

## Customer Requirements RF Antenna Installations

**C-OH-2000**

### Application

Attachment requirements and clearances on the Pole for Radio Frequency (RF) antenna equipment installations. This standard is intended to allow electrical workers to perform their normal job duties working on power lines and electrical equipment without requiring special training, having to take special precautions, or having to wear RF detectors to comply with Federal Communications Commission (FCC) standard for RF exposure limits for “General Population/Uncontrolled Exposure”. No antenna equipment installation is allowed if this intent is not met, as determined by Tacoma Power in its sole discretion based on the paramount operational needs and requirements of Tacoma Power’s electric utility system.

### Terms

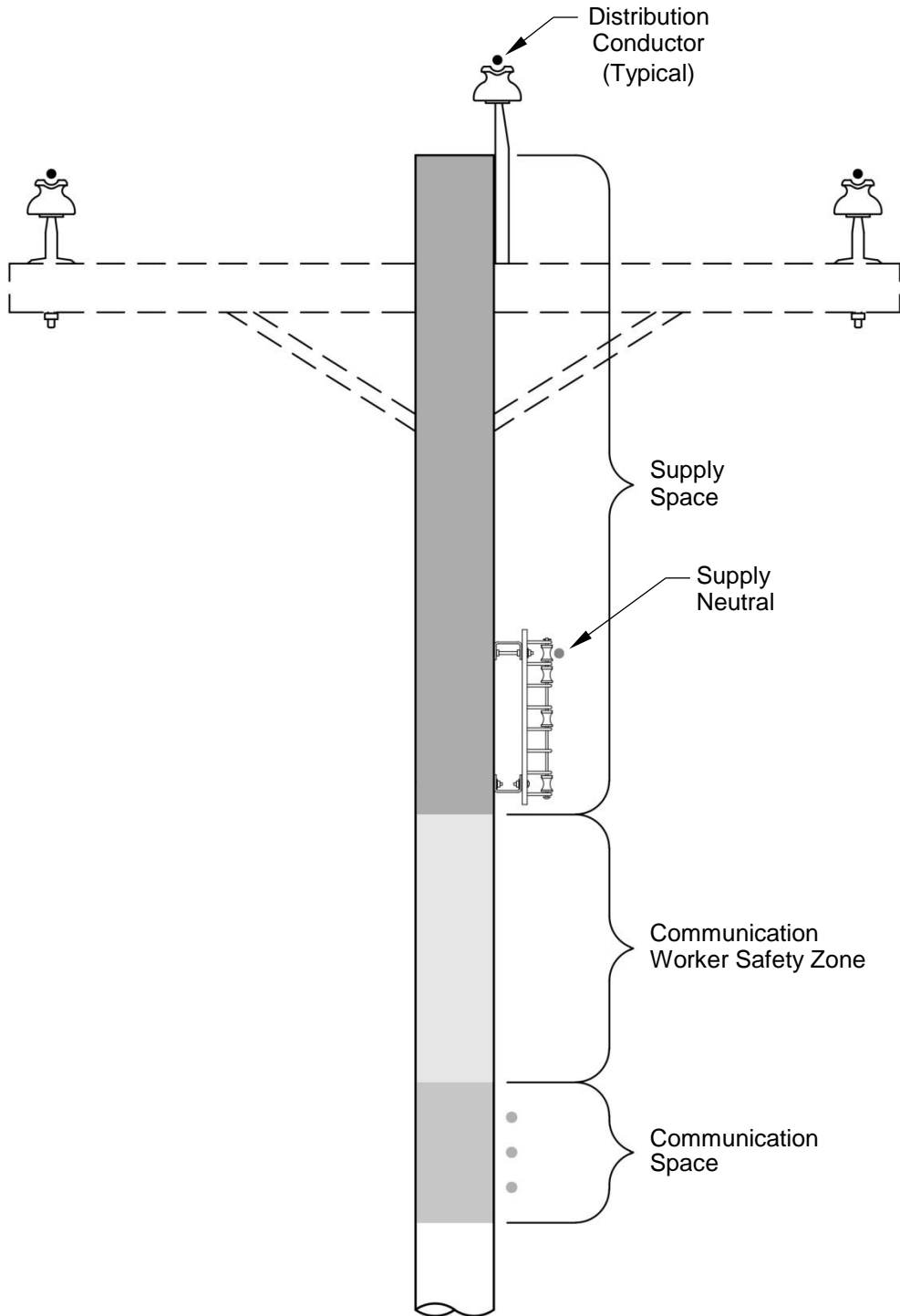
The following are definitions of terms used in this standard, which are also applicable to Tacoma Power joint-use Agreements including, but not limited to Master Pole Attachment Agreements:

