN SIGNED RECEIPT UPON DELIVERY.

20. COORDINATE WITH UTILITY COMPANY FOR CONNECTION OF TEMPORARY AND PERMANENT POWER TO THE SITE. THE TEMPORARY POWER AND ALL HOOKUP COSTS SHALL BE PAID BY THE CONTRACTOR.

21. VERIFY ALL EXISTING CIRCUITRY PRIOR TO REMOVAL AND NEW WORK. MAINTAIN POWER TO ALL OTHER AREAS & CIRCUITS NOT SCHEDULED FOR REMOVAL.

22. RED LINED AS-BUILT PLANS SHALL BE PROVIDED TO THE CONSTRUCTION MANAGER UPON REQUEST.

## PEPCO GUIDELINES:

STRUCTURAL

1. ANTENNA SUPPORT POLES SHALL BE DESIGNED TO WITHSTAND THE HEAVY LOAD CASE AS DEFINED IN NATIONAL ELECTRIC SAFETY CODE (NESC) RULE 250B. IF ANY PART OF THE ANTENNA SUPPORTPOLE PROJECTS OVER SIXTY FEET ABOVE THE GROUND, THEN THE POLE SHALL BE DESIGNED TO WITHSTAND THE NESC EXTREME WIND LOAD CASE, AS DEFINED IN RULE 250C AND NESC FIGURE 250-2(B) (120 MPH WIND SPEED). THE SPECIFIED OVERLOAD CAPACITY FACTOR FOR THE NESC LOAD CASES, ARE SPECIFIED IN SECTION 26 OF THE NESC.

2. POLES REPLACED (TO SUPPORT ANTENNAS) SHALL BE DESIGNED FOR AT LEAST GRADE B CONSTRUCTION. POLES THAT ARE NOT REPLACED AND WILL SERVE AS SUPPORTS FOR ANTENNAS CAN BE DESIGNED FOR GRADE C CONSTRUCTION PROVIDED THAT APPROPRIATE RELATED STRENGTH REDUCTION FACTORS ARE APPLIED.

3. ALL POLES REPLACED TO SUPPORT ANTENNAS SHALL BE CLASS 1 OR LARGER. INSTALLATIONS THAT REQUIRE POLES LARGER THAN A CLASS 1 SHALL USE AN APPROPRIATE POLE CLASS, HEIGHT AND TYPE APPROVED BY STANDARDS. THE DESIGN OF THE STEEL POLE AT A MINIMUM SHALL MEET THE STRENGTH REQUIREMENTS OF THE NEXT HIGHER ANSI WOOD POLE CLASS.

a. TO MAINTAIN RELIABILITY AND ACCOMMODATE GEOMETRIC ALTERATIONS, ALL 69KV CANDIDATE POLES WILL BE CHANGED TO A TALLER CLASS 1 OR LARGER POLE.

b. EXCEPTIONS WILL BE CONSIDERED ON A CASE-BY-CASE BASIS, WHEN THE EXISTING 69KV POLE MEETS OR EXCEEDS THE SPECIFICATIONS TO BE OBTAINED IN THIS SPECIFICATION WITHOUT REPLACING THE POLE. ALL EXCEPTIONS TO THE REQUIREMENT TO REPLACE POLES THAT CARRY 69KV FEEDERS ARE SOLELY AT THE DISCRETION OF PEPCO.

4. ALL HARDWARE USED TO SUPPORT THE ANTENNA SHALL BE GALVANIZED, IN NEW CONDITION AND CAPABLE OF WITHSTANDING ALL DESIGNED LOADS.

5. LOCK WASHERS SHALL BE USED ON ALL THRU BOLTS USED TO CONNECT ANTENNA SUPPORT BRACKETS AND OTHER CARRIER EQUIPMENT TO THE POLE.

6. SPLIT BOLTS WITH WASHERS SHALL BE INSTALLED PERPENDICULAR TO THE ANTENNA SUPPORT BRACKET BOLTS.

7. THE ANTENNA SUPPORT BRACKET SHALL BE ABLE TO WITHSTAND THE NESC HIGH WIND DESIGN LOADS SPECIFIED ABOVE.

8. ALL STRUCTURAL AND DESIGN ANALYSIS SHALL BE PERFORMED BY THE CARRIER AND BE REVIEWED BY PEPCO'S DISTRIBUTION ENGINEERING DEPARTMENT. PEPCO SHALL PROVIDE REQUESTED DATA FOR SUCH ANALYSIS AND RESERVES THE RIGHT TO VALIDATE THE ANALYSIS. DESIGNS MUST PASS THE STRUCTURAL ANALYSIS REQUIREMENTS BEFORE PROCEEDING TO THE FINAL DESIGN PHASE OR CONSTRUCTION.

9. CARRIER SHALL PROVIDE AND OWN ALL POLE TOP EXTENSIONS USED TO SUPPORT ANTENNAS ABOVE THE PEPCO OVERHEAD COVERED CONDUCTORS (SECONDARY OR PRIMARY VOLTAGES). THE CONDITION OF THE MOUNTING SURFACE AT THE TOP OF THE POLE SHALL BE INSPECTED BY APPROVED PEPCO PERSONNEL. IF ANY DETERIORATION IS FOUND, THE POLE SHALL BE REPLACED BEFORE MOUNTING. "POLE TOP EXTENSIONS" SHALL BE AT LEAST 5' BUT NOT TO EXCEED 8'; AND NOT BE USED IN THE FOLLOWING INSTANCES:

a. TO SUPPORT ELECTRICAL CONDUCTORS.

b. TO SUPPORT ANTENNAS ON 69KV POLES.

10. THE LOWEST GROUNDED POINT OF A CARRIER'S EQUIPMENT SHALL MAINTAIN THE FOLLOWING MINIMUM SEPARATIONS:
- AT LEAST 4FT FOR OVERHEAD SECONDARY FACILITIES.
- AT LEAST 8FT FOR OVERHEAD PRIMARY FACILITIES.
CLEARANCES SHALL BE INCREASED AS REQUIRED, FOR BUCKET ACCESS.

11. POLE ANALYSIS SHALL BE BASED ON FIELD MEASUREMENTS.

DPS BATCH STAMP

SAFETY:

1. AUTHORIZED PEPCO PERSONNEL SHALL INSTALL ALL THE EQUIPMENT SUCH AS ANTENNA SUPPORT BRACKETS, ANTENNAS, JUMPERS AND COAXIAL CABLE AND APPROPRIATE CHANNEL RISER, WHICH ARE DESIGNED TO BE ABOVE THE COMMUNICATION AND SAFETY ZONES ON EACH POLE.

2. BOTH RF AND POWER SUPPLY DISCONNECT SWITCHES SHALL BE PROVIDED. THE RF DISCONNECT SWITCH SHALL BE A "LOCK-OUT" TYPE TO MAKE THE EQUIPMENT FREQUENCY (RF) TRANSMITTER EQUIPMENT INOPERABLE, SUCH THAT ELECTRIC UTILITY CREWS WILL HAVE TOTAL CONTROL OVER OPERATION OF THE EQUIPMENT. THE "LOCK-OUT" DEVICE SHALL BE DESIGNED INTO ANY SYSTEM DEPLOYED IN PEPCO'S SERVICE TERRITORY. THE DISCONNECT MECHANISM SHALL BE OF A CLEARLY VISIBLE MECHANICAL TYPE. PEPCO PERSONNEL MUST BE ABLE TO CLEARLY DETERMINE BY VIABLE MEANS THAT THE RF OUTPUT OF THE SUBJECT SYSTEM IS DISABLED. THE SWITCHING MECHANISM REQUIRED TO DISABLE THE RF TRANSMITTER SHALL BE CLEARLY MARKED WITH SIGNAGE AND IT SHALL BE LOCATED OUTSIDE THE MAXIMUM PERMISSIBLE RF EXPOSURE (SAFE APPROACH) DISTANCE/RADIUS FROM THE ANTENNA. A "KEEP-OUT" TAG SHALL BE PLACED ON THE DISCONNECTING DEVICES DURING SERVICE ON THE POLE.

3. AN RF SIGN SHALL BE PLACED ON THE POLE AND SHALL INDICATE THE SAFE/MINIMUM APPROACH DISTANCE FROM THE ANTENNA BASED ON THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS AS INDICATED IN TABLE 1 OF FCC'S RULE 47C.F.R.1.1310, IEEE C95.1 AND IEEE C95.5 (AS APPLICABLE) IN CONJUNCTION WITH ITS EFFECTIVE SOTROPIC RADIATED POWER (EIRP) VALUE AND THE OPERATIONAL FREQUENCY. THE SIGN SHALL INDICATE THE CARRIER'S NAME, AND 24-HOUR SYSTEM OPERATOR CONTACT INFORMATION, SO THAT NOTIFICATION CAN BE GIVEN TO THE APPROPRIATE PERSONNEL. IT SHALL BE AT LEAST 9" X 11" SIZE AND SHALL COMPLY WITH IEEE C95.2 STANDARDS. IN ADDITION, AN RF MAXIMUM PERMISSIBLE EXPOSURE (MPE) REPORT MUST BE SUBMITTED TO PEPCO.

