

National Electrical Safety Code NESC (IEEE C2)



Trevor Bowmer
Bunya Telecom Consulting

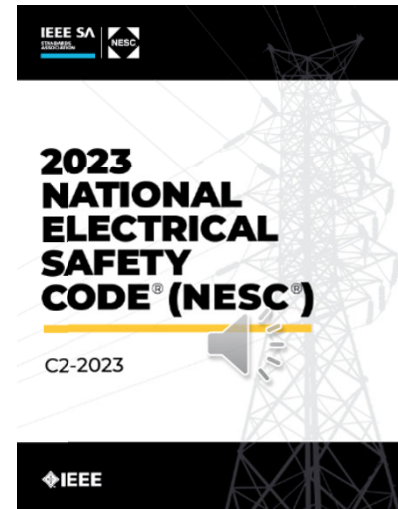
Ernie Gallo
NEBScore

National Electric Safety Code



Purpose - The practical safeguarding of **persons**, during the installation, operation, and maintenance of electric supply and communications facilities.

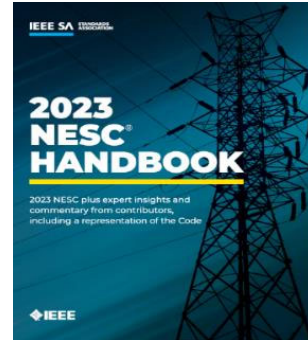
Scope - covers **supply and communication facilities** and associated work practices employed by a electric supply, communications, or railway in the exercise of its functions as a utility.



The 2023 Code is now open for Change Proposals to

Develop the 2028 code.....Feb 1st to May 15th 2024

NEESC Scope and Uses



NEESC Is Not a Design Guide or Instruction Manual; however

- The NEESC is used as reference baseline for Joint-Use Agreements, design choices, and construction guidelines across the supply power and communications industries as well as in legal compensation cases (i.e., Who's to blame! Who's at fault!).
- Part 4 Work Rules Harmonizes with OSHA (1910), IEEE 1584,
- Industry best practices such as Telcordia GRs & SRs, ATIS standards, many industry practices align with the objectives of NEESC rules
- The current NEESC competes with but does not directly conflict with NFPA 70 (NEC) or 70E requirements in areas where their scopes may overlap
- The NEESC is used by 90+% of the States in USA with 80-85% following the current version for regulatory purposes and rulings (California GO 95 is major exception)

The NEESC provides a critical safety-focused baseline and design guideline to help manage the logistics, business and technical (design/engineering) complications that may arise



NEESC Schedule -- 2023 to 2028

- **5-year Revision Schedule** –
- Administered by IEEE ... ANSI Approved
- 2023 NEESC issued August 2022 with Effective Date of Feb 2023 applies on adoption by PUC, State legislative or local AHJ bodies
- 2023 – TIAs and Fast Track changes were made for FMPS issues
- **Feb 1st - May 15th 2024 = Submission of Change Proposals (CPs)**
for August–October 2024 review
- 1 July 2025 Preprint of 2028 Edition Issued
- 24 March 2026 = Final date for Public Comments (PCs) on the Draft
for Aug.–Oct. 26 2026 review
- 1 August 2027 Publication of the 2028 Edition of the NEESC



Summary Major NESC Changes in the 2023 NESC Code



- The usual editorials, clarifications and format revisions
- Feet/inches made primary units (metric moved to annex)
- Clarification that safety of persons is primary objective - facilities are secondary concern
- Add grid-connected distributed energy facilities (solar & wind farms, energy storage..) – expands generation sections of Part 1 beyond substations
- Clarification of clearances associated with communications and wireless
 - Revised 235H between lines and equipment in communication space
 - New 238F separations for wireless facilities on poles
- Strength and loading for poles – new updated ASCE wind and ice maps with new Appendix C for calculation examples

