2018 ACE SCHOOL & RUS SYMPOSIUM
TERMINUS
CONNECTING POINTS OF OPPORTUNITY

NEC / NESC 2017

Speaker:

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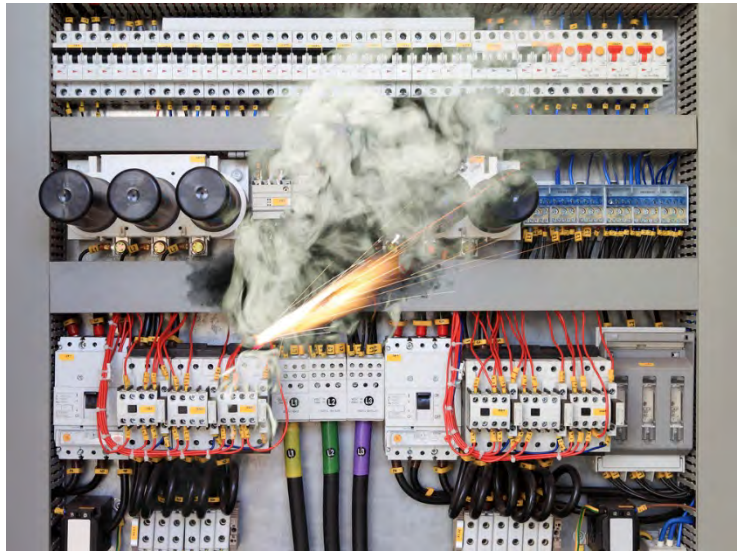
Disclaimer

- The following presentation is the opinion of Dean Mischke and has not been verified with NFPA or IEEE.
- The changes discussed in this presentation are not all inclusive and each reader is responsible for reviewing the Code to determine their exact application and full extent of the changes.

Purpose of Grounding and Bonding

- Primary function of grounding and bonding is the protection of the customer and maintenance personnel from lightning, induced voltages, or direct contact with electrical supply circuits.



- Secondary Function of grounding and bonding is to reduce the amount of damage the communication facilities from lightning, induced voltages, or direct contact with electrical supply circuits.

Purpose of Grounding and Bonding

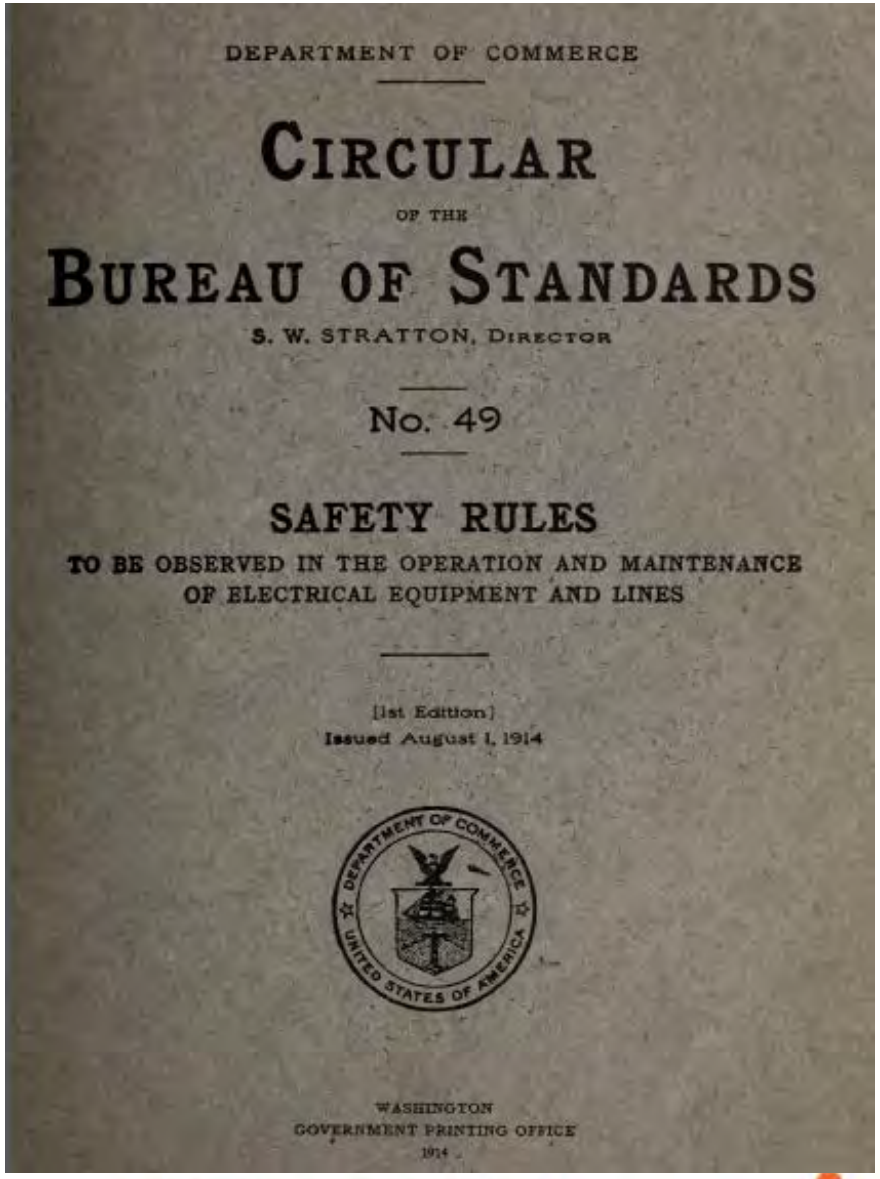
- Finally, to comply with NEC and NESC.

