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2023 NATIONAL ELECTRICAL SAFETY CODE® (NESC®)

C2-2023

IEEE

National Electrical Safety Code®

Secretariat
The Institute of Electrical and Electronics Engineers, Inc.

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2023 Edition

Abstract: The 2023 Code covers practical safeguarding of persons during the installation, operation, or maintenance of (1) electric supply stations, (2) overhead supply and communications lines, and (3) underground or buried supply and communication cables. It also includes work rules for the operation of electric supply and communications lines and equipment. This Code consists of the introduction, definitions, grounding rules, lists of referenced and bibliographic documents, and Parts 1, 2, 3, and 4 of the 2023 Edition of the National Electrical Safety Code.

Keywords: communications industry safety; construction of communication lines; construction of electric supply lines; electrical safety; electric supply stations; electric utility stations; high-voltage safety; operation of communications systems; operation of electric supply systems; power station equipment; power station safety; public utility safety; safety work rules; underground communication line safety; underground electric line safety

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Foreword

This foreword is not a part of C2-2023, National Electrical Safety Code®.

This publication consists of the parts of the National Electrical Safety Code® (NESC®) currently in effect.

Substantive changes in the 2023 Edition are identified by a change bar in the left-hand margin. In several cases, rules have been relocated without substantive changes in the wording. In these cases, only the rule numbers have been indicated as having been changed.

2023 Edition

Major changes in the 2023 Edition include (1) the understanding that the Code is intended to primarily address the practical safeguarding of persons, (2) the priority of customary (inch-foot-pound) units over metric units, (3) new rules providing requirements for photovoltaic generating stations, (3) recognition of new battery technologies, applications and hazards, (4) relaxing of the grounding intervals for a multi-grounded system for underwater or difficult terrain installations, as well as for underground installations with random separation, independent on the difficulty to implement, (6) the consideration of antennas as equipment, rather than a "rigid" conductor, for the purposes of specifying clearances, (7) the reframing of the requirements for the application of the extreme wind and extreme ice with concurrent wind loadings to emphasize they represent additional loading conditions applicable for tall structures or lines, and (8) an additional table available for use as an alternative to performing a detailed arc hazard analysis to determine required clothing. Further details and other significant changes are described as follows.

In Section 1 (Introduction), the Purpose was revised, indicating that the Code is intended to safeguard persons, not necessarily facilities, and does not provide design criteria for abnormal events, such as the actions of others or weather events in excess of those specified. Rule 013B addressing existing structures has been reformatted and clarified; when a supporting structure is replaced due to maintenance, the new structure must meet the required strength and be of an appropriate height of the structure being replaced. Rule 014C for temporary installations now also applies to underground lines, and includes an Exception when unable to achieve the otherwise required burial depth. **The 2023 Edition now gives priority to customary (inch-foot-pound) units over metric units.** Tables including metric units only are now located in a new normative (mandatory) annex.

New definitions include *functional grounded pv dc conductor* and *photovoltaic (PV) system*, supporting the new rules for photovoltaic electric supply generating systems. Existing definitions for *effectively grounded neutral conductor*, *communication lines,* and *electric supply lines*, as well as that of *wind span* and *weight span* were revised or clarified. The definition of *joint-use lines* was deleted, as no longer necessary.

In Section 9 (Grounding Methods), Rule 096C, the requirements for a multi-grounded system, based on the Exceptions for underwater or difficult terrain installations, no longer include the ampacity of the neutral. The grounding intervals for these applications, as well as for underground installations with deliberate separation, may be increased in general, and is not dependent on the difficulty to implement. The Note indicating the intended distribution of at least "four grounds per mile" has been deleted. In Rule 099C, the recommendation regarding the use of water piping for bonding has been made part of the rule.

In Part 1 (Electric Supply Stations), an Exception has been added to Rule 110A3 such that the grounding of metal fences is not required if a qualified study determines there is no safety issue, with a Note providing an IEEE reference. The requirement (Rule 110C) that equipment must withstand expected conditions has been extended to supporting structures. Section 14 has been rewritten to recognize new battery technologies, applications, and hazards; new content addresses switchgear and plant batteries, and grid storage batteries. New Rule 175 specifies that open gaps and breaks must be sufficient for system conditions, and includes a

Note providing IEEE references. The previous rules in Section 19 have been combined into revised Section 17, allowing new Rules 190–195 for photovoltaic generating stations in revised Section 19.

Part 2 (Overhead Lines) is the most extensive portion of the NESC, and is therefore subject to the most changes between subsequent editions. These changes address clearances and strength and loading requirements, in addition to other rules affecting the overhead lines and persons.

The previous rule for bonding of communications messengers has been extended to bonding of all messengers, supply neutrals, and metallic poles, now corresponding to Rule 215D. New Rule 217A2d requires separation of equipment and its support brackets such that the structure is not readily climbable. Rule 217C1 has been revised to clarify that a conspicuous marker is required at the ground end of every anchor guy in places where persons are normally encountered.

Existing Rule 231B now includes the statement that it is not required to provide protection for structures from vehicles traveling outside established ways.

Rule 232 covers vertical clearances of wires and equipment above ground, road, and water surfaces, for which a new Note provides information on appropriate vertical clearances for irrigation equipment. The column headings of Table 232-1, and corresponding portions of footnotes, were simplified by removal of the "grounded" or "ungrounded" condition of guys, since guys must be properly grounded or insulated, as per Rule 215C. The requirements for clearances above water areas were clarified, with the water level for uncontrolled areas no longer based on a "flood level," but on the ordinary high-water mark, government information, or other resources.

For clearances between wires carried on different structures (Rule 233), the determination of clearances for voltages exceeding 22 kV reverts to the 2012 Code requirement of using the phase-to-ground voltage for the upper and lower conductors instead of the phasor difference between the conductors. Similar to Table 232-1, the column headings of Table 233-1 were simplified by removal of the "grounded" condition of guys.