Term	Definition
Communication Space	The space on joint-use Poles where communication facilities are separated from the supply space by the communication Worker safety zone. This space is below the communication worker safety zone.
Communication Worker Safety Zone	That space on joint-use Poles as defined in National Electric Safety Code (NESC) Rule 235C4. This zone generally originates at the lowest point of the supply space. This space is intended to maintain a physical separation between supply and communication facilities. The minimum dimensions of this space shall at no time be violated.
Supply Space	The space on joint-use Poles where supply facilities are separated from the communication space by the communication worker safety zone. This space is above the communication worker safety zone.
Transmission	Tacoma Power supply voltages of 115 kV or 230 kV.
Distribution	Tacoma Power supply voltages of 7.2 kV to 15 kV.
Secondary	Tacoma Power supply voltages of 600 V or less.
Supply Neutral	Multi-grounded conductor of the distribution system.

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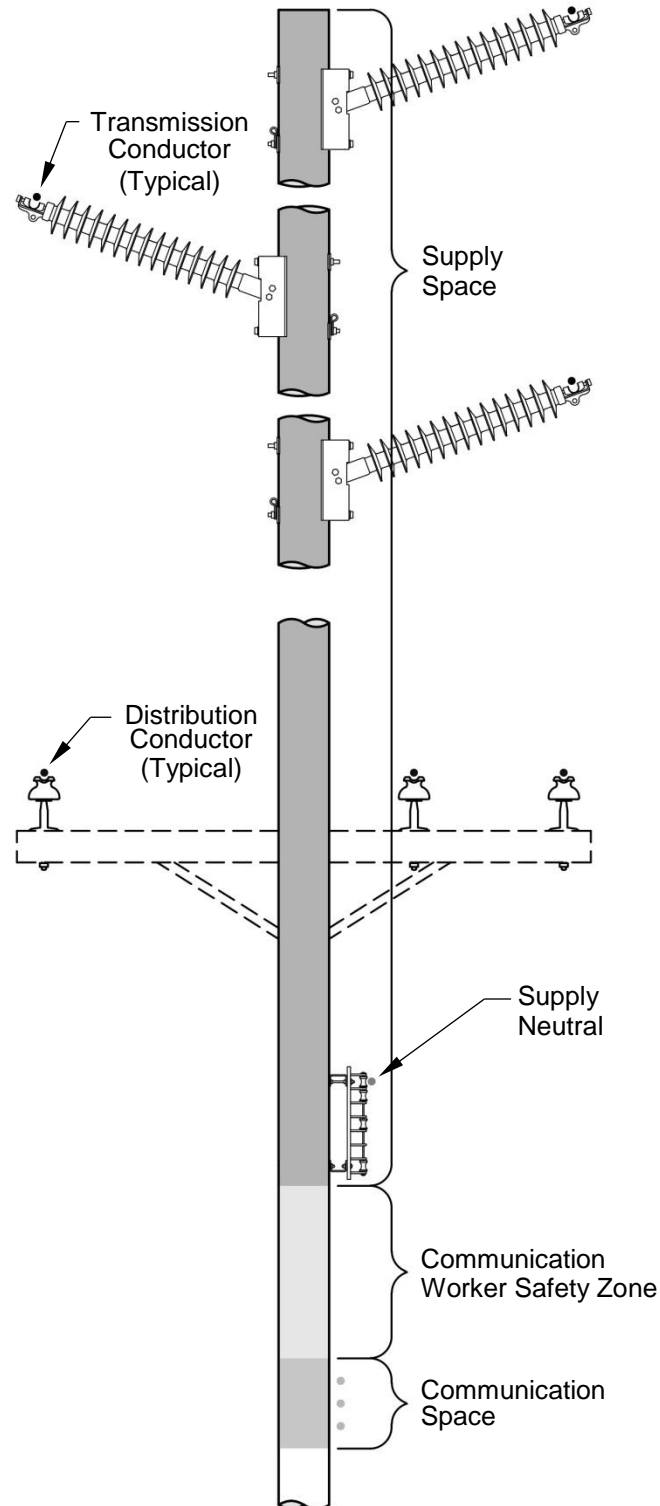
**Figure 1** Illustration of Space Allocation on Pole (Distribution Only)