And we all try to follow directions, right??

https://onsizzle.com/i/meanwhile-in-florida-the-alligators-have-developed-sign-making-skills-11268488

National Electric Safety Code: NESC

- Governed by IEEE
  http://standards.ieee.org/about/nesc/



DEPARTMENT OF COMMERCE

CIRCULAR

OF THE

BUREAU OF STANDARDS

S. W. STRATTON, DIRECTOR

No. 49

SAFETY RULES

TO BE OBSERVED IN THE OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT AND LINES

[1st Edition]

Issued August 1, 1914

WASHINGTON

GOVERNMENT PRINTING OFFICE

1914

https://archive.org/details/circularofbureau49unse

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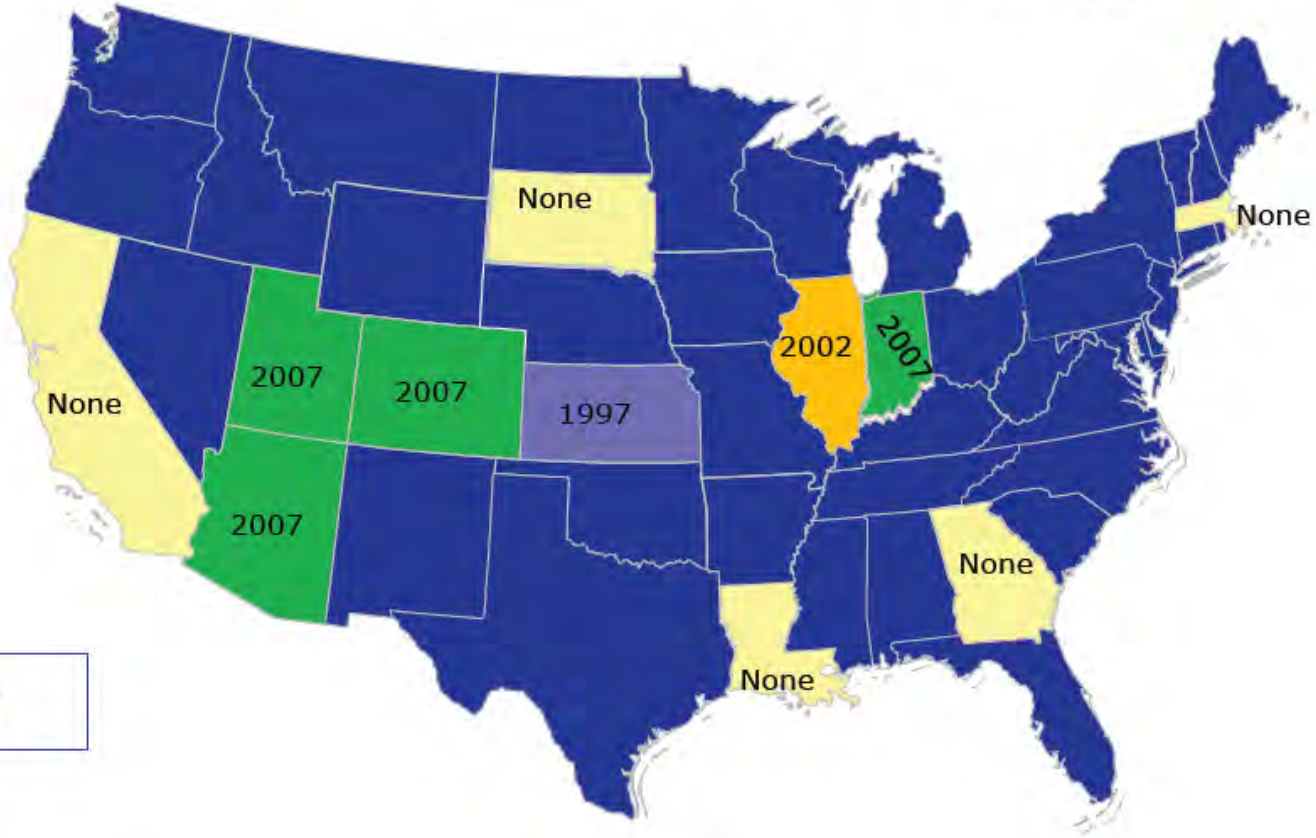
NESC Editions in Effect by State