Open Issues from 2023 Cycle



- **Ground Rods** (Rule 094C2) – “Equivalency” of driven rods, buried wire, strips, or plates debated – **Resolved in Working Group (WG)** to make a Change proposal to
 - Replace “equivalent” with “acceptable” in 2028 code to recognize that these different electrodes are effective grounding means, but not strictly equal in all ways
- **Ground Clearances** for insulators on guys (Rule 215) and over driveways (Rule 232) **Remains an open issue – several CPs expected in this cycle**
- **Powering of Communications Equipment** (wireline/wireless) using **FMPS** (Fault Managed Power Systems) - Rules 224/344 – **Resolved for the moment**
 - Resolved by WG that created 4 Fast Track Change proposals that were accepted
- **Congestion/competition on Poles** – (Clearances - Section 23) – **Partly resolved**
 - Remains an open issue, but IEEE/NESC WG decided it was better addressed by completion and publication of IEEE Guide on Joint Use P2939-2023 entitled *“IEEE Guide for Joint Use of Utility Poles with Wireline and/or Wireless Facilities”*



Fast Track Changes Proposals to 2023 Code for FMPS - 1



New FMPS Definition in NESC Section 2

Fault-Managed Power System (FMPS). A powering system for communications equipment that monitors for electrical faults and controls the current delivered to limit fault energy.

NOTE 1: Fault- managed power systems consist of a power transmitter and a power receiver connected by a cabling system. These systems are characterized by monitoring the circuit for faults and controlling the power transmitted to ensure the energy and power delivered into any fault is limited with respect to electric shock between transmitter and receiver. [ATIS Technical Report 0600040](#), - Fault Managed Power Distribution Technologies — Human Contact Fault Analysis, provides a description of FMPS and testing protocols. FMPS circuits are also referred to as Class 4 circuits.

NOTE 2: The monitoring and control systems differentiate fault-managed power from electric light and supply power circuits with different requirements regarding minimum wire sizes, overcurrent and surge protection, insulation requirements, and wiring methods.

This description defines FMPS in the NESC as a method specifically for powering communications equipment and explicitly points to ATIS 0600040.



Fast Track Changes Proposals to 2023 Code for FMPS - 2



Revisions to “communications lines” under “lines” definition in NESC Section 2

1. communication lines.

The conductors and their supporting or containing structures, equipment, and apparatus that are used for public or private signal or communications service. A communication line may include fault-managed power system (FMPS) circuits used exclusively for communications equipment that monitors for electrical faults and controls the current delivered to limit fault energy meeting Rule 224B. See: fiber-optic cable—supply and fiber-optic cable—communication.

- a. located in the communication space. Communication lines located in the communication space and which operate at potentials not exceeding 400 V to ground or 750 V between any two points of the circuit, and the transmitted power of which does not exceed 150 W. When operating at not more than 90 V ac or 150 V dc or as an FMPS circuit, no limit is placed on the transmitted power of the system.

.....

This revision links the FMPS application for powering communications equipment with rule 224B and the new definition of FMPS .



Fast Track Changes Proposals to 2023 Code for FMPS - 3



Revised 224B2(a) in NESC Part 2

B. Supply circuits used exclusively in the operation of communication circuits

Circuits used for supplying power solely to apparatus forming part of a communications system shall be installed as follows:

1. Open-wire circuits shall have the grades of construction, clearances, insulation, etc., prescribed elsewhere in these rules for supply or communication circuits of the voltage concerned.
2. Special circuits operating at voltages in excess of 90 V ac or 150 V dc and used for supplying power solely to communications equipment may be included in communication cables under the following conditions:
 - a. Such cables shall have a conductive sheath or shield that is effectively grounded.

EXCEPTION: Fault-managed power system (FMPS) cables are permitted to operate without a conductive sheath or shield.

.....

This exception permits FMPS cable to not have shield. All other safety conditions (b) through (e) of 224B still apply. The allowance recognizes that the safety provide by a shield is replaced by the FMPS software system and its control features.