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**Figure 2** Illustration of Space Allocation on Pole (Transmission with Distribution Underbuild)





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### Attachment Requirements

#### Agreements, Permits and Codes

- Prior to attaching equipment to Poles owned by Tacoma Power, a Pole attachment agreement must be signed by all parties involved and the related Pole attachment permit approved. Please contact Tacoma Power *Business and Financial Mgmt Dept* at [pwrjointutilities@cityoftacoma.org](mailto:pwrjointutilities@cityoftacoma.org).
- All attachments must meet the requirements for clearance and strength as specified by standard C-OH-9000 "Customer Requirements, Clearance Requirements for Overhead Joint Utility Construction" and the NESC, along with statutory, code, and other regulatory requirements established by the State of Washington, Pierce County, and local governments including the City of Tacoma.
- Attachments within the city limits of Tacoma must comply with the requirements of City of Tacoma Municipal Code, Title 16 and City of Tacoma franchise agreement.

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#### Complaints

- It shall be the responsibility of the antenna owning company to resolve any and all complaints resulting from the installation of the antenna equipment. The owning company shall provide Tacoma Power a phone number to receive and resolve the complaints.

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#### Outage Notification

- Tacoma Power will make reasonable effort to notify the antenna owning company of outages 24 hours in advance when possible, but reserves the right to disconnect power without notice when necessary in cases of emergency and/or based on the paramount operational needs and requirements of Tacoma Power's electric utility system as determined by Tacoma Power in its sole discretion.

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#### Who will Install and Maintain the Antenna Equipment

- Tacoma Power will install and maintain the antenna equipment and service **located in the supply space**. Fees for this work are established in the Tacoma Power Pole attachment agreement.
- In some cases, Tacoma Power may require the antenna owning company to hire an approved electrical contractor with qualified electrical employees as defined in Chapter 296-45 of the Washington Administrative Code (WAC) to install antenna equipment in the supply space.
- Antenna equipment and the service **below the communication worker safety zone** will be installed and maintained by the antenna owning company.

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#### Serving Voltage

- Tacoma Power will provide 120/240V single phase service to RF antenna equipment installations.

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#### Customer Outages

- Antenna equipment will be installed and maintained so that Tacoma Power customers will not be taken out of service, with the exception of customers whose services are directly attached to the Pole that supports the antenna equipment.



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### Attachment Requirements *(continued)*

#### **Pole Selection Criteria**

- Antenna equipment shall be mounted on clean tangent Poles when possible.
- Antenna equipment shall not be installed above any transmission conductors.
- Antenna equipment shall not be installed above any distribution conductors where that installation will be under any transmission conductors not attached to the Pole.
- RF emitting antennas shall not be installed in or below the communication space.
- Antenna equipment shall not be mounted on 4 way or 3 way corner Poles (buck leads) or Poles with:
  - primary switches.
  - primary cable terminations.
  - transformers.
  - capacitors.
  - sectionalizers.
  - regulators.
  - primary metering.
  - locations where adequate clearance is not available.
- Installations are approved on a Pole-by-Pole basis and Tacoma Power reserves the right to approve or deny attachment to any Pole in its sole discretion based on the paramount operational needs and requirements of Tacoma Power's electric utility system.

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#### **Poles shall be Climbable**

- Unless otherwise specifically designated by Tacoma Power, all antenna equipment shall be mounted on the Pole so that the Pole is climbable to the requirements of the NESC.

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#### **Materials Provided by Antenna Owner**

- Materials shall meet or exceed Tacoma Power material standards where Tacoma Power specifications exist.