Editions of the NESC
2012 – Blue
2007 – Green
2002 – Orange
1997 – Purple
None - Yellow



Alaska – 2012
Hawaii - 2002

Compiled 10/13/16

http://standards.ieee.org/about/nesc/2012-nesc-state-adoption-reference-maps.pdf

NESC

Section 1, Introduction to the NESC

011. Scope: NECS covers

1. "Supply and **communication facilities** (including metering) and associated work practices employed by a public or private electric supply, **communications**, railway, trolley, street and area lighting, traffic signal (or other signal), irrigation district or other community owned utility, or a similar utility **in the exercise of its function of a utility**."
2. "The generation , transmission and distribution of electricity, lumens, communications signals, and communication data through public and private utility systems that are installed and maintained under the exclusive control of utilities or their authorized representatives."
3. Utility facilities and functions of utilities that either (b) provide energy or communication signals through delivery point to another entity.

NESC Important Sections for Communications Systems

- Section 9: Grounding methods for electric supply and communications facilities
- Part 1: Rules for the Installation and Maintenance of Electrical Supply Stations and Equipment
  - Section 14. Storage Batteries
- Part 2: Safety Rules for the Installation and Maintenance of overhead Electrical Supply and Communications Lines
  - Section 20. Purpose, scope, and application of rules
  - Section 21. General requirements
  - Section 22. Relations between various classes of lines and equipment
  - Section 23. **Clearances**

NESC Important Sections for Communications Systems

- Part 2: Continued
  - Section 24. Grades of Construction
  - Section 25. Loadings for Grades B and C
  - Section 26. Strength requirements
- Part 3. Safety Rules for the Installation and Maintenance of Underground Electric Supply and Communications Lines
  - Section 30. Purpose, scope, and application of rules
  - Section 31 General requirements applying to underground lines
  - Section 32. Underground conduit systems
  - Section 34. Cable in underground structures