Rule 234 covers clearances of wires and equipment from buildings, for which the various rules for supply and communications drops were clarified and provide greater detail, including new figures. Vertical clearances above accessible areas of roofs, decks, etc. (but not subject to truck traffic) were reduced in Table 234-1. Similar to Table 232-1, the column headings of several tables were simplified by removal of the "grounded" or "ungrounded" condition of guys.

Rule 235 (clearances between wires carried on same structure) added various clarifications, including that it is required to meet the vertical or horizontal clearance for energized conductors, but not necessarily both. Rule 235H now indicates that the clearances for communications lines apply in the vertical direction, at ambient 60 ^{o}F (15 ^{o}C) conditions, and Rule 235C2 clarifies that additional vertical clearances based on voltage or sag do not apply to such cables in the communications space. Previous requirements (Rule 235I) for antennas were replaced by new Rule 238F and new Table 238-3, which recognize an antenna as "equipment" rather than as a "rigid" conductor.

For loading requirements, Extreme Wind loading Rule 250C has been reframed to emphasize that it represents an additional loading condition applicable for tall structures or lines, as well as any structures prior to the installation of conductors, rather than suggesting it is a general loading condition from which shorter lines are exempt. The previous wind map used for both Grade B and Grade C structures is replaced by a 100 year Mean Recurrence Interval (MRI) map for Grade B and a 50 year MRI map for Grade C, in Figure 250-2. A new method is used for calculating the gust response factor for both the structure and the wires, as provided in Table 250-3. The Table 253-1 load factors for Rule 250C are now 1.0, consistent with the use of the separate wind maps for Grade B and Grade C construction. Appendix C provides examples illustrating the use of the formulas for determining the corresponding wind pressure. The first sentence in Rule 250D for Extreme Ice with Concurrent Wind loading has been deleted, indicating this loading also

represents an additional loading condition applicable for tall structures or lines, rather than suggesting it is a general loading condition from which shorter lines are exempt.

Rule 252 has been revised to include or emphasize the terms “weight span” and “wind span” to determine the vertical and transverse loads on line supports, and the previous Note indicating engineering judgment may be used to determine appropriate wind loading at structures with large line angles has been replaced by an addition to the rule allowing such considerations, including at deadends. The reduced load factors in Table 253-1 are clarified as applicable to foundations and anchors vs. other components. The reduced load factor for wire tensions for Grade C now includes fiber-reinforced polymer components

While deformations or deflections may change the effects of loads, the potential for decreasing the load is specifically addressed in Rule 260A1. A new recommendation in Rule 261A5 provides longitudinal strength for cascade mitigation, and the rule regarding the deflection of flexible structures and its potential effect on clearances has been eliminated. All splices (Rule 261H2a) must have sufficient strength to withstand the maximum required tensions, although splices should be avoided in crossings and adjacent spans.

In Part 3 (Underground Lines), a new Note in Rule 313A2 indicates inspections may be performed when performing other duties, similar to the existing Note in Rule 214A2 for overhead lines. Various rules in Section 32 (Underground Conduit Systems) have been simplified, such as deletion of the requirement regarding “conduit alignment” and “protrusions” since this issue is addressed elsewhere, the allowable use of “flowable fill” as an alternative to “well-tamped earth,” and the deletion of the need for supplemental mechanical protection for reduced separation of conduit containing communication cables from lines that transport flammable material. The references to “vaults” and “tunnels” have been added or deleted, consistent with their usage within in these rules. There is now a burial depth requirement (Rule 344A7) for communications cables with “special supply circuits” if the voltage and power exceed communication levels. The required intervals for bonding or grounding in Rule 354 (direct-buried cables, random separation) for certain applications have been relaxed, analogous to that of Rule 096C.

In Part 4 (Work Rules), Table 410-1 and Table 410-3 have been revised and new Table 410-4 provides arc ratings for clothing systems for medium voltage (1 kV to 36 kV) for enclosed live-front equipment. A specific radio-frequency safety program is now required for exposed employees. Rule 420G for batteries has been extensively revised and expanded to cover other battery types and applications, including stationary batteries and energy storage systems. In Rule 421A6, the need for emergency-response information has been added to job briefings. In Section 44 (Additional Rules for Supply Employees), neutrals, messengers, and guys are added to the list of items to be guarded or insulated, and sources of backfeed, such as from distributed energy resources, must be considered when de-energizing lines.

2017 Edition

Major changes in the 2017 Edition include (1) adding definitions for *communication* and *supply space*, (2) adding exceptions for underground cable grounding requirements, (3) revising and reorganizing the guy insulator placement rules, (4) revising and reorganizing the Grades of Construction application rules, and (5) revising the Part 4 worker safety rules to align with the changes in the OSHA work rules.

2012 Edition

In the 2012 Edition, major changes include: an updated scope, application, and definitions; greatly simplified minimum approach tables and voltage exposure for arc flash; the addition of K factor for wire tension; and added clarification of the ungrounded portions of guys around swimming pools. Consistency to the application of the terms *grounded* and *effectively grounded* was applied. Rule 313 was reworded to include the recording and correction of conditions, not just defects, which affects compliance with the Code. A new rule, Rule 355, was added that contains rules for duct not part of a conduit system. Two significant changes were made to the work rules in Part 4, specifically in the Rule 441 minimum approach distanced tables, and also in Rule 410A3 on arc flash exposure.

2007 Edition

The major revisions for the 2007 Edition included grounding, moving sag calculations to Section 23, moving guy and span wires insulator rules to Section 21, phasing out of the alternate method for load factors and strength factors, flammable materials transported, phase-to-phase cover-up, and minimum approach distance tables.

2002 Edition

In the 2002 Edition, several changes were made that affected all or several parts of the Code. Particularly, this edition clarifies interfaces between the NEC and NESC with regard to Code jurisdiction in the area of streetlights and area lights. Also included is clarification for situations between utility workers and their authorized contractors and installations on industrial complexes.