4. ANY TREE TRIMMING REQUIRED FOR ANTENNA FACILITIES ABOVE THE COMMUNICATION ZONE WILL BE PERFORMED BY PEPCO AT THE CARRIER'S EXPENSE.

5. CARRIER PERSONNEL ARE NOT PERMITTED TO ACCESS THE POLE ABOVE THE COMMUNICATIONS ZONE. ONLY APPROVED PEPCO PERSONNEL OR CONTRACTORS UNDER THE DIRECTION OF AN AUTHORIZED PEPCO EMPLOYEE ARE PERMITTED TO ACCESS THIS SECTION OF THE POLE.

6. WHEN REQUIRED, ALL PERMITS SHALL BE COORDINATED BETWEEN THE CARRIER AND PEPCO'S APPROPRIATE SYSTEM DESIGN DEPARTMENT.

7. EQUIPMENT INSTALLED BELOW THE SAFETY ZONE SHALL BE MAINTAINED BY THE CARRIER.

8. IF AN ANTENNA POLE IS DAMAGED DUE TO HEAVY STORMS, PEPCO WILL NOTIFY THE CARRIER, USING THE PHONE NUMBER PROVIDED ON THE CAUTION SIGN BUT SHALL NOT BE RESPONSIBLE FOR ANY EQUIPMENT.

9. TO ACCOMMODATE FUTURE PEPCO POLE REPLACEMENTS, THE CARRIER SHALL AGREE TO TRANSFER THEIR EQUIPMENT WITHIN 30 DAYS OF NOTIFICATION OF SUCH WORK.

CLEARANCES:

1. RF CAUTION SIGNAGE SHALL BE PLACED OUTSIDE THE SAFE APPROACH DISTANCE RADIUS OF THE ANTENNA.

2. THE SEPARATION OF ANTENNA MOUNTING BRACKET PARTS FROM UNPROTECTED ENERGIZED RIGID CONDUCTOR MOUNTED ON THE SAME POLE SHALL BE AT LEAST 40" FOR DP (48" FOR PEPCO).

3. CLEARANCES AT THE SUPPORT AND MID-SPAN SHALL NOT BE REDUCED, BUT SHALL BE INCREASED AS REQUIRED FOR BUCKET ACCESS.

4. FIBER OPTIC WIRE SHALL BE INSTALLED IN THE COMMUNICATION ZONE WITH 12 INCHES OF SEPARATION FROM OTHER THIRD PARTY COMMUNICATION CONDUCTORS AND SHALL MAINTAIN AT LEAST 40" FOR DP (48" FOR PEPCO) OF SEPARATION FROM THE LOWEST SECONDARY CONDUCTOR FOR NEW POLE INSTALLATIONS AND 40 INCHES FOR EXISTING INSTALLATIONS.

5. AN ANTENNA MOUNTED BELOW PEPCO'S SECONDARY CONDUCTORS WILL MAINTAIN CLEARANCES OF NO LESS THAN 40" FOR DP (48" FOR PEPCO) BETWEEN THE LOWEST SUPPLY CONDUCTOR AND THE HIGHEST POINT OF THE ANTENNA.

6. WIRELESS CARRIER'S EQUIPMENT BOX MAY BE MOUNTED AS LOW TO GROUND LEVEL AS PRACTICAL (PER RECOMMENDATION BY PEPCO FIELD PERSONNEL) IF POLE IS AT LEAST 4.5' AWAY FROM THE CURB OR ROAD.

WIFI DEVICES:

1. WIFI REFERS TO DEVICES THAT MEET IEEE 802.11 STANDARDS.

2. IF MOUNTED ON A STREETLIGHT BRACKET, THE POWER VOLTAGE REQUIREMENTS OF THE RF DEVICE MUST MATCH THE EXISTING STREETLIGHT VOLTAGE. THE PHOTOCELL POWER TAP CONNECTOR SHALL BE PROVIDED BY THE CARRIER AND MUST MEET ANSI C136 REQUIREMENTS.

3. A MAXIMUM OF 1 WIFI DEVICE IS ALLOWED PER CANDIDATE POLE.

4. GROUNDING OF MOUNTING BRACKETS (INCLUDING STREETLIGHT BRACKET) SHALL BE AS SHOWN ON DRAWINGS. THE WIRELESS CARRIER SHALL SUPPLY THE WEIGHT OF THE PROPOSED EQUIPMENT. THE EXISTING BRACKET MUST BE STRUCTURALLY SUFFICIENT TO SUPPORT THE PROPOSED DEVICE. STREETLIGHT BRACKETS WILL NOT BE CHANGED TO ACCOMMODATE THE DEVICE.

5. NESC AND MAXIMUM RF EXPOSURE LIMIT CLEARANCES IN ALL DIRECTIONS SHALL BE MET.

**GROUNDING AND BONDING NOTE:**
**GENERAL CONTRACTOR SHALL FOLLOW ALL CONSTRUCTION GUIDELINES PER CROWN CASTLE'S GROUNDING AND BONDING REQUIREMENTS FOR STRAND MOUNT NODES (oDAS) – DOCUMENT 337910.**

NODE:
MNG-094M1 (478113)

ENGINEER:

NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092


OWNER/DEVELOPER:

CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044


TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

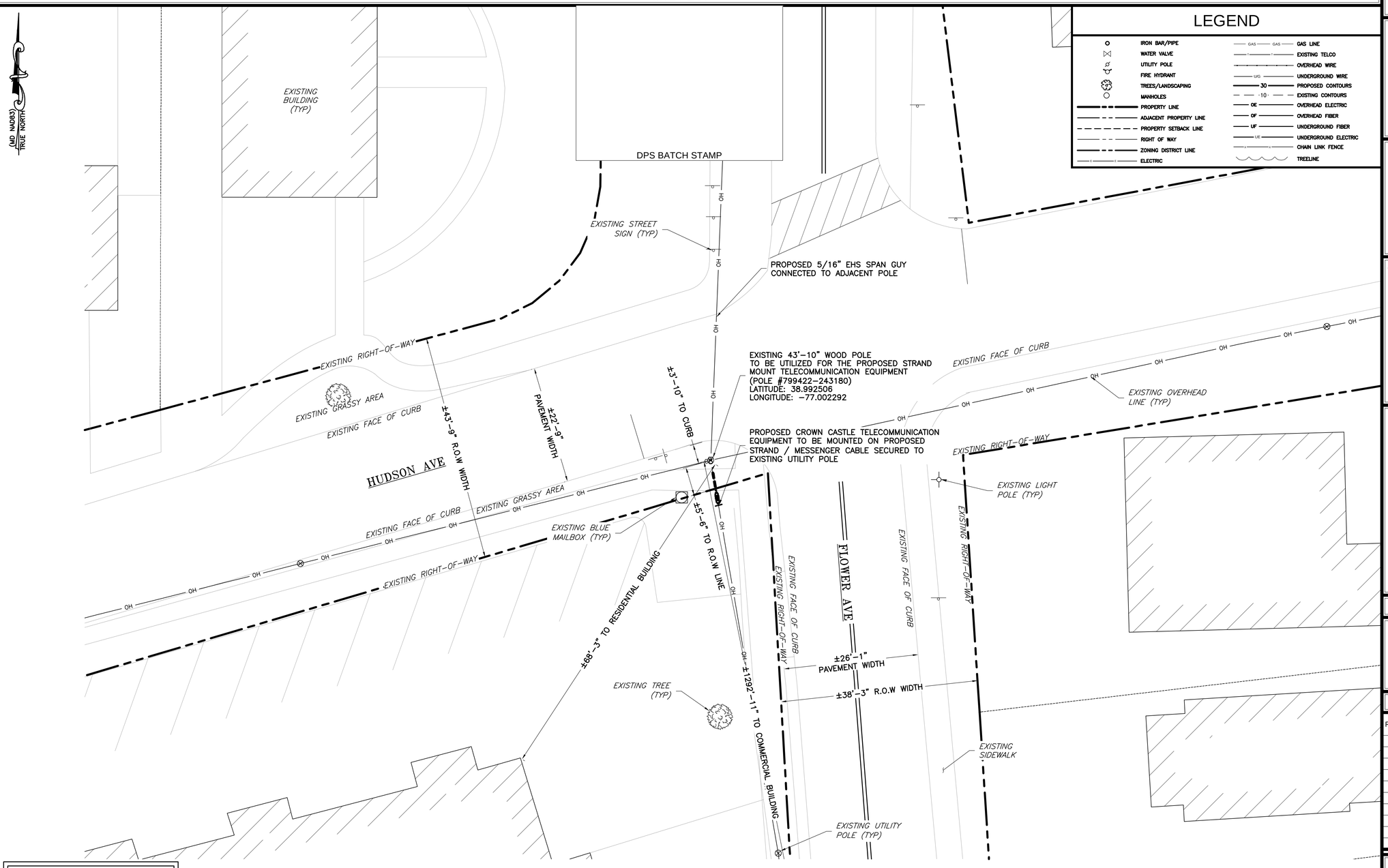
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| JED | SDR | PCQ |