Fast Track Change Proposals to 2023 Code for FMPS - 4



Revised 344A1(a) in NESC Part 3 Underground and Buried Plant

B. Supply circuits used exclusively in the operation of communication circuits

344. Communication cables containing special supply circuits

A. Special circuits operating at voltages in excess of 90 V ac or 150 V dc and used for supplying power in excess of 150 W solely to communications equipment may be included in communication cables under the following conditions:

1. Such cables shall have a conductive sheath or shield that shall be effectively grounded.

EXCEPTION: Fault-managed power system (FMPS) cables are permitted to operate without a conductive sheath or shield.

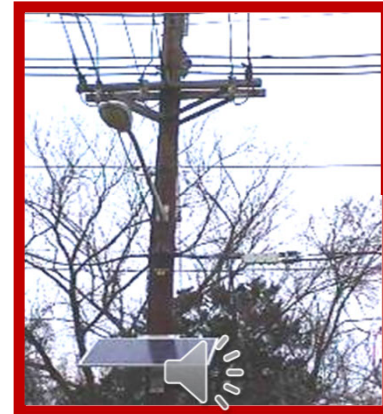
.....

This exception permits FMPS cable to not have shield. All other safety conditions (2) through (7) of 344A still apply. The allowance recognizes that the safety provide by a shield is replaced by the FMPS software system and its control features.



Expected Issues in 2028 Cycle - 1

- Adjustments to and confirmation of the new sections on **grid-connected generation facilities** (solar farms, battery arrays) –
 - Battery Section 14 - Substation & Plant Batteries Vs. Grid Storage Batteries
 - Photovoltaic Section 19
- **Ground Clearances** – 215C2 (guys), 232 (driveways), 239 (climbable structures).
 - Reference 8-foot height - could it be raised to 9 foot or 10 feet or higher?
 - 8-foot criteria is practical for insulators on guys, and for the minimum gap between hand holds to make a structure not readily climbable.
 - Allowed clearances over a residential driveways may need to be raised to better correlate with height of RV and delivery trucks.
- **Congestion and competition for available vertical space on pole**
 - Further refinements and clarifications in Rules 235 and 238
 - 235C (General application), 235H (within communications space) and 238F (Wireless)



Expected Issues in 2028 Cycle - 2

- **Rule 224B and 344 FMPS** – The accepted Fast Track changes will need to be formally re-confirmed during the normal code subcommittee meetings.
- **Section 25-27** - Further refinements expected to **Pole Strength and Loading**
 - Wind and Ice Loading maps – load factors and calculation methods
 - Construction Grades – clarifications to Table 242-1
- **Part 3 – Underground and Buried Plant**
 - Refinements and Adjustments – No large changes expected
- **Part 4 – Work Rules** - Refinements and Adjustments on
 - Arc Flash clothing default table–
 - Work rules around batteries and energy storage systems needs review
 - No other significant changes expected





NESC Related Activities

- Issue 7 of SR-1421 - *Telcordia Construction Book* – issued April 2023
 - Further editions may be issued as needed
- IEEE Guide - P2939 – Issued Nov 2023 - *IEEE Guide for the Joint Use of Utility Poles with Wireless Facilities*
- Active work on ATIS and UL Standards on span powering and FMPS continues in for example
 - ATIS 0600040
 - UL 1400-1 and 1400-2
 - NEC Articles 722 and 725 and possibly other articles after restructuring possibilities (as discussed in Ernie Gallo's presentation on NEC activity)

Telcordia Blue Book - Manual of Construction Procedures

Special Report
SR-1421
Issue 7, April 2023

Comments Requested (See Preface)

Enterprise License Restrictions

This document is available only via an Enterprise License (EL) and can only be shared among the EL licensees of this document. Violators of the EL agreement may be subject to damages for breach of the EL agreement and for copyright infringement. Ericsson strictly prohibits the unauthorized distribution, download, or sale of this copyrighted material.

Copyright © Ericsson Inc. All rights reserved.





Thank You and Questions



Further questions may
be emailed to
tnbowmer@gmail.com
or
egallo@nebscore.com