1997 Edition

In the 1997 Edition, the most notable general change that took place is that numerical values in the metric (SI) system are shown in the preferred position, with customary inch-foot-pound values (inside parentheses) following. A bibliography, Appendix B, which consists of a list of resources identified in notes or recommendations, was added. Changes were made to rules affecting grounding, electric supply stations, and overhead lines, particularly with regard to clearance rules applicable to emergency and temporary installations. Strength requirements contained in Sections 24, 25, and 26 were revised completely. Underground line requirements for random separation for underground lines of direct-buried cables were modified. The requirement for cable identification marking by means of sequentially placed logos was introduced. Work rules added a requirement that warning signs and tags comply with applicable ANSI standards, tagging requirements were clarified with regard to SCADA, and extensive requirements for fall protection were added.

1993 Edition

In the 1993 Edition, changes were made in the rules applicable to emergency and temporary installations. In Section 9 and Parts 1, 2, and 3, rules were extended or clarified to include HVDC systems. The requirements for random separation of direct-buried supply and communications systems were modified for consistency and clarity, as was the rule in Part 4 on tagging electric supply circuits.

1990 Edition

The 1990 Edition included several major changes. General rules were revised. A significant change to the method for specifying overhead line clearances was made and the rationale added as Appendix A. Requirements for clearances of overhead lines from grain bins and an alternate method for determining the strength requirements for wood structures was added. Rules covering grounding methods, electric supply stations, underground lines, and work rules were changed.

1987 Edition

The 1987 Edition was revised extensively. Definitions were changed or added. Requirements affecting grounding methods, electric supply stations, overhead line clearances and loading, underground lines, and work rules were revised.

1981 Edition

The 1981 Edition included major changes in Parts 1, 2, and 3, minor changes in Part 4, and the incorporation of the rules common to all parts into Section 1. The 1984 Edition was revised to update all references and to list those references in a new Section 3. Converted metric values, for information only, were added.

Gender-related terminology was deleted. Section 1—Introduction, Section 2—Definitions, Section 3—References, and Section 9—Grounding Methods, were made applicable to each of the Parts 1, 2, 3, and 4.

Early Editions

The former practice of designating parts by editions has not been practical for some time. In the 1977 Edition, Parts 1 and 4 were sixth editions, Part 2 was a seventh edition, Part 3 was a revision of the sixth edition, Part 2, Section 29, did not cover the same subject matter as the fifth edition, and Part 3 was withdrawn in 1970. In the 1987 Edition, revisions were made in all parts, and revisions to all parts have been made in subsequent editions. It is therefore recommended that reference to the NESC be made solely by the year of the published volume and desired part number. Separate copies of the individual parts are not available.

Work on the NESC started in 1913 at the National Bureau of Standards (NBS), resulting in the publication of NBS Circular 49. The last complete edition of the Code (the fifth edition, NBS Handbook H30) was issued in 1948, although separate portions had been available at various times starting in 1938. Part 2, Definitions and the Grounding Rules, sixth edition, were issued as NBS Handbook H81, ANSI C2.2-1960, in November 1961, but work on other parts was not active again until 1970.

In 1970, the C2 Committee decided to delete the Rules for the Installation and Maintenance of Electric Utilization Equipment (Part 3 of the fifth edition), now largely covered by the National Electrical Code® (NEC®) (NFPA 70®, 2011 Edition), and the Rules for Radio Installation (Part 5 of the fifth edition) from future editions. The Discussion of the NESC, issued as NBS Handbook H4 (1928 Edition) for the fourth edition of the NESC and as NBS Handbook H39 for Part 2 of the Grounding Rules of the fifth edition, was not published for the sixth edition.

The Institute of Electrical and Electronics Engineers, Inc., was designated as the administrative secretariat for C2 in January 1973, assuming the functions formerly performed by the NBS. Comments should be sent to the Secretary, National Electrical Safety Code Committee, through the following online comment form:

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Interpretations

Previously rendered interpretations of the NESC can be found at https://standards.ieee.org/products-programs/nesc/products/#interp.

The Interpretations Subcommittee was established to prepare replies to requests for interpretation of the rules contained in the Code. Requests for interpretation should state the rule in question, as well as the conditions under which it is being applied. Interpretations are intended to clarify the intent of specific rules and are not intended to supply consulting information on the application of the Code. Requests for interpretation should be submitted using the NESC Interpretation Request Form on the NESC Products page: https://standards.ieee.org/products-programs/nesc/products/#interp.

If the request is suitable for processing, it will be sent to the Interpretations Subcommittee. After consideration by the committee, which may involve many exchanges of correspondence, the inquirer will be notified of its decision. Decisions are published regularly and may be accessed online at no cost at https://standards.ieee.org/products-programs/nesc/products/#interp.

The NESC as written is a voluntary standard. However, some editions and some parts of the Code have been adopted, with and without changes, by some state and local jurisdictional authorities. To determine the legal status of the NESC in any particular state or locality within a state, the authority having jurisdiction should be contacted.

Change proposals and comments for the 2023 Edition of the NESC will be submitted to the NESC Secretary online. For information on how this electronic revision process will take place and for updates and complete information on the NESC, please visit the National Electrical Safety Code on the IEEE SA Website at https://standards.ieee.org/products-programs/nesc/process/.

Acknowledgments

On behalf of the National Electrical Safety Code (NESC) Committee, the IEEE Standards Association would like to express thanks and gratitude to Nelson Bingel for his tenure as Chair of the NESC from 2016 to 2022. Nelson has served with an enthusiasm and leadership unsurpassed in the NESC.

A new Chair of the NESC will be announced in 2022 following the conclusion of the election.

On behalf of the NESC Committee, the IEEE Standards Association gratefully thanks Danna Leibhaber for her tenure as Vice Chair of the NESC.

A new Vice Chair of the NESC will be announced in 2022 following the conclusion of the election.