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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
GN-2

# CROWN CASTLE FIBER LLC
## SITE PLAN




### LEGEND

| | |
|---|---|
| IRON BAR/PIPE | GAS LINE |
| WATER VALVE | EXISTING TELCO |
| UTILITY POLE | OVERHEAD WIRE |
| FIRE HYDRANT | UNDERGROUND WIRE |
| TREES/LANDSCAPING | PROPOSED CONTOURS |
| MANHOLES | EXISTING CONTOURS |
| PROPERTY LINE | OVERHEAD ELECTRIC |
| ADJACENT PROPERTY LINE | OVERHEAD FIBER |
| PROPERTY SETBACK LINE | UNDERGROUND FIBER |
| RIGHT OF WAY | UNDERGROUND ELECTRIC |
| ZONING DISTRICT LINE | CHAIN LINK FENCE |
| ELECTRIC | TREELINE |

THE CONSTRUCTION MANAGER SHALL COORDINATE POWER AND TELCO UTILITY ROUTING TO THE PROPOSED EQUIPMENT PRIOR TO CONSTRUCTION.

ANTENNA AZIMUTH SHALL BE SET TO 165°

**NOTE:**

EXISTING UTILITY INFORMATION SHOWN REPRESENTS THE BEST DATA AVAILABLE FROM EXISTING DOCUMENTATION AND FIELD EVIDENCE. ALL LOCATIONS SHOULD BE CONSIDERED APPROXIMATE, AND A FIELD INVESTIGATION MUST BE PERFORMED IN THE VICINITY OF ANY CONSTRUCTION ACTIVITIES. NOTE THAT THESE PLANS MAY NOT SHOW ALL UTILITIES THAT ARE PRESENT AT THE SITE.

1 / C-1 **SITE PLAN**
SCALE: 1" = 10' (22X34)
SCALE: 1" = 20' (11X17)

GRAPHIC SCALE
10 0 5 10 20 40
1 INCH = 10 FEET (22X34)
1 INCH = 20 FEET (11X17)

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C™
TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
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CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

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| JED | SDR | PCQ |

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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: C-1

CROWN CASTLE FIBER LLC
ENLARGED SITE PLAN

(NAD 1983)
TRUE NORTH

DPS BATCH STAMP

## LEGEND

| | |
|---|---|
| IRON BAR/PIPE | GAS GAS GAS LINE |
| WATER VALVE | T T EXISTING TELCO |
| UTILITY POLE | OVERHEAD WIRE |
| FIRE HYDRANT | UG UNDERGROUND WIRE |
| TREES/LANDSCAPING | 30 PROPOSED CONTOURS |
| MANHOLES | 10 EXISTING CONTOURS |
| PROPERTY LINE | OE OVERHEAD ELECTRIC |
| ADJACENT PROPERTY LINE | OF OVERHEAD FIBER |
| PROPERTY SETBACK LINE | UF UNDERGROUND FIBER |
| RIGHT OF WAY | UE UNDERGROUND ELECTRIC |
| ZONING DISTRICT LINE | CHAIN LINK FENCE |
| ELECTRIC | TREELINE |

HUDSON AVE

EXISTING FACE OF CURB

EXISTING GRASSY AREA

EXISTING RIGHT-OF-WAY

OH

PROPOSED 5/16" EHS SPAN GUY CONNECTED TO ADJACENT POLE

EXISTING 43'-10" WOOD POLE
TO BE UTILIZED FOR THE PROPOSED STRAND MOUNT TELECOMMUNICATION EQUIPMENT
(POLE #799422-243180)
LATITUDE: 38.992506
LONGITUDE: -77.002292

PROPOSED CROWN CASTLE CABLE DISCONNECT SWITCH (ALPHA MODEL #EPO/D-2-PR) MOUNTED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE CONVERTER UNIT (ALPHA MODEL #LPR48-300-IP68) MOUNTED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE SPLICE BOX MOUNTED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE BRACKET MOUNT SECURED TO PROPOSED STRAND/MESSENGER CABLE

PROPOSED CROWN CASTLE ERICSSON 4402 RADIO MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON 4435 RADIO MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON DIPLEX FILTER B2+B66/B30 (4-2) DIPLEXER MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON 6525 SEMI-INTEGRATED PANEL ANTENNA MOUNTED TO PROPOSED BRACKET MOUNT

PROPOSED CROWN CASTLE ERICSSON 6523 SEMI-INTEGRATED PANEL ANTENNA MOUNTED TO PROPOSED BRACKET MOUNT

591 AVE

FLOWER AVE

EXISTING FACE OF CURB
EXISTING GRASSY AREA
EXISTING RIGHT-OF-WAY

THE CONSTRUCTION MANAGER SHALL COORDINATE POWER AND TELCO UTILITY ROUTING TO THE PROPOSED EQUIPMENT PRIOR TO CONSTRUCTION.

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1 / C-2 EQUIPMENT SITE PLAN
SCALE: 1" = 2' (22X34)
SCALE: 1" = 4' (11X17)

GRAPHIC SCALE

2 0 1 2 4 8

1 INCH = 2 FEET (22X34)
1 INCH = 4 FEET (11X17)

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
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CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

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LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
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ENGINEER OF RECORD

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MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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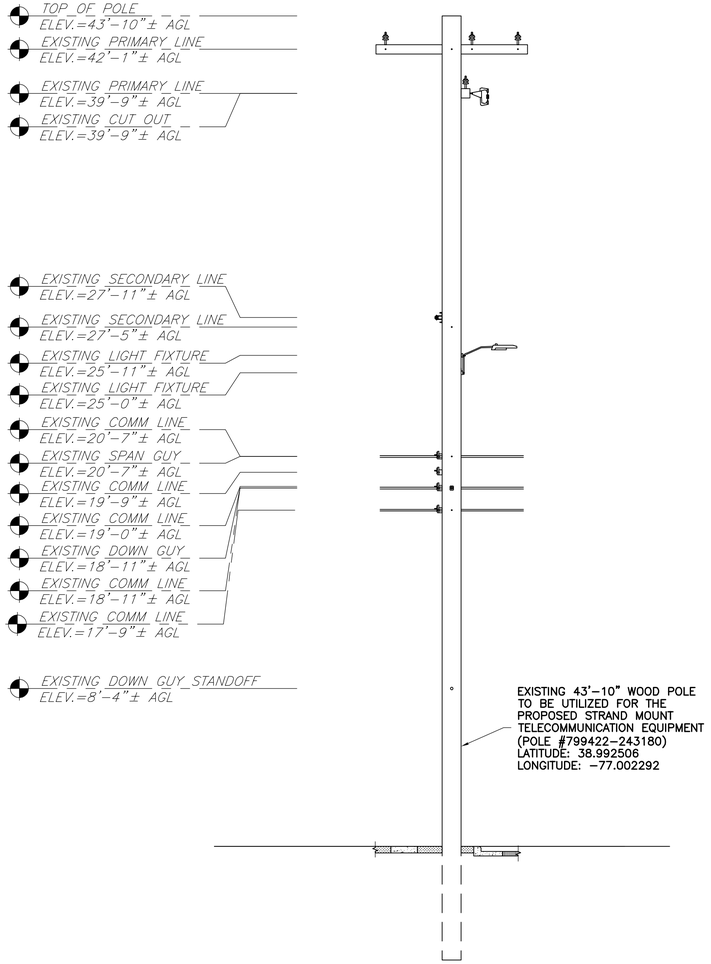
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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-2