NESC Important Sections for Communications Systems

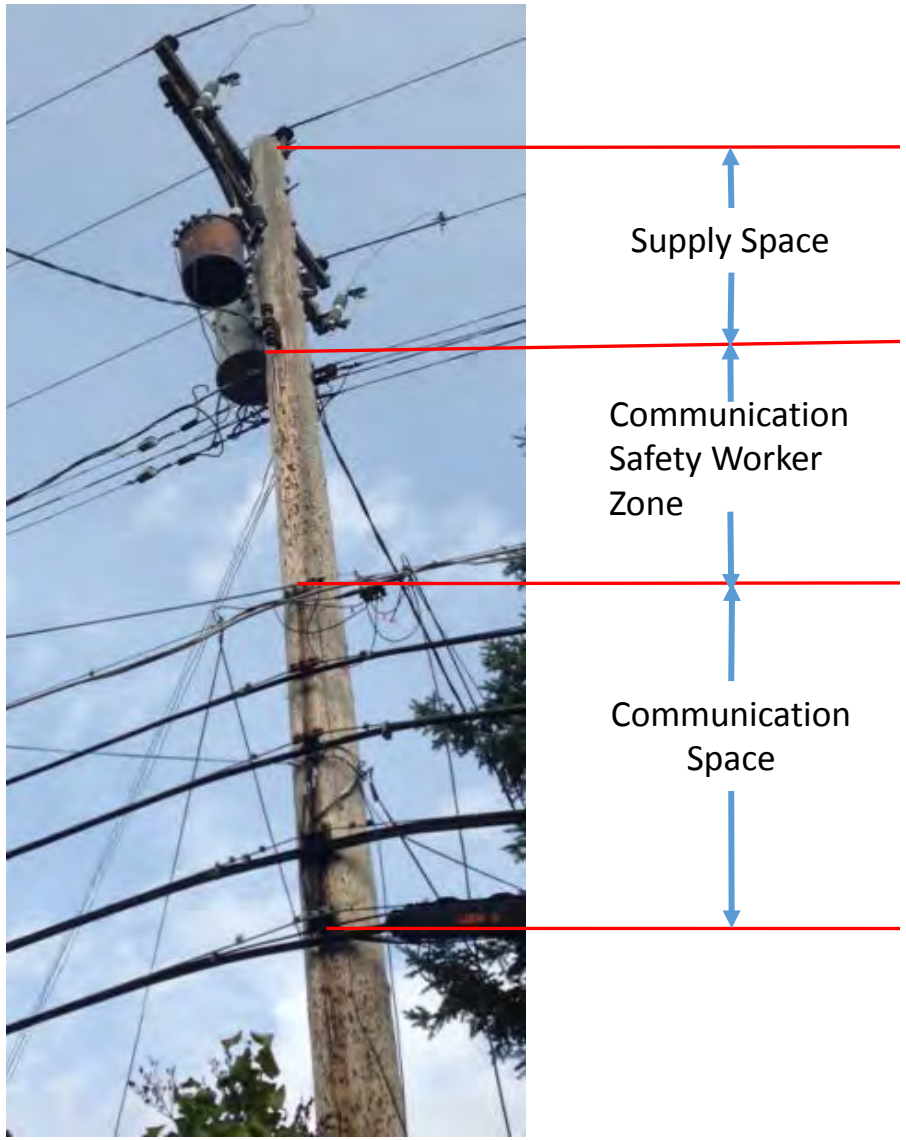
- Part 3. Continued
  - Section 35. Direct buried cable and cable in duct not part of a conduit system
  - Section 36. Risers
  - Section 38. Equipment
  - Section 39. Installation in tunnels
- Part 4. Work Rules for Operations of Electric Supply and Communications Lines and Equipment
  - Section 40. Purpose and Scope
  - Section 41. Supply and communication systems – Rules for employers
  - Section 42. General Rules for employees
  - Section 43. Additional rules for communications employees

Significant Changes to NESC

- Section 2 Definitions:
  - **communications equipment**: Equipment that produces, modifies, regulates, or controls communications signals. This equipment may also produce, modify, or safeguard a supply of electric energy for the exclusive use of communications devices as long as the equipment and communications devices being served are owned and operated by the same party. See: electric supply equipment

  - **electric supply equipment**: *NOTE: Electric supply equipment* does not include equipment whose purpose is to provide power to support locally mounted communications systems. For example, power supplies supporting CATV or communications amplifiers or repeaters are not considered to be supply equipment.

Significant Changes to NESC



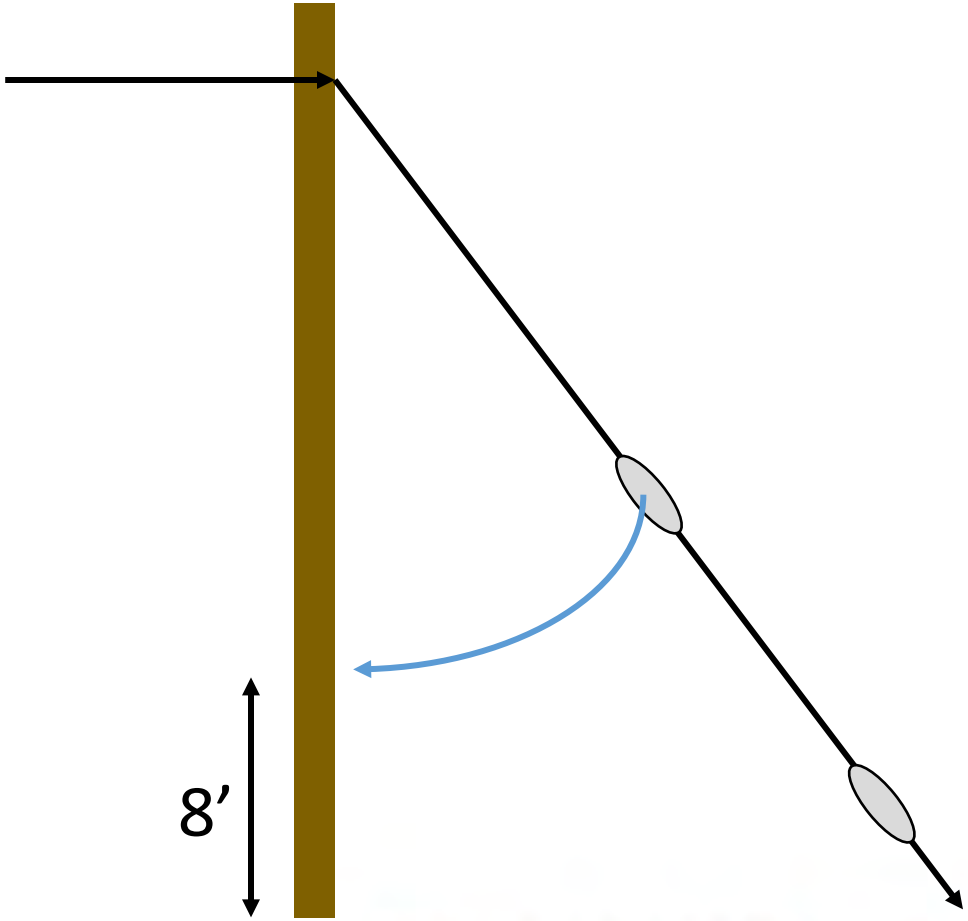
- Section 2 Definitions:
  - **Added: communication space**: The space on joint-use structures where communications facilities are separated from the supply space by the communication worker safety zone.