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#### **Antenna Location on Pole**

- Antenna equipment can be installed in the supply space:
  - between the supply neutral and the distribution conductors.
  - above the distribution conductors where there are no transmission conductors above that are not attached to the Pole.
  - below the transmission conductors.
- Only one antenna installation per Pole.



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### Attachment Requirements *(continued)*

#### Disconnect

- All antenna equipment must be equipped with a quick means of electrical service disconnect, to turn off all RF energy. Installation of the service disconnect shall meet applicable safety regulations including, but not limited to, elimination of RF exposure to Tacoma Power employees in accordance with WAC 296-62-09005. Installation shall be completed as directed by Tacoma Power and at the sole cost of the antenna owning company.
  - This disconnect will also prevent any backup energization of the antenna.
- Tacoma Power reserves the right to disconnect power to installations when determined necessary in its sole discretion, and without prior notice, based on the paramount operational needs and requirements of Tacoma Power's electric utility system.

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#### Backup Energization

- Any backup energization shall be designed and constructed so that it cannot back-feed into the Tacoma Power system.

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#### Ground Mounted Equipment

- Antenna equipment may be installed on the Pole if it does not exceed the following requirements (antenna equipment shall be installed on the ground if it exceeds the following requirements) or as otherwise necessary to comply with applicable safety requirements including, but not limited to, WAC 296-62-09005:
  - 26 in. wide x 48 in. high x 16 in. deep
  - 500 lbs
- Ground mounted equipment shall be:
  - located on the road or field side of the Pole or grouped with any existing handholes/pedestals.
  - a minimum 4 ft (6 ft to 10 ft preferred) from base of Pole.
- Do not install ground mounted equipment or underground conduit in the Pole line where it would conflict with the future replacement of the Pole.
- When the equipment must be placed in line with the Pole, it should be located on the transformer, distribution crossarm, or other power equipment side of the Pole.

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### Attachment Requirements *(continued)*

#### Labeling

Antenna equipment shall be clearly labeled (as directed by Tacoma Power Construction Inspector) as follows:

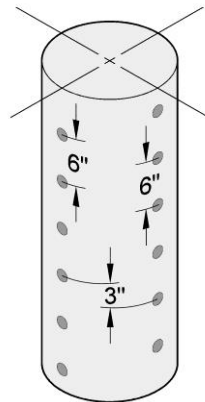
- Labels shall be a reflective, weather and UV resistant sign or decal.
- Labels shall follow all Occupational Safety and Health Administration (OSHA) and FCC Guidelines on labeling of wireless equipment.
- Labels shall also have the following information:
  - Name of owner.
  - Reference, site or equipment ID number.
  - 24 hr. phone number to responsible person that will respond to emergencies in a timely manner.
  - Minimum Approach Distance (MAD) limit clearly identified. This limit shall be calculated in the location of maximum RF strength, with the antenna operating at its maximum output and 100 percent duty cycle.

#### Pole Hole Drilling (see Figure 3)

- Holes drilled on the same side of Pole shall be no closer than 6 in.
- Holes that are perpendicular shall be no closer than 3 in.
- Hole Treatment:
  - For Douglas Fir Poles: Treat holes with Tacoma Power's current approved preservative.
  - For Cedar Poles: No treatment required.
- Any bolt holes for antenna equipment shall be 1 ft. min. from top of Pole.

**Figure 3**

Pole Drilling



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### Attachment Requirements *(continued)*

**Conduit Risers**

Riser conduit for RF antenna installations shall meet the following requirements:

Purpose	Type	Minimum Size (in.)	Maximum Size (in.)	Max. Total Qty. on Pole
120/240 V power supply conductors	Sch. 40 PVC, gray	2.5	2.5	6
First 10' of riser for the 120/240 V power supply conductors if fed from UG service	Sch. 80 PVC, gray	2.5	2.5	
Antenna equipment cables	Sch. 40 PVC, gray	1-1/4	6	