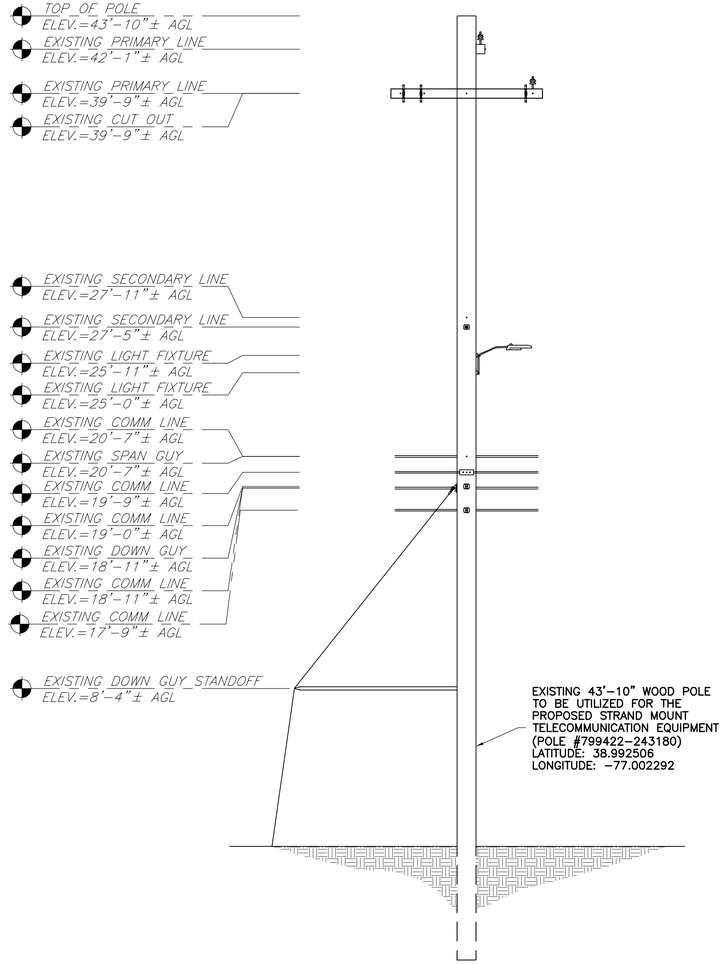
# CROWN CASTLE FIBER LLC
# EXISTING ELEVATIONS

DPS BATCH STAMP






1 C-3 EXISTING CONDITIONS
NOT TO SCALE




2 C-3 POLE ELEVATION (LOOKING NORTH)
SCALE: 3" = 1' (22X34)
SCALE: 1-1/2" = 1' (11X17)

GRAPHIC SCALE

1 0 0.5 1

3 INCHES = 1 FOOT (22X34)
1-1/2 INCHES = 1 FOOT (11X17)

**MOUNTING NOTE:**

IF FIELD CONDITIONS DO NOT ALLOW FOR INSTALLATION AS DIRECTED, CONTRACTOR IS TO CONTACT ENGINEER FOR FURTHER INSTRUCTION.

3 C-3 POLE ELEVATION (LOOKING WEST)
SCALE: 1/4" = 1' (22X34)
SCALE: 1/8" = 1' (11X17)

GRAPHIC SCALE

8 4 0 1 2 4 8

1/4 INCH = 1 FOOT (22X34)
1/8 INCH = 1 FOOT (11X17)

NODE:
MNG-094M1 (478113)

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NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
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ELKRIDGE, MD 21075
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STATE OF MARYLAND
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MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

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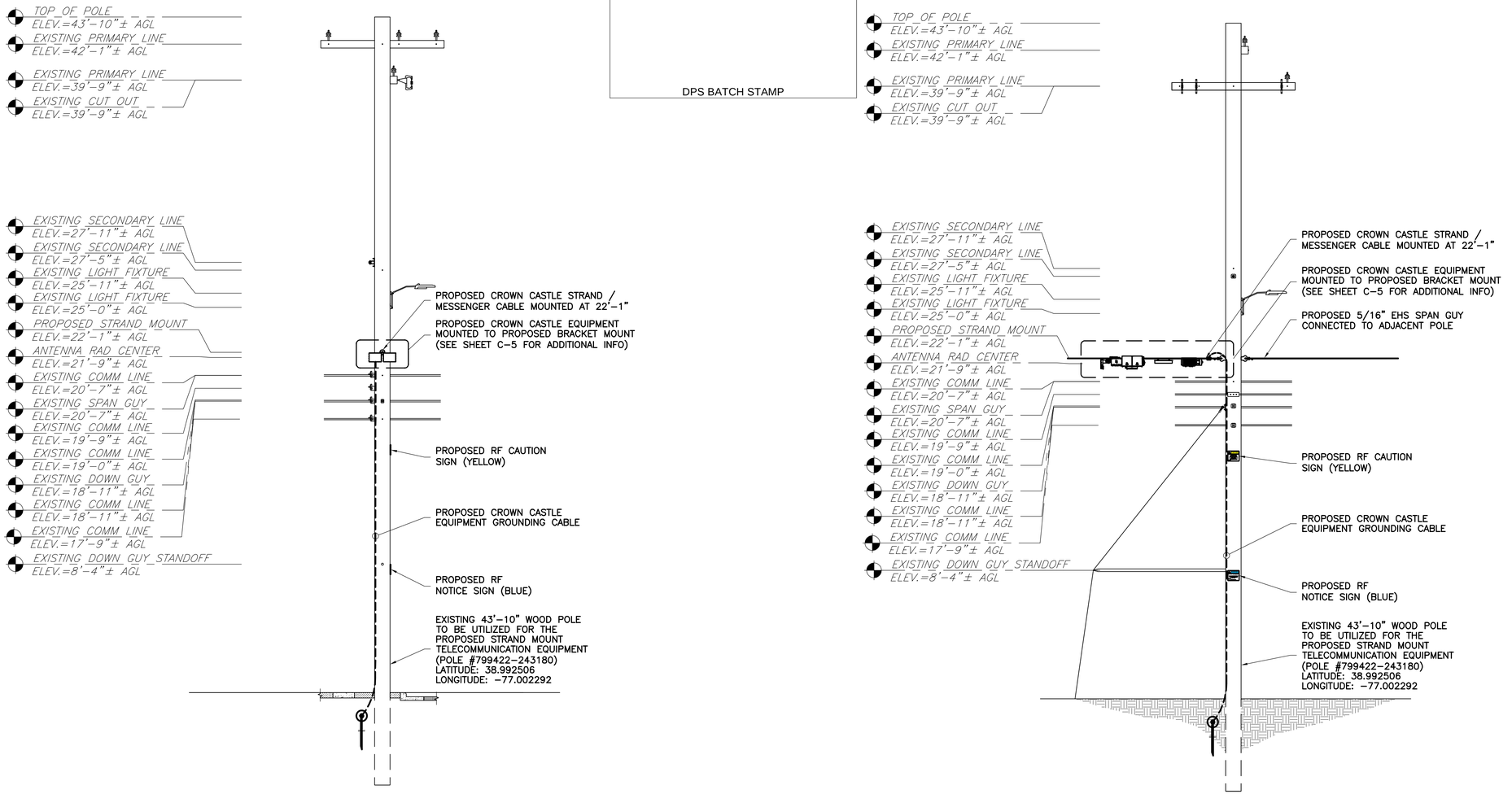
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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-3

CROWN CASTLE FIBER LLC
PROPOSED ELEVATIONS

DPS BATCH STAMP




**MOUNTING NOTE:**

- MAINTAIN 12" CLEARANCE FROM STRAND MOUNT TO STREETLIGHT DRIP LOOP (IF APPLICAPLE).
- MAINTAIN 48" CLEARANCE FROM STRAND MOUNT TO LOWEST SECONDARY LINE (IF APPLICABLE).

ANTENNA AZIMUTH SHALL BE SET TO 165°

**MOUNTING NOTE:**

IF FIELD CONDITIONS DO NOT ALLOW FOR INSTALLATION AS DIRECTED, CONTRACTOR IS TO CONTACT ENGINEER FOR FURTHER INSTRUCTION.

1 / C-4 POLE ELEVATION (LOOKING NORTH)
SCALE: 1/4" = 1' (22X34)
SCALE: 1/8" = 1' (11X17)

GRAPHIC SCALE
8 4 0 1 2 4 8
1/4 INCH = 1 FOOT (22X34)
1/8 INCH = 1 FOOT (11X17)

2 / C-4 POLE ELEVATION (LOOKING WEST)
SCALE: 1/4" = 1' (22X34)
SCALE: 1/8" = 1' (11X17)

GRAPHIC SCALE
8 4 0 1 2 4 8
1/4 INCH = 1 FOOT (22X34)
1/8 INCH = 1 FOOT (11X17)

RF SIGNAGE GUIDELINES

RF SIGNAGE SHOULD FOLLOW THE GUIDELINES BELOW. THESE GUIDELINES INCLUDE COLORS TO ALERT PEOPLE OF THE DANGER AND INFORMATION ABOUT SAFE DISTANCES. SIGNS SHOULD BE PLACED IN READABLE PLACES, IN AREAS WHERE A PERSON CAN READ THEM IN A SAFE LOCATION.

| GEN. POP. OK | OCCUP. POP. OK | COLOR | SIGN |
|---|---|---|---|
| YES | OK | GREEN | INFORMATION |
| NO | YES | BLUE | NOTICE |
| NO | YES | YELLOW | CAUTION |
| NO | NO | RED | WARNING |

1. INCLUDE GENERAL POPULATION STAND OFF DISTANCE.
2. INCLUDE BOTH GENERAL POPULATION AND OCCUPATIONAL POPULATION STAND OFF DISTANCE.
3. INCLUDE HEMISPHERIC STAND OFF DISTANCES. ALL WARNING SIGNS MUST BE REVIEWED WITH CROWN CASTLE NATIONAL RF FOR APPROVAL.