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SEL—Schweitzer Engineering Laboratories
TVA—Tennessee Valley Authority
TWC—Treated Wood Council
WAPA—Western Area Power Administration, U. S. Dept. of Energy
WIA—Wireless Infrastructure Association

Classifications

CEC—Consulting, Engineering, and Construction
CG—Consumer and Government
CPR—Communications Private Sector
CPU—Communications Public Sector
ECL—Electric and Communications Labor
EPR—Electric Private Sector
EPU—Electric Public Sector
GEN/I—General Interest/Insurance Representatives
GEN/IEO—General Interest/Independent Electric Operators
GEN/M—General Interest/Manufacturers
GEN/OU—General Interest/Other Utilities (non-electric or non-communications)
GOV—Government
I—Insurance Representatives
IEO—Independent Electric Operators
M—Manufacturers
OU—Other Utilities (non-electric or non-communications)
PS—Professional Societies

NESC Subcommittee 1
Purpose, Scope, Application, Definitions, and References
Sections 1, 2, and 3

Samuel Stonerock, *Chair*
Mickey B. Gunter, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*
Nelson Bingel		Nelson Research, LLC	Main
	Danna Liebhaber	Bonneville Power Administration	Main
Ron Wellman		American Electric Power	SC2
	Michael Renman	Xcel Energy	SC2
James Houston		Southern Company	SC3
	Gregory Wolven	Wolven Power Engineering Solutions, LLC	SC3
Eric K. Engdahl		American Electric Power	SC4
	Mickey B. Gunter	Engineering consultant	SC4
Joseph Rempe		Tacoma Power	SC5
	Bruce Freimark	American Electric Power	SC5
	Aaron Darby	American Electric Power	SC5
Lauren E. Gaunt		Avangrid	SC7
	Ashley Eanes	Duke Energy	SC7
Samuel Stonerock		Southern California Edison Co.	SC8
	Brent McKinney	City Utilities	SC8
Keith Reese		Georgia Power Company	Interpretations SC

NESC Subcommittee 2—Grounding Methods
Section 9

Ron Wellman, *Chair*
Michael Renman, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Trevor Bowmer		Bunya Telecom Consulting LLC	ATIS	CPR
	Ernie Gallo	Ericsson	ATIS	CPR
Lauren E. Gaunt		Avangrid	EEI	EPR
Michael Renman		Xcel Energy	EEI	EPR
Ron Wellman		American Electric Power	EEI	EPR
Robert Molde		Xcel Energy	EEI	EPR
	Steven Burlison	Duke Energy	EEI	EPR
George Arhos		IBEW	IBEW	ECL
	David Mullen	IBEW	IBEW	ECL
James McGowan			NECA	CEE

NESC Subcommittee 2 *(continued)*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Lee Herron		Burndy LLC	NEMA	GEN
Bob Dew		Hi-Line Engineering	NRECA	EPU
	Robert Harris	National Rural Electric Cooperative Association (NRECA)	NRECA	EPU
Trung Hiu		Rural Development-Electric Program	RUS	GOV
Timothy Cooke		Amphenol Broadband Solutions	SCTE	GEN/M
Keith Reese		Georgia Power Company	SEEX	EPR
	John Bruce	Dominion Energy Virginia	SEEX	EPR

NESC Subcommittee 3—Electric Supply Stations Sections 10–19

James Houston, *Chair*
Gregory Wolven, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
William Pollak		NJ Transit	AAR	GEN/OU
James Houston		Southern Company	AEIC	EPR
	William Munn	Southern Company	AEIC	EPR
Shawn Robinson		AEP Transmission	EEI	EPR
	Henry Lam	National Grid	EEI	EPR
	Kenneth Posey	American Electric Power	EEI	EPR
	Matthew Sigg	American Electric Power	EEI	EPR
Andrew Kunze		Enbridge	Enbridge	GEN/OU
Cody O'Neil		Holy Cross Energy	Holy Cross Energy	EPU
George Arhos		IBEW	IBEW	ECL
	David Mullen	IBEW	IBEW	ECL
David G. Guzman		El Paso Electric Company	IEEE/Substations	EPR
	W. Bruce Dietzman	Oncor Electric Delivery Company	IEEE	EPR
Dustin Metz		North Carolina Utility Commission	NARUC/NCUC	GOV
Gregory Wolven		Wolven Power Engineering Solutions, LLC	NRECA	EPU
	Robert Harris	National Rural Electric Cooperative Association (NRECA)	NRECA	EPU
Larry Hopkins		Piedmont EMC	Piedmont EMC	EPU
John Aultman		Schweitzer Engineering Laboratories	SEL	CEC
Christopher A. Carson		Alabama Power Company	SEEX	EPR
	Tracy Judson	Gulf Power Company	SEEX	EPR

NESC Subcommittee 3 *(continued)*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Greg Ball		Tesla	Tesla	GEN
Mehrdad Eskandary		Rural Utilities Service	USDA/RUS	GOV
Drew Szabo		Westwood PS	Westwood	CEC

NESC Subcommittee 4—Overhead Lines—Clearances
Sections 20, 21, 22, 23

Eric K. Engdahl, *Chair*
Mickey B. Gunter, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Joanna Pardini		Amtrak	AAR	GEN/OU
Keith Reese		Georgia Power Company	AEIC	EPR
Michael Dyer		Salt River Project	APPA	EPU
Anita Atkinson		ASCE	ASCE	CEC
Lawrence M. Slavin		Outside Plant Consulting Services, Inc.	ATIS	CPR
Trevor Bowmer		Bunya Telecom Consulting LLC	ATIS	CPR
	Ernie Gallo	Ericsson	ATIS	CPR
Danna Liebhaber		Bonneville Power Administration	BPA	EPU
	Michael Stoltz	Bonneville Power Administration	BPA	EPU
Troy Little		Brooks, Jackson, Little & May, Inc.	NSPE	CEC
Alan Kuipers		Consumers Energy	EEI	EPR
Barrett Thomas		American Electric Power	EEI	EPR
Eric K. Engdahl		American Electric Power	EEI	EPR
Jeffrey Steiner		National Grid	EEI	EPR
Mickey B. Gunter		Engineering consultant	EEI	EPR
	Frank Tucker	American Electric Power	EEI	EPR
George Arhos		IBEW	IBEW	ECL
	David Mullen	IBEW	IBEW	ECL
Marc Candels		Candels Consulting & Training	IEC	CEC
Robert Kluge			IEEE	PS
Jason Jenks		Rocky Mountain Power Design	IEEE/IAS/REPC	CEC
Douglas Proctor		D. Proctor Engineering, Inc.	IEEE/PES/T&D	CEC
David J. Marne		Marne and Associates, Inc.	Marne and Associates, Inc.	CEC
Akankshe Craft		Public Service Commission of Wisconsin	NARUC	GOV
Brent Killian		PA Public Utility Commission	NARUC	GOV
Mark Rettmann		Oregon Public Utility Commission	NARUC	GOV