- Risers shall be installed on standoff brackets (see “Standoff Brackets” and Figure 4). Standoff brackets shall be:
  - no lower than 8 ft. from the ground or other accessible surface (including the top of the meter enclosure).
  - mounted within 6 in. of the top end of any stick of conduit.
  - evenly spaced along the Pole and no more than 10 ft. apart.
- If standoff brackets are already installed on the Pole, the new riser(s) shall be attached to these standoffs.
- Risers shall be located on the field side of the Pole and the Pole quadrant most protected from traffic.
- If more than one conduit will be on the same side of the bracket, the higher voltage will be closest to the Pole.
- The entire length of conduit riser should parallel the structure or Pole, regardless of taper of the Pole.
- The antenna owning company shall install riser conduit extended up to the Communication Worker Safety Zone. (Tacoma Power will extend the conduits through the communication worker safety zone and supply space as required)



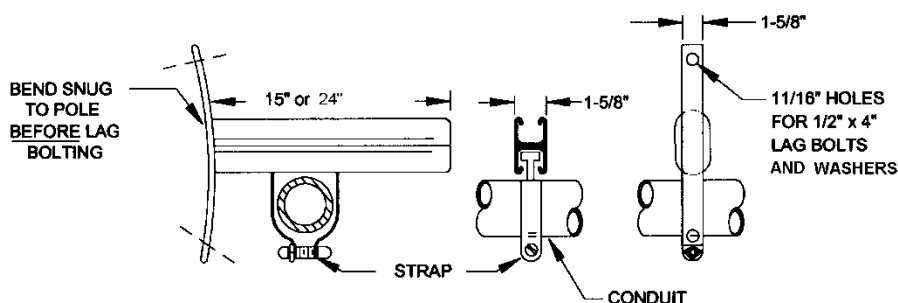
## Attachment Requirements *(continued)*

### Standoff Brackets (see Figure 4)

Standoff brackets for risers and other equipment shall be:

- hot dip galvanized with 1-5/8 in. C channel, 15 to 24 in. length.
- 2-piece steel galvanized binding member clamps suited to conduit size and type. Wire clamps are not acceptable.
- Fit closely to Pole shape by bending straps before lag-bolting and firmly lag-bolt to Pole.

**Figure 4** Standoff Bracket Requirements



## Bonding and Grounding

- A separate grounding electrode system for the antenna equipment installation shall be installed as follows:
  - Two (2) 5/8 in. x 8 ft. min. copper-clad ground rods shall be driven at least 6 in. below surface of final grade at a minimum of 6 ft. apart.
  - The ground rod nearest the Pole shall be a minimum of 4 ft. from base of Pole.
  - The ground rods shall be bonded to the existing Pole ground with minimum #4 AWG copper.
- All metallic antenna equipment shall be bonded to the existing Pole ground with minimum #4 AWG copper.
- All connections shall be non-reversible, compression type.
- Any bonding or grounding conductor installed on the Pole below 8 ft. from grade shall be minimum #4 AWG **copper-clad** conductor and shall meet the following requirements:
  - Staped to the Pole with min. 1-7/8 in. long, galvanized Pole ground wire staples every 3 to 6 in.
  - Covered with 1/2 in. wire molding and stapled again every 3 to 6 in.

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### Clearances

#### Antenna Equipment in Communication Space (see Figures 5 and 6)

- Spacing between the Pole and any antenna equipment shall be 4 in. min.
- Any part of the antenna equipment and/or associated mounting brackets shall be 40 in. min. below the supply space.
- Any part of the antenna equipment and/or associated mounting brackets shall be 12 in. min. below the lowest existing communications messenger and/or cable .

#### Antenna Equipment in Supply Space (see Figures 5, 6 and 7)

- Spacing between the Pole and any antenna equipment shall be 4 in. min.
- Below the distribution conductors:
  - The highest portion of the antenna shall be 48 in. min. below the top of the Pole.
  - The lowest portion of the antenna shall be 12 in. min. above the supply neutral, if present.
  - If the supply neutral is not present, the lowest portion of the antenna shall be 40 in. min. above the highest communications messenger and/or cable.
- Above the distribution conductors:
  - The lowest portion of the antenna shall be 5.0 ft. above the distribution conductor.
  - The highest portion of the antenna shall be 10.0 ft. below the lowest mounting bolt of the transmission insulators.