**INFORMATION**
RF EXPOSURE AT THIS SITE DOES NOT EXCEED THE FCC PUBLIC EXPOSURE STANDARD AND NO SPECIAL PRECAUTIONS ARE REQUIRED FOR WORK NEAR ANTENNAS.
FOR MORE INFORMATION CALL THE NUMBER BELOW.
Site ID #
888-632-0931

THE "INFORMATION" SIGN MUST BE POSTED ON OR NEAR THE ANTENNA WHENEVER THE GENERAL PUBLIC LIMIT IS NOT EXCEEDED. THIS SIGN SHOULD BE USED ALONE ON ALL SITES THAT HAVE NO AREAS WHERE THE GP LIMIT IS EXCEEDED.

**NOTICE**
POLE WORKERS
There is an antenna operation high on this pole. For more guidance on signs near the antenna or call the number below.
Site ID #
888-632-0931

THE NOTICE SIGN MUST BE POSTED NEAR THE BOTTOM OF THE POLE OR ON THE SHROUD ANY TIME THERE IS A ZONE NEAR THE ANTENNA THAT EXCEEDS THE GENERAL POPULATION (GP) LIMIT. IF THERE ARE NO ZONES THAT EXCEED THE GP LIMIT THAN THE "NOTICE" SIGN SHALL NOT BE USED.

**CAUTION**
Keep Back 4.5FT From This Antenna. FCC RF Public Exposure Limits May Be Exceeded Within This Distance. Call 8888888888 For More Options. Qualified Workers FCC Occupational Limits May Be Exceeded Within This Distance
Site ID #

THE "CAUTION" SIGN MUST BE POSTED ON THE ANTENNA ANY TIME THERE IS AN AREA THAT EXCEEDS THE GENERAL PUBLIC EXPOSURE LIMIT. THE KEEP-BACK DISTANCE FOR THE GP MUST BE FILLED IN ON THE SIGN. THE EME REPORT MUST CLEARLY STATE THAT THE GENERAL PUBLIC LIMIT KEEP BACK DISTANCE WHEN IT IDENTIFIES THIS SIGN FOR POSTING.

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C™
TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

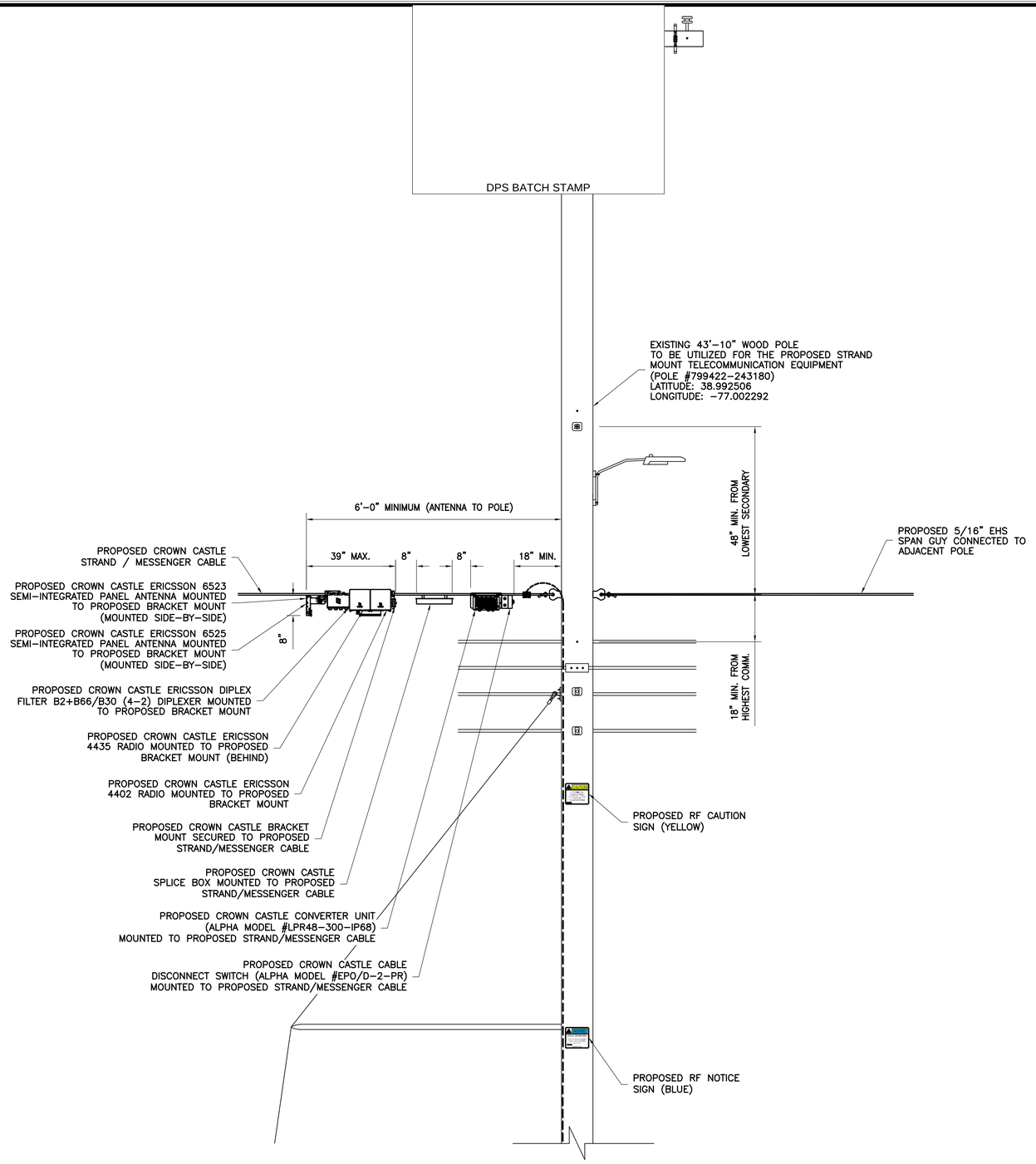
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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

| | |
|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-4

CROWN CASTLE FIBER LLC
ENLARGED ELEVATION




1 / C-5 CARRIER ELEVATION
NTS

MOUNTING NOTE:

IF FIELD CONDITIONS DO NOT ALLOW FOR INSTALLATION AS DIRECTED, CONTRACTOR IS TO CONTACT ENGINEER FOR FURTHER INSTRUCTION.

NODE:
MNG-094M1 (478113)

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LICENSE #55491

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| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
C-5