NESC Subcommittee 4 *(continued)*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Terry Rosenthal		Laclede Electric Cooperative	NRECA	EPU
	Ernest Neubauer	Southern Rivers Energy	NRECA	EPU
	Robert Harris	National Rural Electric Cooperative Association (NRECA)	NRECA	EPU
Jesse Kohler		Power Line Systems, Inc.	Power Line Systems	CEC
Donald Junta		USDA	RUS	GOV
	Norris Nicholson	USDA/RUS	RUS	GOV
Branch Davis		Entergy Corporation	SEEX	EPR
Joseph J. White		BGE	SEEX	EPR
	David Barnard	BGE	SEEX	EPR
	Matthew Uhrig	Alabama Power Co.	SEEX	EPR
Eric O'Brien		Crown Castle	WIA	CPR
	Alex Fiorani	Crown Castle	WIA	CPR

NESC Subcommittee 5—Overhead Lines—Strength and Loading Sections 24, 25, and 27

Joseph Rempe, *Chair*
Aaron Darby, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
John Busel		ACMA	ACMA	GEN/M
	Dustin Troutman	Creative Pultrusions Inc.	ACMA	GEN/M
	Scott Holmes	RS Technologies Inc.	ACMA	GEN/M
Helen Chen		American Iron and Steel Institute	AISI	GEN/M
	William Reisdorff, Jr.	Valmont Utility	AISI	GEN/M
Kurt Traub		Ampirical	Ampirical	CEC
	Derrik Slayman	Ampirical	Ampirical	CEC
Joseph Rempe		Tacoma Power	APPA	EPU
Warren Brooks		City Utilities of Springfield, Missouri	APPA	EPU
Lawrence M. Slavin		Outside Plant Consulting Services, Inc.	ATIS	CPR
Trevor Bowmer		Bunya Telecom Consulting LLC	ATIS	CPR
	Ernie Gallo	Ericsson	ATIS	CPR
Leon Kempner, Jr.		Bonneville Power Administration	BPA	EPU
	Mark Nelson	Bonneville Power Administration	BPA	EPU
Josh Sebolt		Burns & McDonnell	Burns & McDonnell	CEC
	Justin Lightner	Burns & McDonnell	Burns & McDonnell	CEC
Aaron Darby		American Electric Power	EEI	EPR

NESC Subcommittee 5 *(continued)*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
C. Jerry Wong		Florida Power & Light	EEI	EPR
Edward Harrel		Oncor Electric Delivery Company	EEI	EPR
Jeffrey Erdle		Duke Energy	EEI	EPR
Matthew Shellenberger		American Electric Power	EEI	EPR
G. Paul Anundson		National Grid	EEI	EPR
Prasad Yenumula		Duke Energy	EEI	EPR
Ronald Cotant		American Electric Power	EEI	EPR
	Jessica Farrell	National Grid	EEI	EPR
Bruce Freimark		American Electric Power	EEI	EPR
Andrew Schwalm		Victor Insulators, Inc.	IEEE	GEN/M
Michael Garrels		Xcel Energy	IEEE	EPR
Rusty Soderberg		Consumers Energy	IEEE	EPR
	James Dubay	Consumers Energy	IEEE	EPR
	Robert Kluge		IEEE	PS
Wesley J. Oliphant		EXO Group LLC	IEEE Working Group 7	CEC
Mark Jurgemeyer		CORE Electric Cooperative	IEEE/IAS	CEC
Art Graham		Commissioner, Florida Public Service Commission	NARUC	GOV
Ryan Laruwe		Michigan Public Service Commission	NARUC	GOV
Martin Rollins		H.M. Rollins Company, Inc.	NAWPC	GEN/M
Will Pittman		Carteret-Craven Electric Cooperative	NCEMC	EPU
Robert Harris		National Rural Electric Cooperative Association (NRECA)	NRECA	EPU
	Kevin Mara	GDS Associates, Inc.	NRECA	EPU
	Rene Smith	Smunter EMC	NRECA	EPU
Robert Fuller		Texas-New Mexico Power Co.	NSPE	EPR
	Grant Glaus	Columbia Rural Electric Association	NSPE	EPU
Mark Messenger		Osmose Utilities Services	Osmose Utilities Svc	CEC
Otto Lynch		Power Line Systems	Power Line Systems	CEC
	Brandon Grillon	Power Line Systems	Power Line Systems	CEC
Thomas Haire		Rutherford EMC	REMC	EPU
	Norris Nicholson	USDA/RUS	RUS	GOV
Timothy Cooke		Amphenol Broadband Solutions	SCTE	GEN/M
John Trentham		Alabama Power Company	SEEX	EPR
Frank Agnew		Alabama Power Company	SEEX	EPR
Wade Shultz		Alabama Power Company	SEEX	EPR
	Melanie McDowell	Florida Power & Light	SEEX	EPR
Brian Lacoursiere		Tapp Inc.	Tapp Inc.	GEN/M
Brenda Sears		TRC Companies	TRC Companies	CEC
Steve Cantrell		TVA Transmission	TVA	EPU