#### Secondary Only Poles

- The lowest portion of the antenna shall be 12 in. min. above the secondary conductor.
- Pole top extensions are allowed on a case by case basis, depending on the following:
  - The extension must not extend more than 48 in. and be designed specifically for that purpose.
  - The Pole must be structurally sound and of adequate strength to support the additional load.

#### Conduit Riser Clearances

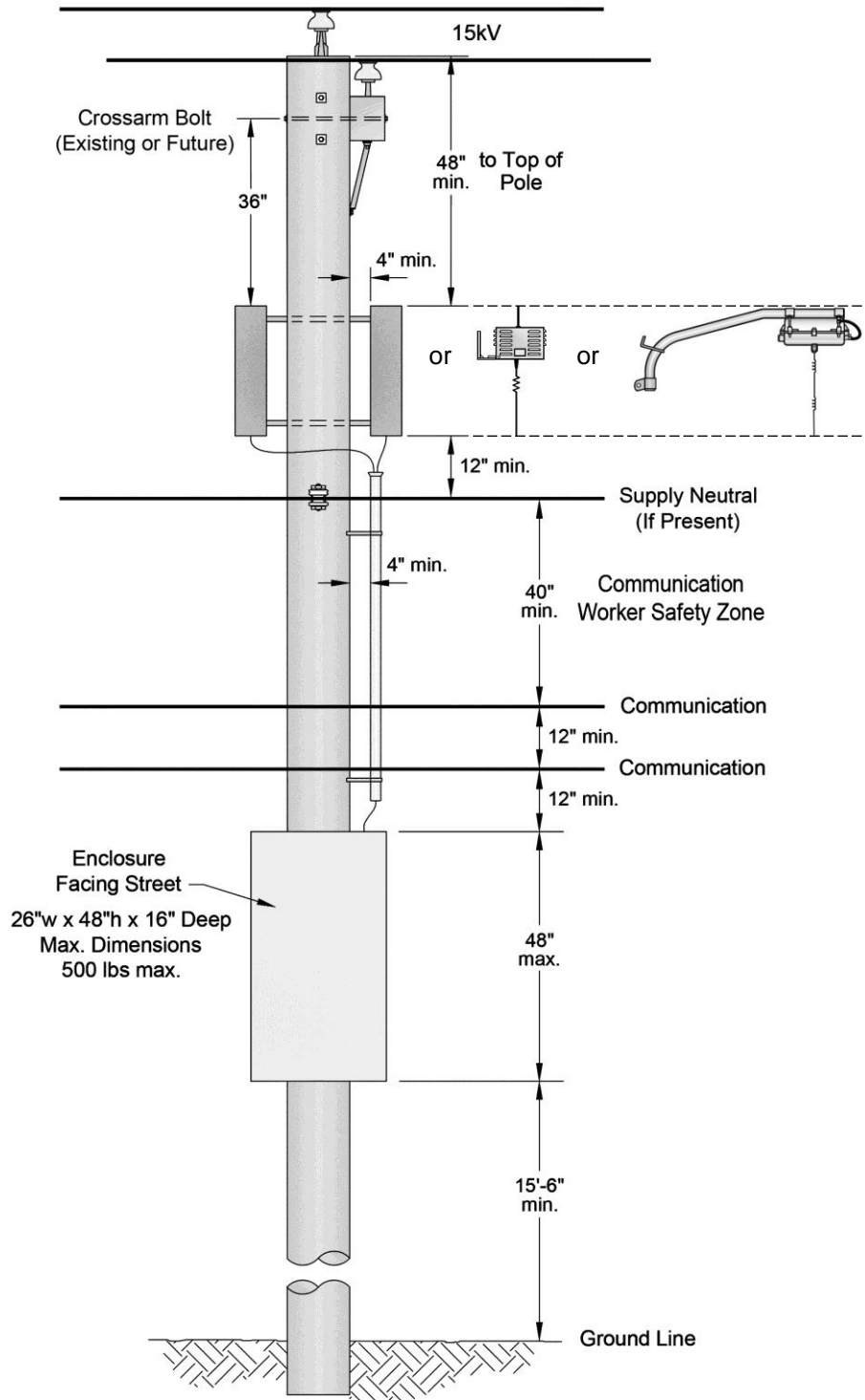
- Spacing between the Pole and any conduit riser shall be a minimum of 4 in.
- Any part of a conduit riser assembly shall maintain the following minimum clearances in any direction from conductors in the supply space:
  - Supply Neutral = 3 in.
  - Distribution Conductors = 6 in.