CROWN CASTLE FIBER LLC
PLUMBING DIAGRAM

DPS BATCH STAMP

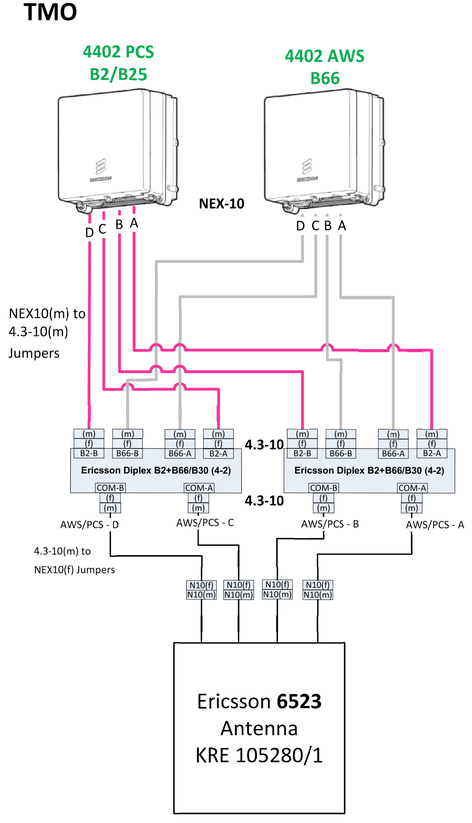
CROWN CASTLE

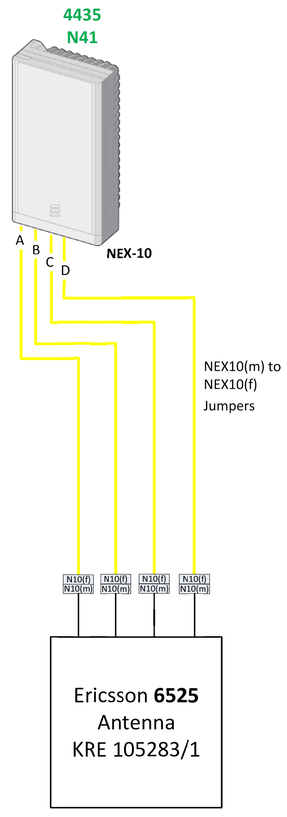
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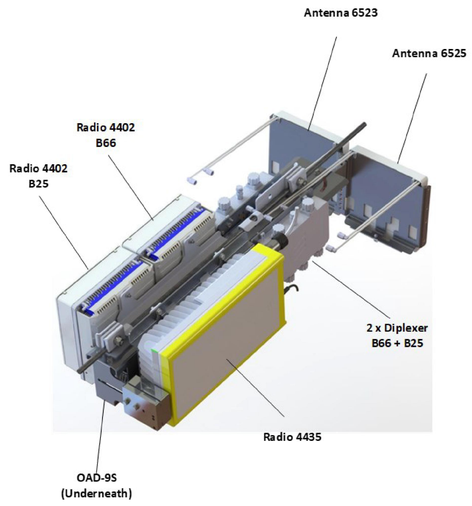
04/19/2022

**For TMO only Strand Nodes**

## TMO




**Proprietary and Confidential**

1 / D-1 PLUMBING DIAGRAM
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
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TITLE:
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ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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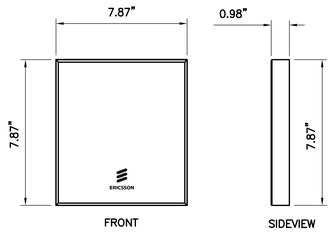
| DRAWN BY: | CHECKED BY: | APPROVED BY: |
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| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: D-1

CROWN CASTLE FIBER LLC
EQUIPMENT & ANTENNA DETAILS

DPS BATCH STAMP

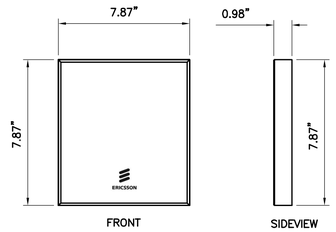



| NUMBER OF REQUIRED ANTENNAS |
|---|
| 1 |

| ERICSSON 6523 ANTENNA | |
|---|---|
| WEIGHT | 1.76 LBS. |
| DIMENSIONS (HxWxD) | 7.87"x7.87"x0.98" |
| VOLUME | .035 Cu.Ft. |

ANTENNA AZIMUTH SHALL BE SET TO 165°

1 D-2 ANTENNA DETAIL
NTS

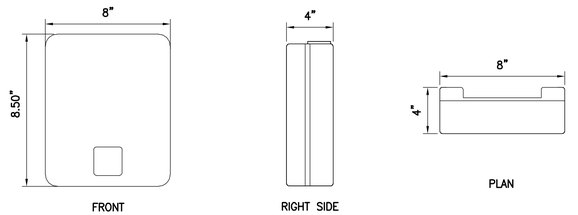



| NUMBER OF REQUIRED ANTENNAS |
|---|
| 1 |

| ERICSSON 6525 ANTENNA | |
|---|---|
| WEIGHT | 1.76 LBS. |
| DIMENSIONS (HxWxD) | 7.87"x7.87"x0.98" |
| VOLUME | .035 Cu.Ft. |

ANTENNA AZIMUTH SHALL BE SET TO 165°

2 D-2 ANTENNA DETAIL
NTS




SIZE AND WEIGHT TABLE, INCLUDING MOUNTING BRACKET AND ESTHETIC FRONT COVER

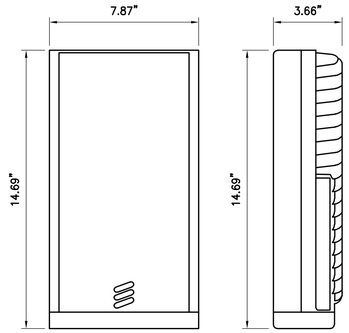
| RRU | LENGTH | WIDTH | DEPTH | WEIGHT W/O BRACKET |
|---|---|---|---|---|
| RADIO 4402 | 8.5" | 8" | 4" | ~11.2 LBS. |

| NUMBER OF REQUIRED RADIOS | VOLUME |
|---|---|
| 2 | .157 Cu.Ft. |

NOTES:

1. DO NOT PAINT THE RRU. RRU SOLAR SHIELD CAN BE PAINTED PER MANUFACTURER'S METHOD OF PROCEDURE.

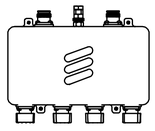
3 D-2 REMOTE EQUIPMENT HEAD DETAIL
NTS




| ERICSSON 4435 RRH | |
|---|---|
| WEIGHT | 2.2 LBS. |
| DIMENSIONS (HxWxD) | 14.69"x7.87"x3.66" |
| VOLUME | .245 Cu.Ft. |

| NUMBER OF REQUIRED RADIOS |
|---|
| 1 |

4 D-2 REMOTE EQUIPMENT HEAD DETAIL
NTS



| DIPLEXER | LENGTH | WIDTH | DEPTH | WEIGHT |
|---|---|---|---|---|
| DIPLEX B2+B66/B30 (4-2) | 8.27" | 4.57" | 1.71" | 5.07 LBS. |

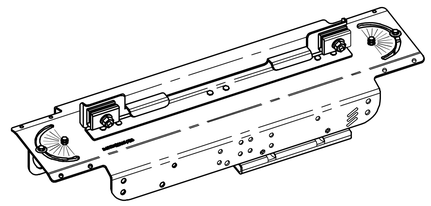
| NUMBER OF REQUIRED DIPLEXERS | VOLUME |
|---|---|
| 2 | .037 Cu.Ft. |

5 D-2 DIPLEXER DETAIL
NTS

BILL OF MATERIALS

| ITEM | PART NUMBER | DESCRIPTION |
|---|---|---|
| 1 | NTB 101 0450 | Material Kit |
| | SXK 125 3187/5 | KIT/SMALL CELL STRAND MOUNT, 3x 2203 |
| | TSR 899 277/31 | 4.3-10(M) PP-4.3-10(F), 24INCH |
| | TSR 899 277/32 | R/A4.3-109(M)PP TO 4.3-10(M)PP, 30INCH |
| | KRF 102 409/3 | DIPLEX B2+B66/B30, 4.3-10 |
| | 130C-1X15FT | LINERLESS RUBBER TAPE 3/4"x15' |
| | 1400-3/4x60FT | VINYL TAPE 3/4x60FT |
| 2 | | Panel Antenna |
| 3 | | Equipment Kit |

MECHANICAL PARTS (SXK 125 3187/6)



EQUIPMENT BRACKET ASSEMBLY (TOP VIEW)

6 D-2 DUAL ANTENNA STRAND BRACKET MOUNT DETAIL
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

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STATE OF MARYLAND
TRENT TRAVIS SNARR
55491
PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO: 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

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| 0 | 09-23-22 | FINAL CDs | AMT |
| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