NESC Subcommittee 5 *(continued)*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Jim Fixsen		Bell Lumber and Pole	TWC	GEN/M
	Bob Reisdorff	Laminated Wood Systems, Inc.	TWC	GEN
Chendi Zhang		USDA/RUS	USDA/RUS	GOV
Cody Neyens		Western Area Power Administration	WAPA	EPU

NESC Subcommittee 7—Underground Lines
Sections 30–39

Lauren E. Gaunt, *Chair*
Ashley Eanes, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Michael Dyer		Salt River Project	APPA	EPU
Narayana Sundaram		American Public Transit Association	APTA	GEN
	Nathan Leventon	American Public Transit Association	APTA	GEN
Lawrence M. Slavin		Outside Plant Consulting Services, Inc.	ATIS	CPR
Trevor Bowmer		Bunya Telecom Consulting LLC	ATIS	CPR
Ashley Eanes		Duke Energy	EEI	EPR
Jonathan Gonynor		National Grid	EEI	EPR
Lauren E. Gaunt		Avangrid	EEI	EPR
	Michael Renman	Xcel Energy	EEI	EPR
	William Ross McCorcle	American Electric Power	EEI	EPR
George Arhos		IBEW	IBEW	ECL
	David Mullen	IBEW	IBEW	ECL
David J. Marne		Marne and Associates, Inc.	Marne and Associates, Inc.	CEC
Akankshe Craft		Public Service Commission of Wisconsin	NARUC	GOV
Kevin Ogles		Middle Tennessee Electric Membership Corporation	NRECA	EPU
Trung Hiu		Rural Development-Electric Program	RUS	GOV
	Donald Junta	USDA	RUS	GOV
Timothy Cooke		Amphenol Broadband Solutions	SCTE	GEN/M
Mickey B. Gunter		Engineering consultant	SEEX	EPR
	Keith Reese	Georgia Power Company	SEEX	EPR
Kevin Hall		LG&E and KU Energy	SEEX	EPR

NESC Subcommittee 8—Work Rules
Sections 40–43

Samuel Stonerock, *Chair*
Brent McKinney, *Secretary*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Bill McGough		Alabama Power Company	AEIC	EPR
	Bernie D. (Donnie) Bell	Florida Power and Light	AEIC	EPR
Brent McKinney		City Utilities	APPA	EPU
Jonathan Beasley		Electric Cities of GA	APPA	EPU
	Kevin Dody	City Utilities of Springfield	APPA	EPU
Trevor Bowmer		Bunya Telecom Consulting LLC	ATIS	CPR
	Ernie Gallo	Ericsson	ATIS	CPR
Ronald May		Brooks, Jackson, Little & May, Inc.	NSPE	CEC
	F. M. Brooks	Brooks, Jackson, Little & May, Inc.	NSPE	CEC
	Troy Little	Brooks, Jackson, Little & May, Inc.	NSPE	CEC
Michael Granata		American Electric Power	EEI	EPR
Samuel Stonerock		Southern California Edison Co	EEI	EPR
Stephen Barnard		Dominion Energy	EEI	EPR
	David Robinson	American Electric Power	EEI	EPR
	Dennis Hoffman	American Electric Power	EEI	EPR
	William Beutler	First Energy Corp	EEI	EPR
David Wallis		Self	Emeritus	EM
George Arhos		IBEW	IBEW	ECL
	David Mullen	IBEW	IBEW	ECL
Thomas Verdecchio		Self	IEEE	CEC
	Mark M. Green	PECO Energy Company	IEEE/PES	EPR
Stephen Poholski		Newkirk Electric	NECA	EPR
JD Cox		Northcentral Electric Power Assoc.	NRECA	EPU
	Dwight Miller	Ohio Electric Cooperatives	NRECA	EPU
	Robert Harris	National Rural Electric Cooperative Association (NRECA)	NRECA	EPU
Steven Theis		PSE&G	NSC	EPR
Albert Smoak		Southwestern Electric Power Company	NSPE	EPR
Brian Erga		ESCI Inc.	NWPPA	EPU
William Rodriguez		Pfizer Global Engineering	Pfizer Global Engineering	CEC
Norris Nicholson		USDA/RUS	RUS	GOV
Christopher Wilbert		Florida Power & Light	SEEX	EPR
Todd Revell		Dominion Energy	SEEX	EPR
	George Brasher	Alabama Power Company	SEEX	EPR
	Eddie Smith	Southern Company Services	SEEX	EPR
Charles Grose		Self	Self	CEC

NESC Subcommittee 8 *(continued)*

Principal	*Alternate*	*Employer*	*Representing*	*Classification*
Edward Hunt		Western Area Power Administration	WAPA	EPU
	Gary Zevenbergen	Western Area Power Administration	WAPA	EPU

NESC Executive Subcommittee

Nelson Bingel, *Chair*
Danna Liebhaber, *Vice Chair*

Name	*Employer*	*Representing*
Danna Liebhaber	Bonneville Power Administration	BPA
Eric K. Engdahl	American Electric Power	EEI
Lawrence M. Slavin	Outside Plant Consulting Services, Inc.	ATIS
Leon Kempner, Jr.	Bonneville Power Administration	BPA
Michael Hyland	American Public Power Association	Amer Public Power Assoc.
Nelson Bingel	Nelson Research, LLC	
Robert Harris	National Rural Electric Cooperative Association (NRECA)	NRECA

NESC Interpretations Subcommittee

Keith Reese, *Chair*

Name	*Employer*	*Section*	*Part*
Branch Davis	Entergy Corporation		2
David J. Marne	Marne and Associates, Inc.		A
F. M. Brooks	Brooks, Jackson, Little & May, Inc.		4
James Houston	Southern Company		1
Johnny Dagenhart	Dagenhart Consulting		A
Joseph J White	BGE		2
Keith Reese	Georgia Power Company		A
Lauren E. Gaunt	Avangrid		A
G. Paul Anundson	National Grid		A
Troy Little	Brooks, Jackson, Little and May, Inc.		4
Allen Clapp	Power & Communication Utility Training Center		A
Alton L Comans	Southern Company	9	1
Bruce Freimark	American Electric Power		2
Charles Grose			4
Eric K. Engdahl	American Electric Power		A

NESC Interpretations Subcommittee *(continued)*

Name	*Employer*	*Section*	*Part*
Ewell Robeson		9	3
Lanny L. Smith			A
Lawrence M. Slavin	Outside Plant Consulting Services, Inc.		A
Mickey B. Gunter	Engineering consultant		A
Wade Shultz	Alabama Power Company		A

Key:

A = All areas; 1 = Part 1; 2 = Part 2; 3 = Part 3; 4 = Part 4; 9 = Section 9

Grounding: When a member has Section 9 and a part number, the member covers grounding and grounding for that part.