Significant Changes to NESC

- Item 4 was added to Section 1:013.B. to allow adding a new item, or replacing or rearranging existing items would not in itself, either (1) create a structural, clearance, or grounding non-conformance, or (2) worsen an existing non-conformance, then the addition, replacement, or alteration may be performed prior to correcting existing non-compliance items.
  - In other words, if you need to attach to a pole or maintain your existing facilities and you find another attachment out of compliance, you do not need to wait for them to fix their mess before you attach if your attachment does not make the issue any worse.

Significant Changes to NESC

- Part 2, Rule 215.C has been revised to specify that if insulators are used on guys or span guys, they shall be positioned so that in the event they fail, they shall prevent the guy from being energized within 8 feet of the ground.



Significant Changes to NESC

- Part 2, Rule 215.C.8 Added exemption that allowed less than 4 bonding points between communications and power on the same structure due to spans over water or wetland areas where there are no structures
- Part 2, Rule 235.I: All of the Antenna rules have been consolidated into this section.
- Table 238-2 has been revised to combine luminaries (lights), traffic signaling, and trolley conductors into a single category.
  - The main impact of this rule is that vertical clearances in Table 238-2 have been increased from 20” to 40” in most cases for not effectively grounded metallic elements of luminaries, traffic signals, and trolley conductors.

Significant Changes to NESC

- Part 3, 354: Random Separation-Separation less than 300 mm (12in) from underground structures or other cables.
- Applies to random separation of supply and communication conductors
  - D.1: A exception has been added to note that upon agreement by all parties, the distance between bonding points can be increased from the maximum 300m if the only reason to open a duct to or the jacket of either cable is to facilitate a bond.
  - Caution is that while fiber is not impacted by induced voltage, there is still the risk to staff so the desire is bond as much as possible.

Significant Changes to NESC

- Part 4: Supply and communications systems-Rules for employers
  - 410.A.6. Addition of language that employers shall provide training to all employees that work in the vicinity of antennas operating in the range of 3 kHz to 300 GHz to recognize and mitigate radiation exposure’
  - 420.K.1. The 10’ height requirement for fall protection was removed and the code now states that employees shall use fall protection while climbing unless unfeasible or would create a greater risk than working unattached.
  - 420.K.2. The term “qualified climbers” has been removed and employees working on an elevated position above 4 feet shall use a fall protection system while working on poles, towers, or similar structures…

