

IEEE Guide for Joint Use of Utility Poles with Wireline and/or Wireless Facilities

IEEE Power and Energy Society

Developed by the
Transmission and Distribution Committee

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STANDARDS

IEEE Guide for Joint Use of Utility Poles with Wireline and/or Wireless Facilities

Developed by the

Transmission and Distribution Committee
of the
IEEE Power and Energy Society

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IEEE SA Standards Board

Abstract: The mechanisms and an analytic approach for developing consistent rules, agreements, and/or methodologies for the evaluation and inter-entity cooperation managing pole attachments on utility infrastructure that can contain both electric supply as well as communications wireline and wireless facilities are identified by this guide. The common safety codes and accepted good industry practices for joint use are referenced, including items such as clearances and strength/loading requirements; appropriate work rules during installation, maintenance, and restoration; and general guidelines. The considerations within this guide can be used to help perform a detailed assessment of attachment installations where communications antennas and related wireline and wireless equipment are to be colocated on joint use structures.

Keywords: 5G, antennas, communications, Communications Worker Safety Zone, distribution, future networks, IEEE 2939™, joint use, make-ready, National Electrical Safety Code®, NESC®, optical fiber, qualified electrical small cell, supply, transmission, wireless, wireline, worker zone

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Introduction

This introduction is not part of IEEE Std 2939-2023, IEEE Guide for Joint Use of Utility Poles with Wireline and/or Wireless Facilities.

Communications antennas and equipment placement on existing utility infrastructure is a growing level of complexity, especially with more equipment being colocated on vertical assets often owned by electric supply and telecommunications utilities that are not necessarily otherwise involved in providing communications services. The National Electrical Safety Code® (NESC®) (Accredited Standards Committee C2-2023) provides rules that help ensure the safe placement of supply and communications facilities on the same supporting structures, while the telecommunications industry has developed additional construction and installation procedures. This guide helps to fill possible gaps and is written with members of both industries in mind. The guide captures common guidelines/limits from various sources, considering both safety and best practice design principles. This guide also addresses clearances and strength/loading as well as other considerations for worker safety inclusive of restoration and disaster recovery activities. While this guide focuses on joint use installations, additional IEEE guides and standards are referenced where applicable.

This guide does not provide specific design details or procedures, such as when a joint use interference analysis must be performed, or cover other issues that may need to be considered in joint use installations (e.g., procedures for remediation, settling disputes, and penalties). Although the attachment of wireless facilities to existing joint use poles is a primary focus, many of the issues addressed and the technical concerns reviewed will also apply to proposed wireless attachments to streetlights, traffic lights, towers, buildings, and other supporting structures where space is available.

One issue that has complicated the attachment of small cell installations is the lack of standardization related to the criteria for attaching small cells and equipment. The industry recognizes that all parties, including licensee communications providers and pole owners, both electric utility and Incumbent Local Exchange Carriers (ILECs), have concerns related to small cells and must maintain safety as a top priority. However, experience has shown that virtually every pole owner has established their own criteria for poles that are candidates for small cell installation and how they should be attached. As a result, the specifications for wireless equipment attachment vary widely by pole owner, which creates challenges for network builders attempting to be compliant with the requirements of different pole owners. The reason for these differences varies as companies have different factors affecting design and specifications.

The deployment of small cell technology will be progressing for many years, and increased standardization would greatly improve the overall efficiency of construction and subsequent operations. It is hoped that this guide can be a catalyst for greater cooperation and standardization in the industry.

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IEEE Guide for Joint Use of Utility Poles with Wireline and/or Wireless Facilities

1. Overview

1.1 Scope

This guide provides recommendations for the development of consistent guides, agreements, and/or methodologies for the evaluation and intercompany cooperation of managing pole attachments on electric utility infrastructure.

1.2 Purpose

The purpose of this joint use guide is to provide information to help develop consistent rules, agreements, and/or methodologies for managing the interaction of communications attachments with electric supply facilities on overhead utility infrastructure. The common considerations for joint use, such as clearances and loading and strength requirements, are discussed. Included are general guidelines and considerations for performing joint use attachment installations, with several sections specific to the analysis of colocated small cell communications antennas and related equipment, while being consistent with multiple workers' safety rules. Although the information in this guide should be universally useful, the focus is on applications in the United States and its practices and regulations.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).^{6,7}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

⁶The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

⁷The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

Accredited Standards Committee C2-2023, National Electrical Safety Code® (NESC®).^{8,9}

Code of Federal Regulations Title 29 Part 1910 Subpart Z Section 1020(c)(13) (29 CFR 1910.1020(c)(13)), Occupational Safety and Health Standards, Subpart Z—Toxic and Hazardous Substances—Definitions—Toxic substance or harmful physical agent.¹⁰

FCC 18-111, “Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment; Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment,” Report and Order, Declaratory Ruling.¹¹

FCC 18-133, “Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment; Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment,” Declaratory Ruling, Report and Order.