Procedure for revising the NESC

1. Preparation of proposals for amendment

   NOTE: The procedures for the collection of change proposals are subject to change for the 2028 NESC revision cycle. See https://standards.ieee.org/products-programs/nesc/program/process/ for updates.

   1.1 A proposal may be prepared by any

   a. Substantially interested person

   b. Interested organization

   c. NESC Subcommittee

   d. Member of the NESC Committee or its subcommittees

   1.2 Change proposals shall be submitted to the Secretary of the National Electrical Safety Code Committee via the NESC's electronic revision process found at https://standards.ieee.org/products-programs/nesc/program/process/.

   1.3 Each separate topic shall begin on a separate form and shall only address one rule, unless a change in a rule directly affects another rule. If a proposal references documents not readily available to all subcommittee members, sufficient copies of the referenced documents to supply the subcommittee must be furnished.

   1.4 The proposal shall consist of

   a. A statement, in NESC rule form, of the exact change, rewording, or new material proposed.

   b. Words to be deleted shall be indicated via strikethroughs, and words to be added shall be underlined.

   c. The name of the submitter (organization or individual as applicable).

   d. Supporting comments, giving the reasons why the NESC should be revised.

   NOTE: A change proposal will not be accepted if these steps are not followed.

2. The NESC Secretary will

   a. Acknowledge receipt of proposals for revision.

   b. Distribute to each member of the appropriate NESC Subcommittee all of the proposals received, arranged in a coordinated sequence.

3. Subcommittee recommendation

   The NESC Subcommittee responsible will consider each proposal and take one or more of the following steps:

   a. Endorse the proposal as received.

   b. Prepare a proposed revision or addition for the NESC (this may be a coordination of several comments or a committee consensus on a modification of a proposal).

   c. Refer the proposal to a technical working group for detailed consideration.

   d. Request coordination with other NESC Subcommittees.

   e. Recommend rejection of the proposal, for stated reasons.

   For each item, the responsible subcommittee shall prepare a voting statement, accompanied by all members' statements concerning their votes (cogent reasons are required for negative votes). Steps (c) and (d) are intended to result, eventually, in a proposal of category (b).

Action under steps (c) or (d) shall be completed and reported to the subcommittee before the end of the public review period if the item is to be included in the upcoming revision.

4. Preprint of proposals

The NESC Secretary shall organize and publish a preprint of the proposed revisions including

a. The original proposal as received from the submitter.

b. The recommendation of the subcommittee with respect to the proposal (including a voting statement and subcommittee members' statements).

c. Copies of submittal form for comments.

The Preprint shall be distributed to all members of NESC Subcommittees and representatives of organizations comprising the NESC Committee. Copies shall be available for sale to other interested parties. Notice of availability of the Preprint shall be submitted to ANSI for publication in ANSI Standards Action. The Preprint shall carry information on how to submit comments on the proposals and the final date for such submissions.

5. Final processing of proposed revisions and comments

5.1 Following the public review period, the Secretary shall organize and distribute for subcommittee consideration all comments received electronically.

5.2 The Preprint and the comments received shall be reconsidered by the subcommittees. No new change proposals may be considered.

a. The subcommittee may recommend adoption or rejection of the proposal by majority vote.

b. When extended technical consideration or resolution of differing or conflicting points of view is necessary, the subcommittee shall refer the problem to a working group of the subcommittee for proposed resolution. If expeditious resolution is not possible, the subject shall be held on the docket.

Each working group shall provide, to its parent subcommittee, recommendations on matters considered as a result of subcommittee referrals under items 3(c) and 4.2(b).

Each subcommittee shall prepare a report showing its proposed revisions and all items held on the docket together with a plan for their disposition.

5.3 The Secretary shall provide commenters with copies of actions taken on the rules affected by their comments, and shall make all such reports available for examination upon request.

6. Final approval

6.1 Based upon the subcommittee reports, the Secretary shall prepare a draft of the revision of the NESC and distribute copies to

a. The NESC Committee for approval by a 30-day letter ballot

b. The ANSI Board of Standards Review for concurrent 45-day public review

Comments received in response to the letter ballot and public review shall be referred to the Executive Subcommittee for resolution or referral to the appropriate subcommittee. Those items on which consensus cannot be reached shall be referred to the appropriate subcommittee for consideration during the next revision cycle. Unless a consensus for revision is established, the requirements of the current edition shall carry over to the proposed edition.

Time schedule for the next revision of the NESC

The revision schedule for the 2028 NESC is as follows:

15 May 2024	Final date to receive change proposals from the public for revision of the 2023 Edition of the NESC, preparatory to the publication of a 2028 Edition.
August–October 2024	NESC Subcommittees consider change proposals to the NESC and prepare their recommendations.
1 July 2025	Preprint of the change proposals for incorporation into the 2028 Edition of the NESC published for distribution to the NESC Committee and other interested parties. This opens the comment period, by interested parties, on the submitted change proposals and the subcommittee recommendations.
24 March 2026	The final date to submit comments on the submitted change proposal and the subcommittee recommendations. All comments and recommendations on these proposals are due to the Secretary, NESC Committee.
August–October 2026	Period for NESC Subcommittee Working Groups and NESC Subcommittees to reconsider all recommendations concerning the proposed amendments and prepare a final report.
15 January 2027	Proposed revision of the NESC, C2, submitted to NESC Committee for letter ballot and to ANSI for concurrent public review.
14 May 2027	NESC Committee approved revisions of the NESC submitted to ANSI for recognition as an ANSI standard.
1 August 2027	Publication of the 2028 Edition of the NESC.