Closing Comments on NESC

2. Be Cautious

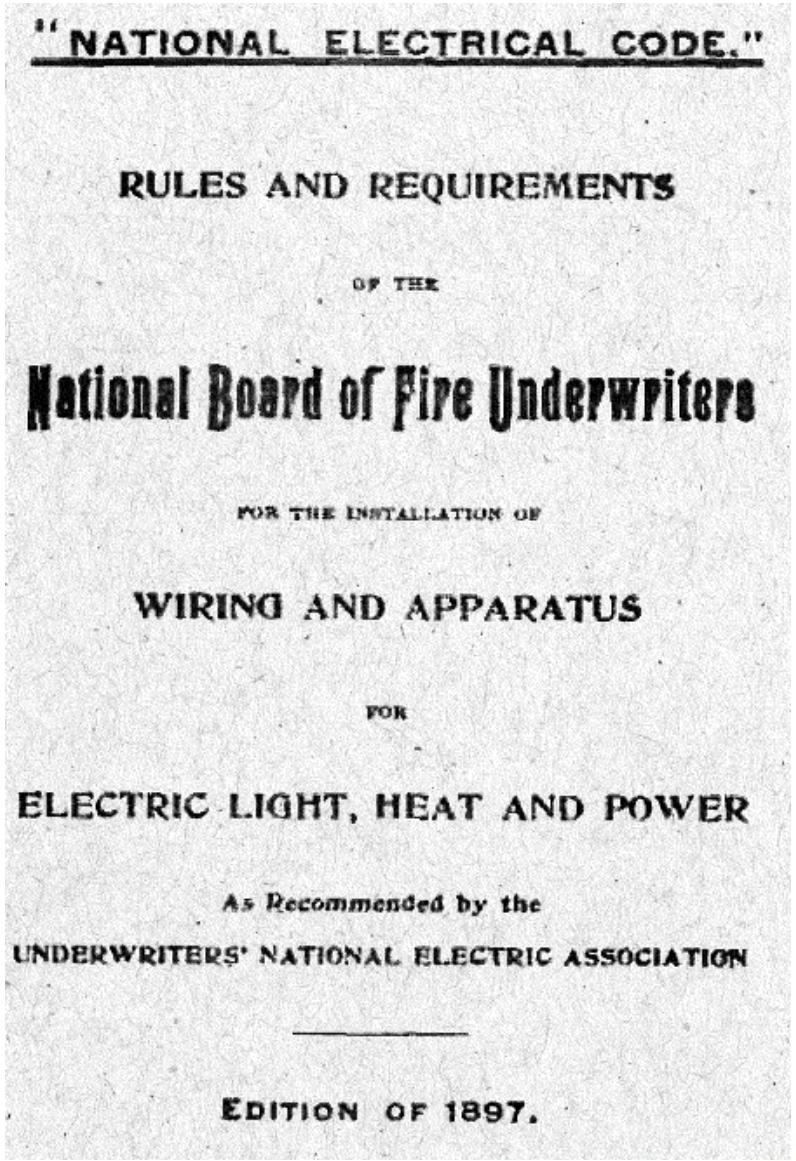
To reduce the hazard of handling equipment and lines, employees should cultivate the habit of being cautious and always heed warning signs and signals.

First Edition NESC August 1, 1914 Page 19 Part II. General Rules for the Employee
C. General Precautions, Rule 2 https://archive.org/details/circularofbureau49unse

National Electric Code: NEC

- Read the 2017 NEC online at:

  https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70



"NATIONAL ELECTRICAL CODE."

RULES AND REQUIREMENTS

OF THE

National Board of Fire Underwriters

FOR THE INSTALLATION OF

WIRING AND APPARATUS

FOR

ELECTRIC LIGHT, HEAT AND POWER

As Recommended by the

UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION

EDITION OF 1897.