FCC OET-65, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields,” Bulletin.

3. Definitions, acronyms, and abbreviations

3.1 Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.¹²

antenna: A physical item used to transmit or receive electromagnetic waves operated at radio frequencies; it may be mounted directly to supporting structure (pole), on pole-top extension, sidearm, crossarm, bracket, or on messenger strand.

attachment height: The distance measured vertically from the groundline of the utility supporting structure to the attachment point of the item being measured.

bonding: The physical electric connection of communication conductors to each other and a common vertical neutral conductor on utility supporting structures.

class: *See:* **pole class.**

clearance: The quantitative separation between electric supply or communications facilities and various surfaces, below or above, or between the facilities themselves.

colocated: A term used to describe communication and supply facilities that are near each other on shared or immediately adjacent utility supporting structures.

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⁹The NESC is available from the Institute of Electrical and Electronics Engineers (<https://standards.ieee.org/>).

¹⁰CFR publications are available from the U.S. Government Publishing Office (<https://www.ecfr.gov/>).

¹¹FCC publications are available from the Federal Communications Commission (<https://www.fcc.gov/>).

¹²*IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>. An IEEE account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

communication space: The location on utility supporting structures where communication facilities are typically located and separated from the electric supply space.

Communication Worker Safety Zone (CWSZ): The safety zone on utility supporting structures between the uppermost communication facility and the lowest electric supply facility.

competitive local exchange carrier (CLEC): A telecommunications provider company (sometimes called a *carrier*) competing with other, already established carriers, generally the incumbent local exchange carrier (ILEC).

dead end: A utility supporting structure where the overhead conductors extend on only one side of the pole.

distribution: Electric supply or communications conductors that provide service to end-use customers.

easement: A legally binding real estate instrument that grants nonpossessory rights of access to utilize private property for a specified purpose.

grade of construction: Strength level defined by the National Electrical Safety Code® (NESC®), based on condition and location, that utilities shall use to construct facilities to help ensure safety under specified weather scenarios.

ground line circumference: The distance around a cross section of the pole at the point where the utility pole meets the ground.

grounding: Physical connection of conductive utility lines and equipment to the earth by means of metallic rods, components, and/or other acceptable methods.

incumbent local exchange carrier (ILEC): Local telephone company that held the regional monopoly on landline service before the market was opened to competitive local exchange carriers (CLEC) or the corporate successor of such a firm.

investor-owned utility: An electric supply utility listed on a public stock exchange and controlled by a board of directors representing the stockholders.

joint use: The shared use of utility supporting structures, by mutual agreement, between pole-owning utilities [typically electric power and incumbent local exchange carrier (ILEC) telephone companies]. It can also refer to licensed third-party attachments by non-pole-owning utilities (e.g., cable television and telecommunications providers) to utility-owned poles.

line angle: The resultant angle that is created when adjacent utility poles are not aligned.

loading district: Geographic area defined by the National Electrical Safety Code® (NESC®) with defined weather conditions, such as wind and ice, that determine engineering requirements for the installation and maintenance of utility supporting structures and conductors.

make-ready: The process of preparing utility supporting structures and conductors for the addition of new attachments or equipment. This may include moving, rearranging, and/or adjusting the positions of existing facilities to comply with applicable requirements.

messenger: A multistrand galvanized steel wire used to support communication cables in combination with lashing wire, rings, or hoops or to secure equipment with brackets. *Syn:* **messenger strand; strand; suspension strand.**

messenger strand: *See:* **messenger.**

multiplex: Electric supply cable consisting of a bare neutral messenger and up to three insulated supply conductors used for final service connections (also known as duplex, triplex, quadruplex).

municipal (muni) and government-owned electric utility: Electric utility provider owned and operated by a municipality or government entity.

overlash: Installation of additional cable(s) to existing communications messenger that runs between utility pole attachment points.

pole class: The ANSI classification system that designates the strength of wood poles based on their circumference measured 6 ft from the butt, after bark removal and/or shaving.