Working Group assignments and activities for the 2023 Edition

Subcommittee 2, Grounding Methods (SC2)

Working Group 2.1

A Task Force was formed to review CP4059 for possible requirements for grounding line side for services greater than 750 V.

Members: John Dagenhart, Keith Reese

Working Group 2.2

A Task Force was formed to review CP4058 to look at the diameter of different ground rods and modern materials and techniques.

Chair: Roger J. Montambo
Members: Trevor Bowmer, John Dagenhart, Keith Reese, Ewell T. Robeson

Subcommittee 4, Overhead Lines—Clearances (SC4)

Working Group 4.5

Review clearances for Rule 215C2 (Guys).

Scope:

1) Rule 215C, clearances to the ground for positioning of guy insulators.
2) Rules pertaining to guarding and protection as they relate to the 8 ft clearance for supporting structures for clearance from the ground or equipment that may be attached to a structure.
3) Rules pertaining to readily climbable supporting structures as they relate to steps and brackets.
4) Rules pertaining to clearances on permanently mounted ladders as a means of access.

Chair: Branch Davis
Members: Alex Fiorani, Barrett Thomas, Dave Barnard, David J. Marne, Mike Dyer, Mickey B. Gunter

Working Group 4.6

Clearances of supply conductor drip loops associated with a luminaire, or a traffic signal supported by a bracket or span wire in the Communication Worker Safety Zone.

Scope: Lighting brackets (past NESC) and traffic signals (as of 1990 NESC) are allowed in the Communication Workers Safety Zone to allow for mounting heights required for luminaires to produce the proper lighting pattern. In addition to the brackets, drip loops into the brackets also have reduced clearances to communication lines to allow for the required mounting heights. When the luminaires or traffic signals are supported on a span wire, there are still mounting height requirements for these devices. However, clearance reductions for span wires supporting luminaires or traffic signals are mentioned in the *2017 NESC Handbook*. The change made to Rule 238D removed “bracket” from the title but “bracket” is still in the rule. Because the NESC and the NESC Handbook do not align, this creates confusion of the NESC rule.

Chair: Alan Kuipers
Members: Keith Reese, Lawrence M. Slavin, David J. Marne

Working Group 4.7—Rules 233 and 235

Scope:

1) Simplify these two rules and make them more concise.
2) Address inconsistencies where appropriate.
3) Address redundancies to remove these where possible.

Chair: Robert Kluge
Members: Branch Davis, Keith Reese, Mickey B. Gunter

Working Group 4.8—Powering Circuits, Cables, and Systems Serving Communications Equipment

Scope: Review operation of current powering schemes for communications equipment and adequacy of current NESC rules.

Chair: Trevor Bowmer
Members: Ernest Gallo, Ed Badon, Keith Reese, Doug Proctor, Vince Ferretti, Tom Craft, Christian Schafer, Keith Waters

Subcommittee 5, Overhead Lines—Strength and Loading (SC5)

Task Force 5.1.3—Inconsistencies

Chair: Michael Garrels
Members: G. Paul Anundson, James Dubay, Brenda Sears, Rusty Soderberg, Joe Rempe, Melanie McDowell

Task Force 5.1.5—Meteorological Loading Criteria

Scope: Coordination of industry standards and practices, such as ASCE 7 and ASCE 74, for meteorological loading criteria.

Chair: Otto Lynch
Members: Cody Neyens, Aaron Darby, Joe Rempe, Jeffrey Erdle, John Trentham, Steve Cantrell, Leon Kempner, Josh Sebolt, Melanie McDowell, Prasad Yenumula

Task Force 5.1.11—K Factor

Scope: Evaluation of the conductor additive constant (K factor).

Chair: Steve Cantrell

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Annex 1 (metric)

Section 1.
Introduction to the
National Electrical Safety Code®

The National Electrical Safety Code (NESC®) is American National Standard C2. It is a consensus standard that has been prepared by the National Electrical Safety Code Committee under procedures approved by the American National Standards Institute (ANSI). The membership of the NESC Committee is composed of national and international organizations and is certified by ANSI as having an appropriate balance of the interests of members of the public, utility workers, regulatory agencies, and the various types of private and public utilities.

The NESC is used in whole or in part by statute, regulation, or consent as the standard (or basis of the standard) of safe practice for public and private utilities in the United States, as well various jurisdictions and industries in other countries.

010. Purpose

A. The purpose of the NESC is the practical safeguarding of persons during the installation, operation, and maintenance of electric supply and communication facilities, under specified conditions.

NOTE: NESC rules are globally recognized and intended to provide a practical standard of safe practices that can be adopted by public utilities, private utilities, state or local utility commissions or public service commissions, or other boards or bodies having control over safe practices employed in the design, installation, operation, and maintenance of electric supply, communication, street and area lighting, signal, or railroad utility facilities.

B. NESC rules contain the basic provisions, under specified conditions, that are considered necessary for the safeguarding of the public and utility workers (employees and contractors).

C. This Code is not intended as a design specification or as an instruction manual, nor is it intended to provide design criteria for abnormal events such as, but not limited to, actions of others or weather events in excess of those specified herein.

011. Scope

A. Covered

See Figure 011-1.

The NESC 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 as a utility.
2. The generation, transmission, and distribution of electricity, lumens, communication 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 (a) generate energy by conversion from some other form of energy such as, but not limited to, fossil fuel, chemical, electrochemical, nuclear, solar, mechanical, wind or hydraulic or communication signals, or accept energy or communication signals from another entity, or (b) provide that energy or communication signals through a delivery point to another entity.
4. Street and area lights that provide a supply of lumens where these facilities are supplied from the line side of the service point by underground or overhead conductors maintained and/or