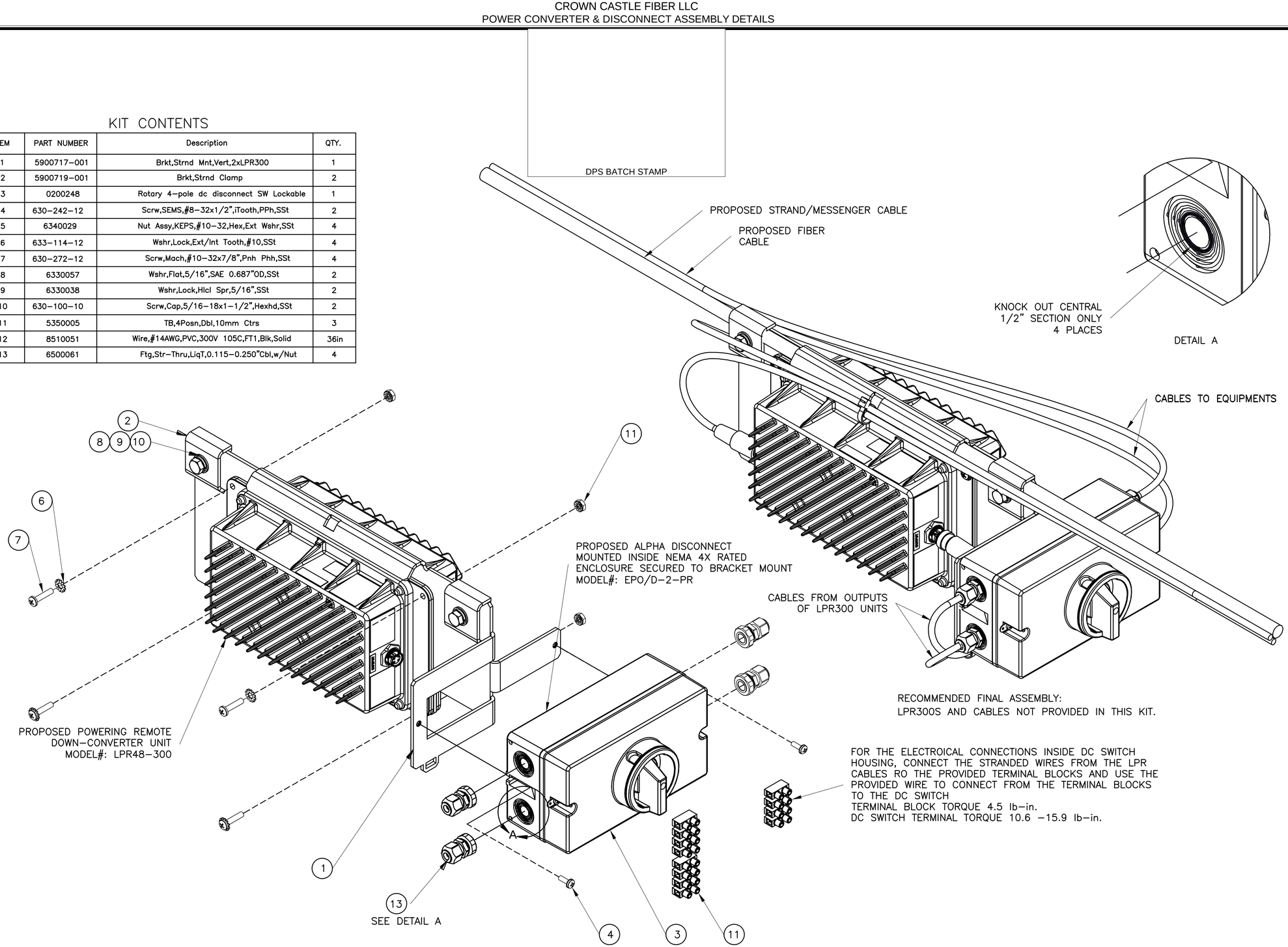
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| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET:
D-2

CROWN CASTLE FIBER LLC
POWER CONVERTER & DISCONNECT ASSEMBLY DETAILS

## KIT CONTENTS

| ITEM | PART NUMBER | Description | QTY. |
|---|---|---|---|
| 1 | 5900717–001 | Brkt,Strnd Mnt,Vert,2xLPR300 | 1 |
| 2 | 5900719–001 | Brkt,Strnd Clamp | 2 |
| 3 | 0200248 | Rotary 4–pole dc disconnect SW Lockable | 1 |
| 4 | 630–242–12 | Scrw,SEMS,#8–32x1/2",iTooth,PPh,SSt | 2 |
| 5 | 6340029 | Nut Assy,KEPS,#10–32,Hex,Ext Wshr,SSt | 4 |
| 6 | 633–114–12 | Wshr,Lock,Ext/Int Tooth,#10,SSt | 4 |
| 7 | 630–272–12 | Scrw,Mach,#10–32x7/8",Pnh Phh,SSt | 4 |
| 8 | 6330057 | Wshr,Flat,5/16",SAE 0.687"OD,SSt | 2 |
| 9 | 6330038 | Wshr,Lock,Hlcl Spr,5/16",SSt | 2 |
| 10 | 630–100–10 | Scrw,Cap,5/16–18x1–1/2",Hexhd,SSt | 2 |
| 11 | 5350005 | TB,4Posn,Dbl,10mm Ctrs | 3 |
| 12 | 8510051 | Wire,#14AWG,PVC,300V 105C,FT1,Blk,Solid | 36in |
| 13 | 6500061 | Ftg,Str–Thru,LiqT,0.115–0.250"Cbl,w/Nut | 4 |




1 / D-3 POWER CONVERTER & DISCONNECT ASSEMBLY DETAILS
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
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(410) 712-7092

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CROWN CASTLE FIBER LLC
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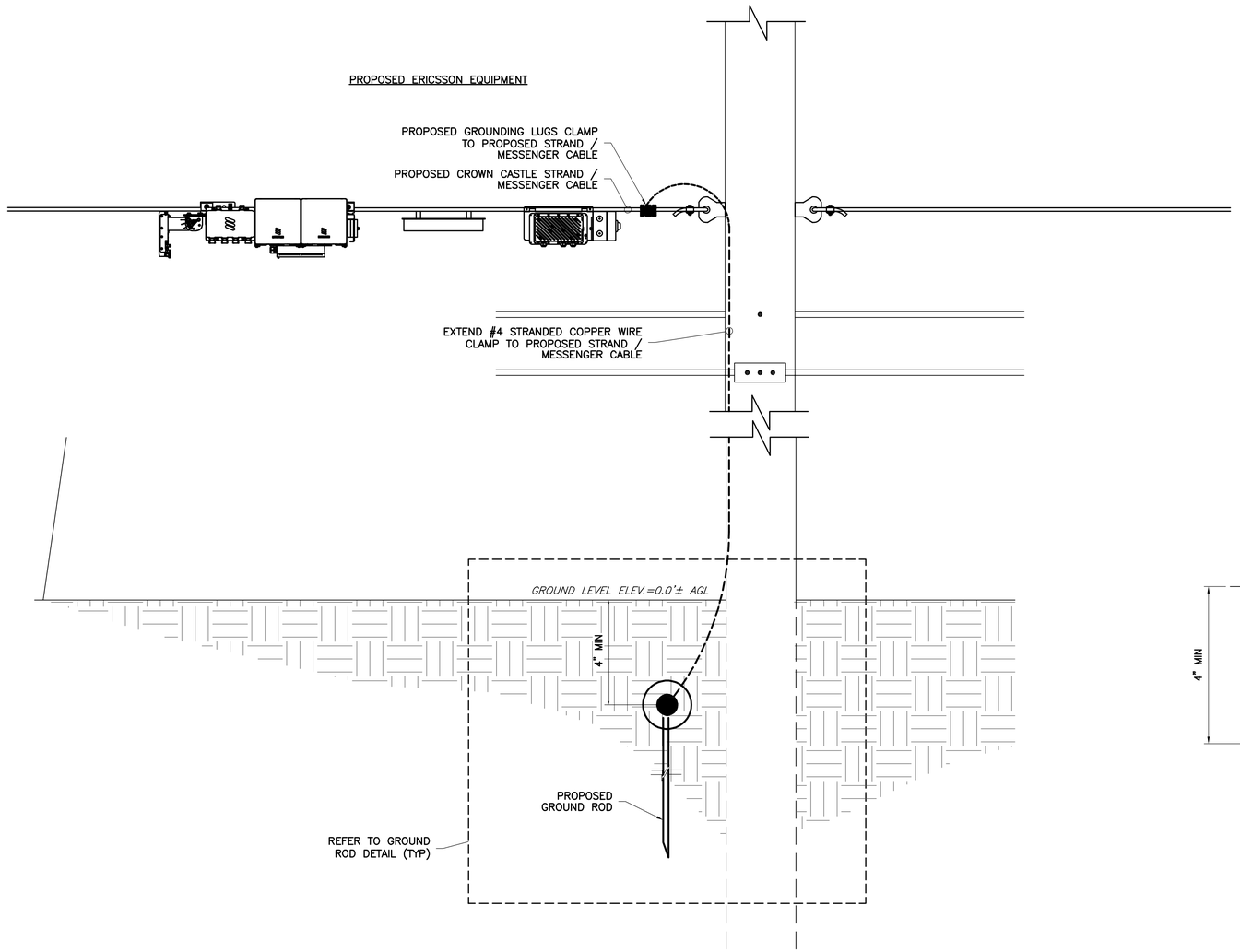
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SHEET: D-3

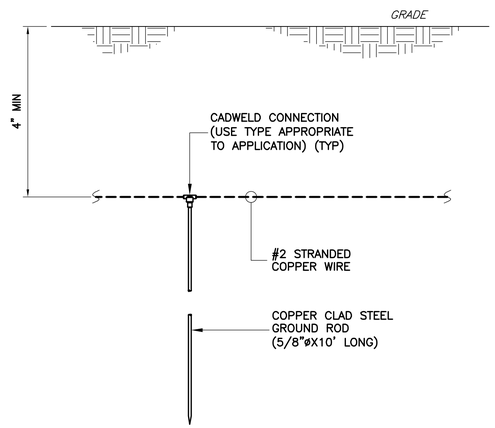
CROWN CASTLE FIBER LLC
GROUNDING DETAILS

**GROUNDING AND BONDING NOTE:**
GENERAL CONTRACTOR SHALL FOLLOW ALL CONSTRUCTION GUIDELINES PER CROWN CASTLE'S GROUNDING AND BONDING REQUIREMENTS FOR STRAND MOUNT NODES (oDAS) – DOCUMENT 337910.