NOTE—See ANSI O5.1-2022, Section 4 [B1].^{13,14}

pole height: The distance from the ground line to the top of a utility pole.

pole length: The overall distance from the bottom (butt) to the top of a utility pole.

primary power: Electric distribution supply conductors on the high voltage side of the electric supply system with ac voltages above 600 V.

pull: At a corner pole or angle supporting structure in the line, the perpendicular distance of the pole from a chord between points 30.5 m (100 ft) from the pole, on the lines on opposite sides of the pole (*See line angle*).

rights-of-way (ROW): The area on, below, or above a designated property in which an authority having jurisdiction (AHJ) has an interest and may allow, by agreement, the installation of public and private utilities. Rights-of-way may be established through various methods, including a) deeded purchase, b) eminent domain, c) easement grant, d) franchise agreement, and e) adverse possession.

rural electric cooperative (co-op): Customer-owned electric utilities that provide electricity to end users in their service territories per United States Rural Utilities Service requirements. The cooperative is governed by a board of directors elected from the user membership.

sag: The distance measured vertically from the lowest point of the conductor to a straight line joining its two points of support at the ends of the span.

secondary power: Electric distribution supply conductors on the low-voltage side of the electric supply system with ac voltages lower than 600 V.

span length: The level horizontal distance between two utility supporting structures.

strand: *See:* messenger.

supply space: The controlled space on a utility pole where only qualified electric line workers are authorized to have access, starting from the top of the Communication Worker Safety Zone and extending to the top of the supporting structure.

supporting structure: A structure used to support supply or communication conductors and cables and related equipment. Examples include poles and towers.

suspension strand: *See:* messenger.

¹³Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

¹⁴The numbers in brackets correspond to those of the bibliography in Annex D.

tangent (pole/structure): Utility structures that are usually arranged in a straight line with other supporting structures and do not require any external type of support and normally are made of wood.

third-party attachment: Cable television, telecommunication, and optical fiber entities that are not the incumbent local exchange carrier (ILEC) provider in a specified regional area. These entities do not own poles and typically attach above an ILEC provider on a pole.

transmission: Electric transmission conductors that carry ac voltages from the generation source to an electric substation prior to being distributed. For telecommunications, it describes long distance conveyance of information or signals.

wireless: Electromagnetic transfer of information between two or more points using radios and antennas.

wireline: Electromagnetic or optical transfer of information between two or more points using cables or conductors.

3.2 Acronyms and abbreviations

ANSI	American National Standards Institute
APPA	American Public Power Association
CLEC	competitive local exchange carrier
CWSZ	Communications Worker Safety Zone
FCC	Federal Communications Commission
GO 95	General Order 95 (California Public Utilities Commission)
ILEC	incumbent local exchange carrier
IOU	investor-owned utility
M&P	methods and procedures
MSO	multiple system operator
NCRP	National Council on Radiation Protection and Measurements
NEC	National Electrical Code®
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code®
NRECA	National Rural Electric Cooperative Association
OET	Office of Engineering and Technology (of the Federal Communications Commission)
OSHA	Occupational Safety and Health Administration
OTMR	one-touch make-ready
PSC	public service commission
PUC	public utility commission
ROW	rights-of-way
RF	radio frequency
RUS	Rural Utilities Service (United States)
SEPA	Southeastern Power Administration
WTB	Wireless Telecommunications Bureau (of the Federal Communications Commission)

4. United States federal and state regulations

4.1 General

Applicants in states regulated by the United States Federal Communications Commission (FCC) should review rulings FCC 18-133 and FCC 18-111.¹⁵ These rulings mandate requirements for fair and nondiscriminatory access by regulated utilities and may apply to municipal or government-owned electric utilities not regulated by a public utility commission (PUC) or public service commission (PSC). Applicants in FCC Reverse Preempted states (states that have elected to provide their own requirements) should review FCC DA-10-893 [B14] for state-specific listing and consult with the state PUC/PSC for specific requirements. Most PUC/PSC requirements mirror FCC regulations and have provisions for fair and nondiscriminatory access. However, some rules are more prescriptive, such as in the states of California, Washington, and Oregon.

The FCC regulations currently (as of March 2020 as per FCC WC Docket 10–101 [B15]) cover utility pole attachments in 28 states: Alabama, Arizona, Colorado, Florida, Georgia, Hawaii, Indiana, Iowa, Kansas, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, North Carolina, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Wisconsin, and Wyoming.

As of 2020, the following 22 states and the District of Columbia have certified that they regulate pole attachments: Alaska, Arkansas, California, Connecticut, Delaware, District of Columbia, Idaho, Illinois, Kentucky, Louisiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Utah, Vermont, Washington, and West Virginia.