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### Clearances (continued)

**Figure 5** Clearance Requirements for RF Antenna Equipment Below the Distribution Conductors

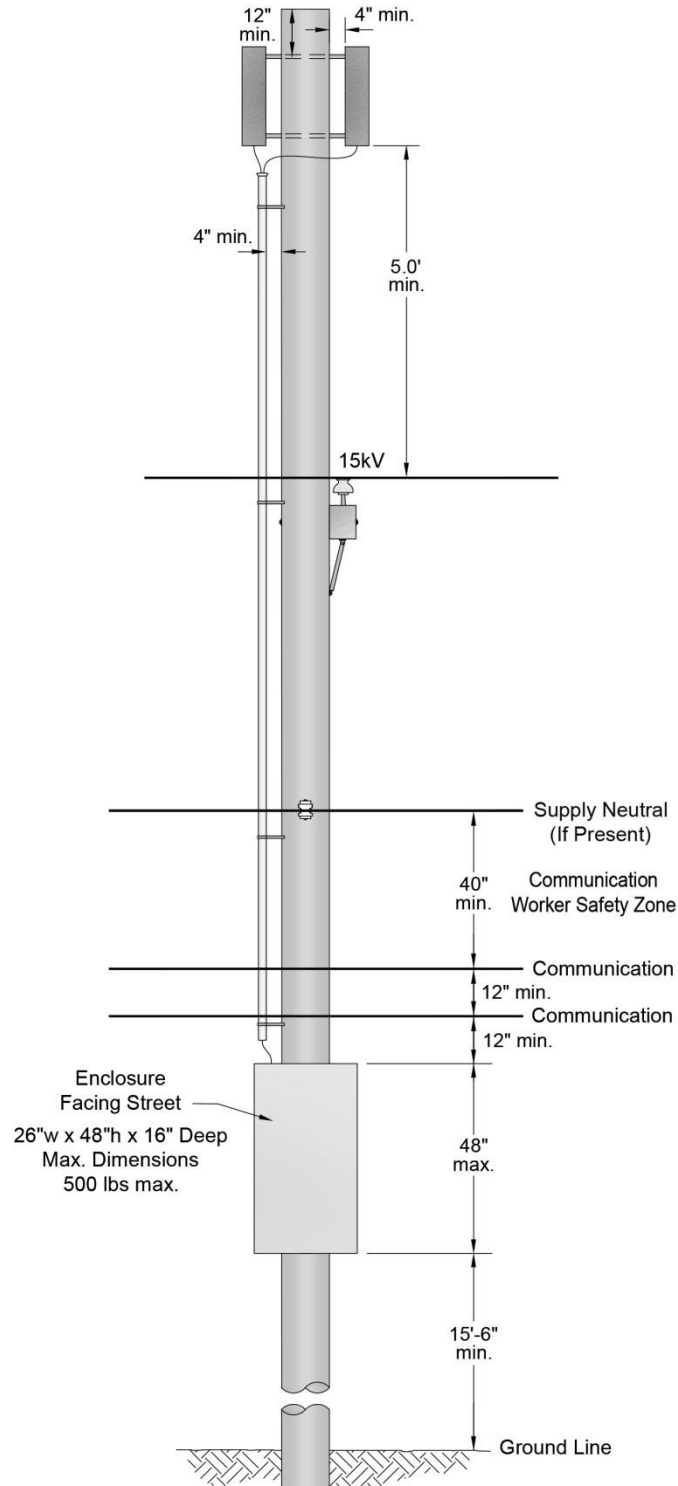


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### Clearances *(continued)*

**Figure 6** Clearance Requirements for RF Antenna Equipment Above the Distribution Conductors



**Clearances** *(continued)*

**Figure 7** Clearance Requirements for RF Antenna Equipment Below the Transmission Conductors

