

NEESC UPDATE

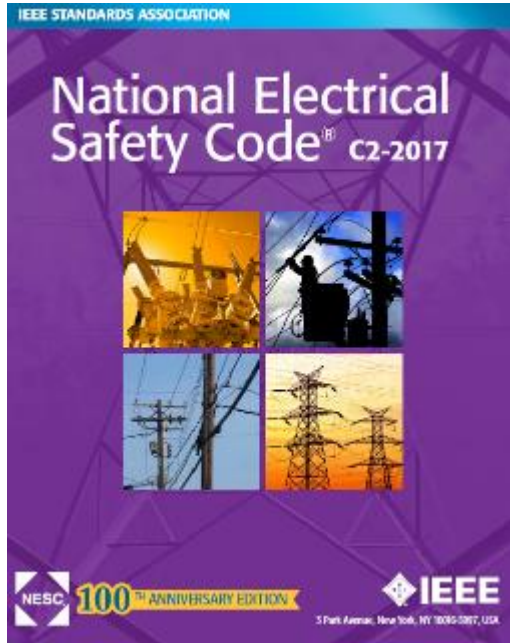
Preview of 2023 NEESC and Related IEEE Joint-Use Activities

Trevor N. Bowmer Ph.D.

Bunya Telecom Consulting LLC



Codes in Context



- Industry Safety Codes and Standards
- Regulatory Rules..... Legal Mandates
- Internal Practices.....Engineering Design

IEEE – NESC

- NFPA -- NEC
- GO-95....GO128....GO165
- OSHA 1910.268/269
- Internal M&Ps
 - GRs and UL Listings
- Joint Use Agreements (JUA)
- UL
- GRs/SRs
- ATIS
- etc.....



National Electrical Safety Code (NESC)

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.

“NESC is Not a Design Guide or Instruction Manual “



NESC STRUCTURE and GOVERNANCE

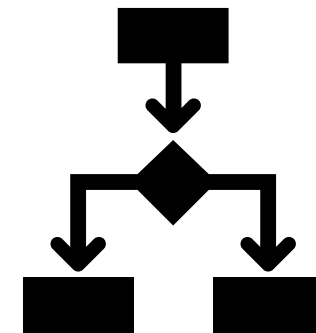
- SC1 - Scope and Purpose
- SC2 - Grounding Methods
- SC3 - Part 1 - Substations and Generation Facilities
- SC4 - Part 2 - Overhead Lines - Clearances
- SC5 - Part 2 - Overhead Lines - Strength & Loading
- SC7 - Part 3- Underground Lines
- SC8 - Part 4 - Work Rules

Main Committee –

- Provides oversight responsibility

Executive Committee –

- General oversight of NESC direction and policy



2023 Revision - Multi-Step Process

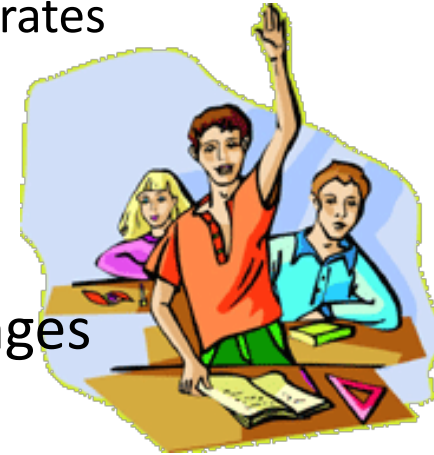
- **5-year Revision Schedule** ... Administered by IEEE ... ANSI Approved
 - TIA and Fast-Trac processes exist for more rapid responses as technology accelerates
- NESC Preprint issued (Sept. 2019) - 600-800 Change Proposals (CPs)
- 465 Public Comments (PCs) on Preprint received March 2nd 2020

*** **Pandemic Pause = 1 year Deferment** ***

- Aug-Oct 2021 – Public Comments considered and resolved – 309 Changes

➔ **DRAFT 2 of NESC is being finalized now for ANSI approval**

- Release of 2023 Code now scheduled for Aug 2022 with Effective Date of Feb 2023
- Applies on adoption by PUC, State legislative or local AHJ bodies



Summary NESC Changes for 2023 Code

- Editorials, clarifications and format revisions
- Feet/inches = primary → metric secondary to annex
- Safety of persons primary → facilities are secondary
- Add grid-connected facilities (solar & wind farms, energy storage..)
- Clearances – 235H (communications lines) and 238F (Wireless)
- Strength and loading – new wind and ice maps
 - New Appendix C for calculation examples

Open Issues

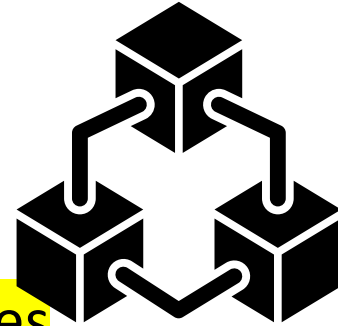
- Ground rods – sizing and equivalency (Section 9)
 - Equivalency of driven rods, buried wire, strips, or plates
- Clearances over driveways (Rule 232)
- Powering of communications equipment (wireline/wireless)
 - Rules 224/344
- Congestion/competition on poles – (Clearances - Section 23)
 - IEEE Guide on Joint Use – impetus is growth of wireless attachments