The FCC does not have jurisdiction over pole attachments in these states that certify to the FCC that they regulate pole attachments unless the state fails to act on a pole attachment complaint for 180 days or to complete action on the complaint for 360 days.

Of the seven operating bureaus within the FCC, the Wireless Telecommunications Bureau (WTB) handles all FCC domestic wireless telecommunications programs and policies, including licensing, enforcement, and regulatory functions. Under its purview are wireless communications services, including cellular telephone, paging, personal communications services, and other commercial and private radio services. The obligation of pole owners to provide wireless telecommunications providers access to utility poles at reasonable rates is considered pursuant to Section 224 of the Telecommunications Act of 1996 [B35].

4.2 Radio frequency (RF) exposure

The FCC Office of Engineering and Technology Bulletin 65 (OET 65) discusses the evaluation of compliance with FCC guidelines for human exposure to radio frequency (RF) electromagnetic fields. The exposure limits discussed in OET 65 are based on recommendations by the National Council on Radiation Protection and Measurements (NCRP), IEEE, and the American National Standards Institute (ANSI). Those guidelines incorporate two tiers of exposure limits based on whether a) the exposure occurs in an occupational or “controlled” situation or b) the general population is exposed or exposure is in an “uncontrolled” situation. For purposes of this document and the FCC’s exposure guidelines, the frequency range of interest is 300 kHz to 100 GHz.

RF energy or electromagnetic radiation (EMR), also known as electromagnetic energy (EME), is a type of nonionizing radiation that has been defined as a physical hazard by Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.1020(c)(13). The main effect of EME exposure is heating, similar to water or food being heated in a microwave oven. However, EME exposure is nonaccumulative if exposure is kept below the body heating damage range: around 40 °C to 40.6 °C (104 °F to 105 °F). Depending on

¹⁵Information on references can be found in [Clause 2](#).

frequency, the ability of RF energy to heat varies greatly. Even in the cases of severe exposure to high energy levels, when individuals remove themselves from the RF environment, their bodies will cool through biological processes in a short period of time.

As a hazard, nonionizing RF radiation needs to be identified, evaluated, and controlled. In addition, one shall consider a worker's and the public's exposure when planning operations at communications sites. While RF devices on power utility infrastructure and streetlights are typically lower power than their tower or building mounted counterparts, the implementation of a radio frequency safety program (RFSP) is recommended (see IEEE Std C95.6™-2002 [B22] and IEEE Std C95.7™-2014 [B23]). Such a program should encourage safe work practices and training for anyone with the potential for significant RF exposure, including recognition of RF-emitting devices, personal protective equipment, and RF mitigation when appropriate. Further details on occupational RF exposure are covered elsewhere in this guide, including [Annex A](#).

Because antennas are placed at a significant height above the ground (especially if mounted at the tops of poles or other tall supporting structures or within the allotted communications space on a pole or supporting structure), the exposure of the general public to RF radiation is not usually of concern. However, industry best practice is that all installed antenna elements should be presumed to be energized and radiating RF energy by the utility personnel working around it unless it can be definitively established and verified that the energy source to the antenna has been disconnected. This practice also includes situations where damage to poles or supporting structures is caused by natural or human incidents (weather, vehicle collisions, etc.).

5. Pole owners

5.1 General

Attachment of communications facilities to utility poles generally requires coordination with and approval by one or more types of pole owner. The type of pole owner can play a significant part in the scope of the attachment rules and regulation of the utility owning the pole. A prospective attacher should understand the regulatory requirements of each type of utility. A general description of each of these entities is provided.

5.2 Investor-owned utilities (IOUs)

Investor-owned utilities (IOUs) generally cover a large geographic area, and most are multistate organizations that provide electricity and other basic services (e.g., gas) to a large group of customers. These utilities are listed on a public stock exchange and controlled by a board of directors representing the stockholders. Utilities are highly regulated by state utility commissions and federal agencies. They follow safety codes and procedures required in the state in which they have facilities as well as federal law, including OSHA regulations (29 CFR 1910.268 [B7], 29 CFR 1910.97 [B6], and 29 CFR 1910.269 [B8]).

IOUs typically have a large engineering staff. Because of their size and engineering expertise, IOUs have attachment procedures and rules that are specific to their utility. The same IOU may have different rules in different states owing to the state's specific requirement. This guide highly recommends that attachers contact the appropriate IOU in each state for compliance information. In general, the IOUs follow FCC/PUC/PSC attachment regulations and the standards of the National Electrical Safety Code® (NESC®) (Accredited Standards Committee C2-2023); however, some states have specific requirements that supplement or supersede the NESC.