https://archive.org/details/00701897

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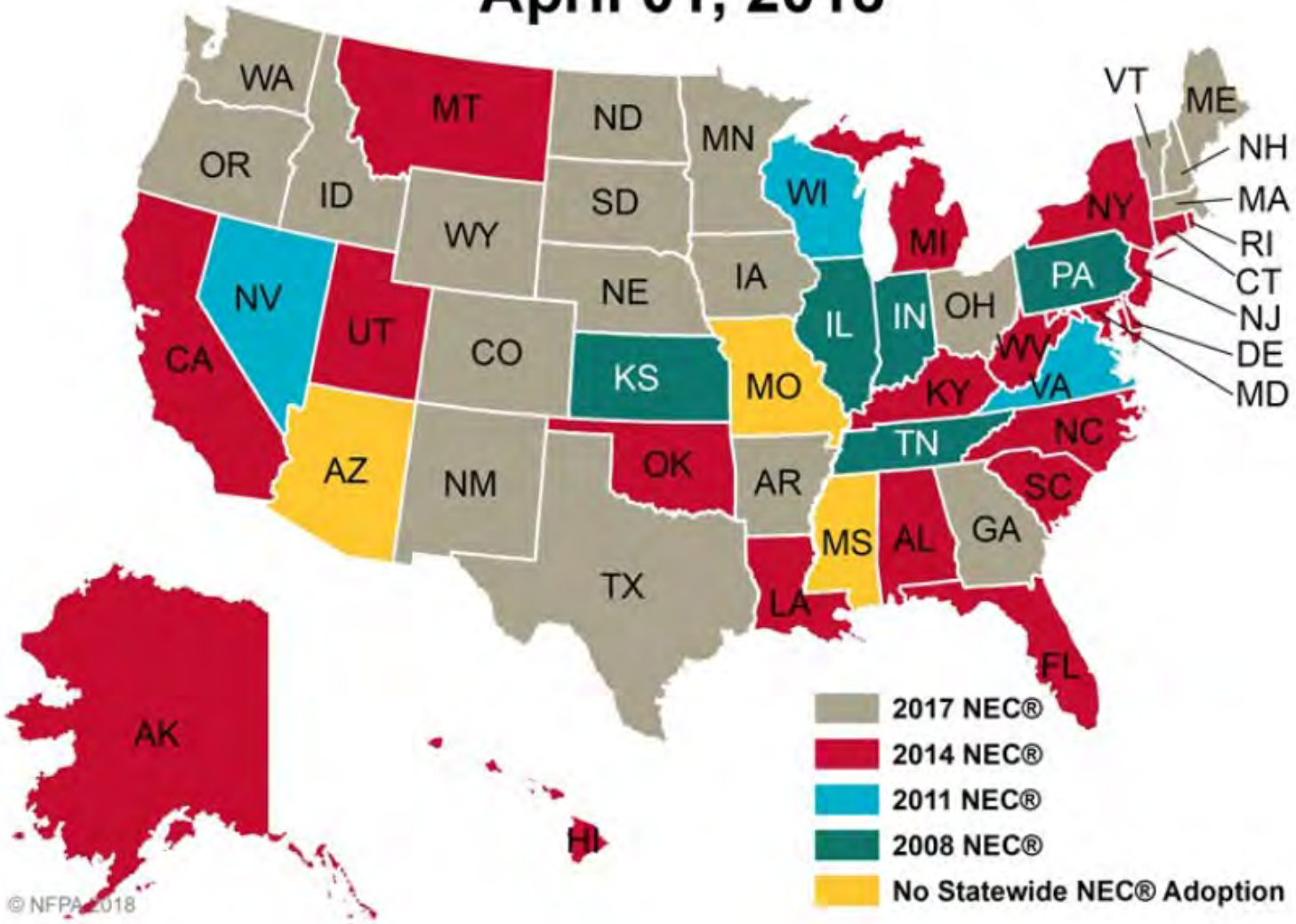
National Electrical Code® in Effect
April 01, 2018



https://www.nfpa.org/NEC/NEC-adoption-and-use/NEC-adoption-maps

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Telephony in First Edition of NEC

57. Protection against Foreign Currents.

a. Where telephone, telegraph or other wires, connected with outside circuits, are bunched together within any building, or where inside wires are laid in conduits or ducts with electric light or power wires, the covering of such wires must be fire-resisting, or else the wires must be inclosed in an air-tight tube or duct.

First Edition NEC 1897 Page 42
https://archive.org/details/00701897

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NEC Important Sections for Communications Systems

- Article 90 Introduction
- Article 100 Definitions
- Article 250 Grounding and Bonding
- Article 480 Storage Batteries
- Article 770 Optical Fiber Cables and Raceways

NEC Important Sections for Communications Systems

- **Article 725 Class 1, Class 2, and Class 3 Remote-Control, signaling, and Power-Limited Circuits**
- Article 800 Communications Circuits
- Article 820 Community Antenna Television and Radio Distribution Systems
- Article 830 Network-Powered Broadband Communications Systems
- Article 840 Premise-Powered Broadband Communications Systems

Significant Changes to NEC

- A listing of all of the changes considered technical is almost 45 full pages.
- CMP-# Identifies the Code Making Panel that is responsible for that section of code
- Primary goal was to eliminate duplication so many sections now reference a similar section instead of duplicating the language in every section.
- Everything has moved!!!

Significant Changes to NEC

- Common Changes:
  - Definitions moved to Article 100 where possible
  - Articles 770, 800, and 820 all contain the following changes
    - 2: Point of Entrance: Removed RMC and IMC as a means to extend the entrance point of unlisted cable
    - 48(A): Adds back in the use of RMC and IMC to extend the point of entrance within a building
    - Article 830 is still written the old way for 2 and 48(A)
    - Article 840 was originally written to reference Article 770, 800, 820

Significant Changes to NEC

- Common Changes Continued:
  - Articles 770, 800, 820, and 830 all contain the following changes
    - 100(B)(2): Points you to Article 250.94(A) if an intersystem bonding terminal is established
  - Articles 770, 800, 820, 830, and by default 840 all contain the following changes
    - 100(B)(3): Prohibits using lightning protection systems as a ground point

Significant Changes to NEC

- Article 100: Definitions:
  - Communications Equipment: Now specifically includes systems that support computers, routers, servers, and their powering equipment
- Article 250: Grounding and Bonding:
  - Table 250.3: Added Articles 830.93, 830.100, 830.106, and 770.100 as Articles with additional grounding requirements