Key Changes – SC1 - Scope, Purpose and Application

- Rule 010 - Emphasize “practical safeguarding of persons” - not performance or reliability.
- Rule 013 - Application of Rules to Existing installations and New Construction - provides operational flexibility for maintenance replacements, adding facilities to existing poles/structures and modifications to existing poles.
- Definition of Communications Lines – simplification
 - Circuits in communications lines used to supply power solely to communications equipment covered under Rules 224 and 344.
- 017 – revised to denote primacy of feet-inches units - metric tables to new Annex
- Major refresh of Appendix C (Example strength and loading calculations for applications)

Key Items - SC2 (Grounding)

- Rule 094B - Ground Rod - open issue for Working Group
 - Minimum Size - trade, nominal or exact size needs clarification
 - What is “equivalency” between driven rods, buried wire, strips, and plates
 - Our Recommendation is for a 5/8-inch diameter copper-clad stainless-steel ground rod as the primary choice rod material and size
- Rule 096C - Grounding Intervals - Effective Grounding of MGN - modified for simplicity and clarity but 4 grounds for each mile remains the basic criteria.
- Intersystem Bonding at Poles - Rule 097G - Re-affirmed – no changes
- Customer Premises Intersystem Bonding – Rule 099 – correlates with NEC



RULE 097 – Grounding & Intersystem Bonding

Rule 097 has 7 interlocking sections with implicit/explicit links to other Rules (e.g., 096, 224, 344, 354, 384) applicable to intersystem bonds –

- Rule 097A -- separate grounding conductors
- Rule 097B – permits a bond to the power ground if MGN system is used and 4 grounds/mile
- Rule 097C - 4 grounds/mile criteria = help to define an effective ground as per NESC
- **Rule 097G** requires a single grounding conductor on structures except as required by Rule 097A
 - Where both electric supply systems and communication systems are grounded on a joint use structure and a single grounding conductor is present, the grounding conductor shall be connected to both systems.



097G sets expectation that a bond to vertical ground should be made unless an explicit technical or safety reason not to bond exists.

SC3 (Part 1) Changes

- Explicit inclusion of **grid-connected generation facilities** (solar farms, battery arrays)
- Separate Generation and Substations Sections planned for Next Cycle
 - All these facilities are served by Communications utilities
 - Effectively Ground Fences with exception for engineering study Rule 110.A.3
- Revised Battery Section 14 - Substation & Plant Batteries Vs. Grid Storage Batteries
- New Photovoltaic Section 19
- Open Issue = Magnetic Field Rules – Barricades and Signage

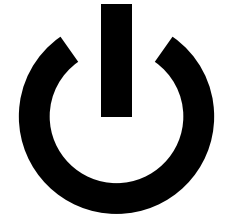
SC4 (Aerial Clearances) – Section 21

- Ground Clearances –215C2 (guys), 232 (driveways), 239 (climbable structures).
 - Reference 8-foot height - should 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 (next cycle) to better correlate with height of current RV and delivery trucks.
- Rule 217A1a and C1 : Protection of structures - Physical protection is not required for supporting structures located outside of established parking areas, alleys, or driveways
- Rule 217C - Markers on anchor guys - Revisions emphasize that every guy should be routinely marked at vulnerable or susceptible locations. Companies need to cooperate where power and communications guys are on same pole or anchor.

Powering Circuits Solely for Communications Equipment

- **Rule 224 and 344** - No technical changes made this cycle
 - **Working Group 4.8 - Powering circuits for communications antennas - Recognized that various new powering architectures are required to match the expansion demands of 5G wireless antennas (span powering & FMPS) and their associated equipment.**
- FMPS systems use software systems to detect faults or problem conditions in the powering circuit and automatically, and rapidly, de-energize the powering circuits

POWER CIRCUITS FOR COMMUNICATIONS EQUIPMENT



Circuits used exclusively for supplying power to communications equipment

- ❖ Are treated as “communications lines” under the NESC if
 - Less than 400 V to ground or 750 V between any two points of the circuit
 - Transmitted power does not exceed 150 W
- ❖ Operating at more than 90 Vac or 150 Vdc and more than 150W then 224B/344A apply
 - Cables will have a shield and be effectively grounded
 - Maintained by qualified (trained) persons
 - Access to Termination points are restricted
 - Under fault conditions voltage on comm circuit shall be less than 400 V to ground
 - Live parts will be inaccessible when circuit is energized.