DPS BATCH STAMP




1 G-1 GROUNDING RISER DIAGRAM
NOT TO SCALE




2 G-1 TYPICAL GROUND ROD DETAIL
NTS

NODE:
MNG-094M1 (478113)

ENGINEER:
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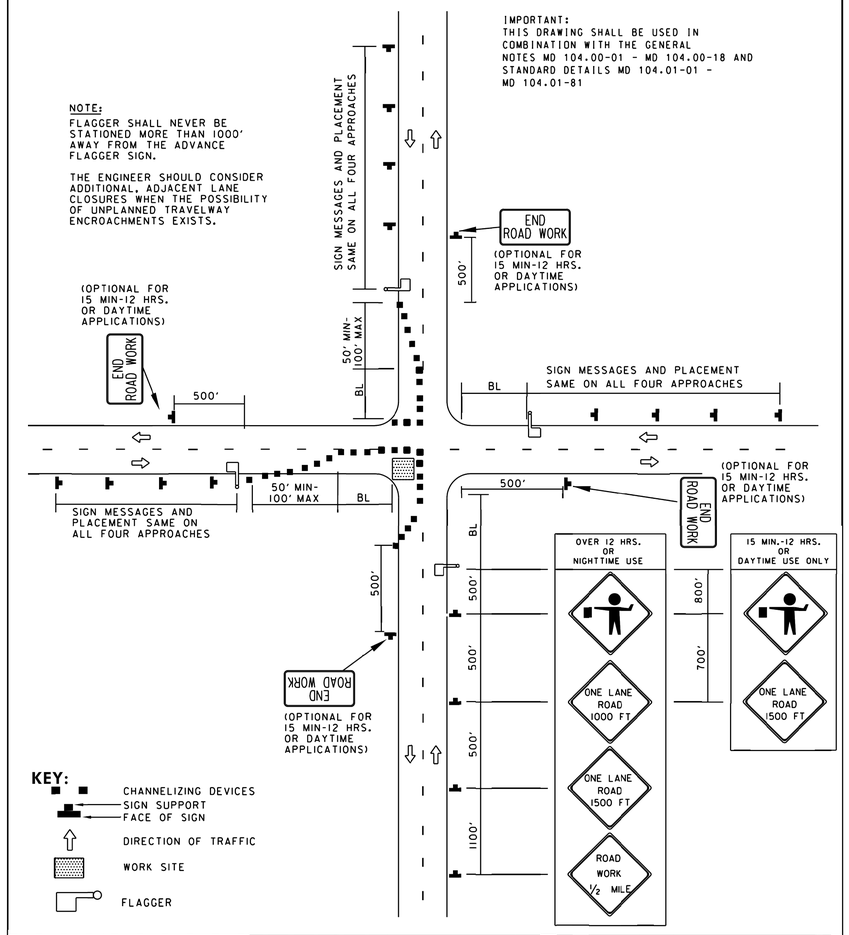
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SHEET:
G-1

CROWN CASTLE FIBER LLC
TRAFFIC CONTROL PLAN

DPS BATCH STAMP

## TEMPORARY TRAFFIC CONTROL TYPICAL APPLICATION




| SPECIFICATION | CATEGORY CODE ITEMS |
|---|---|
| 104 | |

APPROVED

DIRECTOR — OFFICE OF TRAFFIC AND SAFETY

| APPROVAL • SHA REVISIONS | | APPROVAL • FEDERAL HIGHWAY ADMINISTRATION | |
|---|---|---|---|
| APPROVAL | 8-20-03 | APPROVAL | 9-23-03 |
| REVISED | 8-11-10 | REVISED | 7-29-10 |
| REVISED | | REVISED | |
| REVISED | | REVISED | |

**Maryland Department of Transportation**
**STATE HIGHWAY ADMINISTRATION**
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

**INTERSECTION FLAGGING OPERATION**
**2-LANE,2-WAY EQL/LESS THAN 40 MPH**

**STANDARD NO. MD 104.02-14**

## SITE CONDITIONS

SPEED LIMIT 25

HUDSON AVE

## GENERAL NOTES

1. ALL PROPOSED LANE CLOSURES SHALL OCCUR BETWEEN THE HOURS OF 9 AM AND 3 PM, UNLESS OTHERWISE COORDINATED WITH THE PERMITTING AGENCY.
2. ROADWAY MUST BE FULLY RESTORED AT END OF EACH WORKDAY.
3. A MINIMUM OF 10' LANES MUST BE MAINTAINED THROUGH THE WORK ZONE.
4. ACCESS TO ALL DRIVEWAYS MUST BE MAINTAINED.
5. IF STEEL PLATES ARE USED TO TEMPORARILY RESTORE THE ROADWAY, THEN STEEL PLATE WARNING SIGNS SHALL BE INSTALLED ON ALL APPROACHES.
6. DURING THE PERIOD BETWEEN NOVEMBER 15 OF EACH YEAR AND MARCH 15 OF THE FOLLOWING YEAR, STEEL PLATES ARE NOT PERMITTED EXCEPT IN EMERGENCY CASES. WHEN ANY STEEL PLATE IS INSTALLED, THE PERMITTEE SHALL NOTIFY DPWT'S DISPATCHER BY PHONE, AT (301) 324-2710 AND THE DPIE INSPECTOR, WITHIN THE FIRST 4 HOURS OF INSTALLATION OF SAID PLATES. WHEN INSTALLED, STEEL PLATES SHALL BE APPROPRIATELY IDENTIFIED BY PERMITTEE FOR TRAFFIC AND PEDESTRIAN SAFETY. IN ADDITION, A MINIMUM OF FOUR 4-FOOT TALL WOODEN SURVEY STAKES (PAINTED BRIGHT PINK) PLACED BEHIND THE FACE OF CURB, OR IN RURAL TRAFFIC CONTROL DESIGN REVIEW CHECKLIST PAGE 5 OF 6 LAST EDITED JANUARY 17, 2017 AREAS, PLACED BEYOND ROAD SHOULDER, SHALL BE REQUIRED TO DENOTE BEGINNING AND END OF STEEL PLATES.
7. PEDESTRIAN FACILITIES MUST BE MAINTAINED OR A CLEAR, DETECTABLE, TRAVERSABLE, SAFE AND HANDICAP ACCESSIBLE ALTERNATIVE PATH MUST BE PROVIDED.
8. FLAGGERS SHALL BE MARYLAND STATE HIGHWAY ADMINISTRATION OR ATSSA APPROVED/CERTIFIED FLAGGERS. RADIO COMMUNICATION SHALL BE REQUIRED BETWEEN FLAGGERS IF THE FLAGGERS CANNOT SEE EACH OTHER OR IF THE LANE CLOSURE EXCEEDS 200 FEET.

NODE:
MNG-094M1 (478113)

ENGINEER:
NB+C TOTALLY COMMITTED.
NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

OWNER/DEVELOPER:
CROWN CASTLE
CROWN CASTLE FIBER LLC
10980 GRANTCHESTER WAY, 4TH FLOOR
COLUMBIA, MD 21044

TITLE:
MNG-094M1

8240 FLOWER AVE
TAKOMA PARK, MD 20912
JURISDICTION: MONTGOMERY COUNTY

LATITUDE: 38.992506
LONGITUDE: -77.002292

STATE OF MARYLAND — TRENT TRAVIS SNARR — 55491 — PROFESSIONAL ENGINEER

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 55491, EXPIRATION DATE 01/08/2024

ENGINEER OF RECORD

TRENT TRAVIS SNARR, P.E.
MARYLAND PROFESSIONAL ENGINEER
LICENSE #55491

REVISIONS

| REV | DATE | DESCRIPTION | BY |
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| A | 08-24-22 | PRELIMINARY CDs | JED |

| DRAWN BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|
| JED | SDR | PCQ |

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|---|---|
| PROJECT NUMBER: | 100505 |
| FILE NAME: | STRAND MOUNT DWG |
| DATE DRAWN: | 08-24-22 |
| SCALE: | AS SHOWN |

SHEET: TCP-1