Significant Changes to NEC

- Article 770: Optical Fiber Cable
  - Article 770.48(B): Added statement that unlisted outside plant cables cannot be placed in PVC or EMT in risers or any space used for environmental air
- Article 800:
  - Article 800.93:Clarified title of the section to specify that the article applies to the non-current carrying portions of the fiber optic cable
  - Article 800.100.A.(3): Size of Bonding or Grounding Electrode Conductor: There is still a conflict between NEC the minimum conductor size of #14 and the NESC 99.C minimum size of #6
  - Article 800.100.(E): Revise to include and define the use of Innerduct in Metal Raceways in the riser space

Significant Changes to NEC

- Article 840: Premise-Powered Broadband Systems
  - Old 840.1: Scope: This article covers **premise-powered optical fiber based broadband** communications systems that provide any combination of voice, video, data, and interactive services through an **optical network terminal (ONT).**
  - New 840.1: Scope: This article covers **premise-powered broadband communications systems**.
    - Information Note 1: A typical basic system configuration consists of an **optical fiber, twisted pair, or coaxial cable to the premise** supplying a broadband signal to a network terminal that converts the broadband signal into component electrical signals, such as traditional telephone, video, high-speed Internet, and interactive services. Powering for the network terminal and network devices is typically provided through a premise power supply ……..

Significant Changes to NEC

- Article 840 attempts to reference other section wherever possible to reduce duplication.
- Article 840.2
  - Deleted: ONT Definition
  - Added: Network Terminal: A device that converts network-provided signals (optical, electrical, or wireless) into component signals, including voice, audio, video, data, wireless, optical, and interactive services, and is considered a network device on the premises that is connected to a communications service provider and is powered at the premise.

Significant Changes to NEC

- Article 840.48: Adds sections (A), (B), and (C) referencing each cable type to another Article covering that cable type.
- Article 840.101: Premise Circuits not leaving the building.
  - They left alone the ability not ground an optical fiber fed premise-powered network terminal!!!
  - Interesting that they did not address wireless fed network terminals.

What do they have in Common?

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Significant Changes to NEC

- **Added** Article 840.160: Premise Powering of Communications Equipment over Communications Cables.
  - States that communications cables are allowed to carry power for communications equipment. If the transmitted power is over 60W, Article 725.144 will apply.

Type	Standard	# of Pairs	Max Current	Power at Source	Power at Load
PoE	IEEE 802.3af-2003	2	350 ma	15.4 W	12.9W
PoE+	IEEE 802.3at-2009	2	600 ma	30.0W	25.5W
PoE++	IEEE 802.3bt Type 3	4	600 ma	60.0 W	51.0 W
4PPoE	IEEE 802.3bt Type 4	4	960 ma	90.0 W	71.3 W

Challenge to Independence of 2020 NEC Chapter 8

- Article 90.3 states: Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8
- Under the current Code, Article 110: Requirements for Electrical Installations only applies if specifically referenced in Chapter 8
- Code Writing Process for 2020:
  - Public Input Closed September 17, 2017
  - First Draft Meeting held January 8-20, 2018
  - Posting of First Draft Ballots March 9-23, 2018
  - Receipt of First Ballots March 30

Challenge to Independence of 2020 NEC Chapter 8

- The following changes were approved in the 2020 First Draft Ballots:
  - Article 90 was revised to remove the Exemption and Scope Statement for Chapter 8
  - CMP 1 Voted to relocate the “mechanical execution of work” from Item 24 of Articles 725, 760, and all of Chapter 8 and apply Article 110.12(C)
  - CMP 3 appears to have retained status quo of independence in Articles 300, 725, and 760
  - CMP 16
    - Telcordia along with ATIS were successful in convincing to add independence statements in Item 3 for Chapter 8
    - Introduction of Article 890, General Requirements for Communications Systems

Credit: Ernest Gallo, Director-Networks Infrastructure Solutions Ericsson 2018 PRG Conference

Introduction or In Closing??

APPENDIX

ORGANIZATION AND CONDUCT OF SAFETY WORK

In rules A 6, 7, and 8 for the employer, and in many of the foregoing rules for employees, the familiarity of the employee with the prescribed safe methods of performing his duties is emphasized as a prime factor in his qualifications. Rules can be effective only in proportion as they are understood and observed, and safety rules must be thoroughly comprehended and intelligently followed, if the much-desired results in accident prevention are to be secured. The spirit of accident prevention also must be manifested constantly by employer and employee alike to assure the consistent observance of the established rules.

First Edition NESC August 1, 1914 Page 45
https://archive.org/details/circularofbureau49unse

Questions

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