CONGESTION AND COMPETITION FOR SPACE



Sponsored by:



Session 1: *Practical Bonding Practices*
March 16, 2022

SC4 – Specific Clearances for Communications

- **Rule 235** (Clearances between wires on same structure)
 - **Rule 235H** (clearances between communications lines) was revised to provide specific conditions for clearance calculation, as well as greater flexibility for communications installations on congested poles.
 - With the space demands for new wireless equipment, mounting antenna and equipment on strand messengers will become more common. One of the objectives of 235H is to minimize congestion problems and help avoid damage to lines or service.
- Other clearances for wireless facilities – **see new 238F.**



SC4 Clearances – Wireless

- **Wireless Facilities** – Clearances moved and consolidated from 235I to new Rule 238F (*Clearances between communications and supply facilities on same structure*) includes components from Rules 235, 238 and 239.
 - This consolidation will be helpful for wireless network companies for their designs as well as for their approval requests with pole owners and other joint users.
 - An IEEE joint-use guide (P2939) is in preparation which draws on this 238F clearances and other issues around the attachment approval process.



IEEE 5G JOINT ALLIANCE

IEEE White Paper (2019) –

“Establishing Consistency in Joint Use Applications with 5G Wireless Facilities”

<https://standards.ieee.org/industry-connections/facilities-joint-use-program.html>

IEEE Guide 2939 being developed under sponsorship of

Joint Use Committee of the IEEE Power and Energy Society
[<https://standards.ieee.org/project/2939.html>]

with working title –

IEEE Guide for the Joint Use of Utility Poles with Wireless Facilities

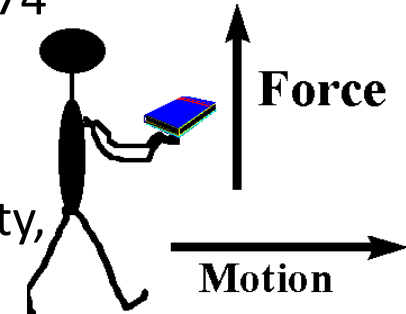
Objective to issue the Guide around 3rd/4th quarter of 2022



SC5 – Strength & Loading (Sections 24-27)



- Rules 250C/250D - 60 foot criteria – Extreme wind and ice factors apply above 60ft only.
- Rule 250C - **Update of Wind Loading Maps** – using most up-to-date ASCE 7 and ASCE 74
 - 100 year MRI loading map for Grade B construction
 - 50 year MRI (Mean Return Interval) loading map for Grade C
- Table 242-1 - Construction Grade – Much revised and improved version increase clarity, accuracy and simplicity for identification of the appropriate grade.
- Rule 263 - Grade N Construction – retained - Grade N is useful for communications and power utilities in spans across customer property, and in temporary and emergency situations.
- Clarifications on various calculation methods and applications of gust response factors, ice accretion, weight and wind spans, ... as well as the general strength requirements in Section 26 and the mechanical strength of guy insulators in Section 27.



SC7 Underground – Direct Buried

- General minor modifications and clarifications as well as updated references to most current IEEE Standards on electrical protection and induction mitigation practices
 - IEEE 487, 487.2, 487.3, 1590, 776, 1137 Series
- Added new Rule 323D4 requiring that “Covers and gratings should be designed to limit the likelihood of tripping by pedestrians”.
 - Risk management issue

Rules 014A2, 230A2d and 311C Emergency Installations

Clarifications for Emergency installations - Supply and communication cables may be laid directly on grade if they are either protected, or their locations are conspicuous, and the cables do not unreasonably obstruct pedestrian or vehicular traffic

- C. For emergency installations, supply and communication cables may be laid directly on grade if the cables do not unreasonably obstruct pedestrian or vehicular traffic and either: they are
1. The cables are covered, enclosed, or otherwise protected, guarded, or
 2. The locations of the cables are conspicuous ~~otherwise located so that they do not unduly obstruct pedestrian or vehicular traffic and are appropriately marked.~~

Supply cables operating above 600 V shall meet either Rule 230C or 350B.

NOTE: See Rules 014A2 and 230A2d.

SC8 Work Rules

- Work Rules - Harmonized with OSHA, Battery Work Rules, RF Exposure (410A6, 420Q)
 - Arc Flash Default PPE Tables - revised to match full scale laboratory test results
- Rule 410A6 - (Job Briefing) - Note moved into main rule
 - Single-person job option in the NOTE reflected the OSHA rule and is required for the vast majority of communications work.
 - The revision does not inhibit the ability of the communications utility to follow its normal best work practices and use of single person for the vast majority of their installation and maintenance work activities.
- New Rule 420G to encompass safe work practices for liquid cell and other battery types - in harmony with new Section 14 in supply facilities



RELATED EFFORTS planned for 2022

New Issue (7) of SR-1421
- *Telcordia Construction Blue Book*



Blue Book - Manual of Construction
Procedures

*IEEE Guide for the Joint Use of Utility Poles with Wireless
Facilities*

ATIS and UL Standards on span powering and FMPS

QUESTIONS



Sponsored by:



Session 1: *Practical Bonding Practices*
March 16, 2022