2017 National Electrical Safety Code® (NESC®)

C2-2017




NESC

100TH ANNIVERSARY EDITION

IEEE

3 Park Avenue, New York, NY 10016-5997, USA

Accredited
Standards
Committee
C2-2017

National Electrical Safety Code®

Secretariat
Institute of Electrical and Electronics Engineers, Inc.

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American National Standards Institute

2017 Edition

Abstract: This Code covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of (1) conductors and equipment in electric supply stations, and (2) overhead and underground electric supply and communication lines. It also includes work rules for the construction, maintenance, and operation of electric supply and communication lines and equipment. The Code is applicable to the systems and equipment operated by utilities, or similar systems and equipment, of an industrial establishment or complex under the control of qualified persons. This Code consists of the introduction, definitions, grounding rules, list of referenced and bibliographic documents, and Parts 1, 2, 3, and 4 of the 2017 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 Accredited Standards Committee C2-2017, National Electrical Safety Code.

This publication consists of the parts of the National Electrical Safety Code® (NESC®) (Accredited Standards Committee C2) currently in effect.

Substantive changes in the 2017 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.

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.

In Section 1, the Purpose rule was reorganized to clarify who and what the rules of the Code are meant to safeguard. The Scope rule was revised to include wind and solar energy as one of the sources for generating electricity. Two major revisions were added to the Application Rule (Rule 013). The first is the addition to Rule 013B3 clarifying which edition of the Code applies after an installation has been updated to a subsequent Code edition. The second revision concerns the addition of new facilities to an installation that does not meet Code rules.

Definitions for terms no longer used in the Code were deleted. Definitions added include *communication equipment, communication space, electric supply equipment, insulator*, *limited access highways, supply space, wind span,* and *weight span*.

In Section 3 (References), standards were added, updated, or deleted if no longer referenced in the Code. Appendix E (Bibliography) was also updated.

In Rules 092C1 and 096C, exceptions were added to exempt the four-grounds-in-each mile requirement under specific limiting conditions. In Rule 094B, stainless steel was included with nonferrous metals. Many of the grounding electrodes described in the rule are now considered to be equivalent. The exception allowing other dimensions and configurations if supported by a qualified engineering study was expanded to cover more types of electrodes.

In Part 1, major revisions to *electric supply stations* consisted of additions to Rule 110A that address safety sign locations, adjoining fence restrictions, and impenetrable fence modifications. Rule 114 pertaining to fire-extinguishing equipment was deleted. Rule 124A1 was revised to require the electric supply station clearance values in Table 124-1 and Table 110-1 to have appropriate atmospheric correction factors applied for altitudes above 1000 m (3300 ft).

Guy insulator Rules 215C2 to 215C8 were rewritten and reorganized to make them easier to understand and apply with the voltage transfer rules associated with guy insulators being removed. Voltage ‘adder’ calculations for vertical clearances between conductors carried on different supporting structures specified in Rule 233C will now require using a phasor relationship when determining the voltage between the conductors involved. Clearances of overhead lines from aboveground swimming pools with and without decks were added to Rule 234E1. All the rules associated with the clearances of antennas from supply and communication lines were placed into one rule, Rule 235I, and Rule 238E will now require a 1 m (40 in)

vertical clearance between luminaires that are not effectively grounded and communication cables and equipment located in the communication space.

NOTE—Definitions of supply and communication space are now in Section 2.

In general, the rules in Section 24 were edited to provide greater clarity and easier reading. For example, Rule 241C was converted from a paragraph format to a bulleted format and a note was added to Rule 240 to point out that requirements for emergency and temporary installations are addressed in Rule 014.

Although the content of Table 242-1 remains largely the same, the order of the columns and rows was changed to follow a more intuitive progression. Take note that for crossing supply conductors exceeding 22 kV, the table value is now shown as Grade B and Footnote 3 allows a reduction to Grade C if the supply circuits will be promptly de-energized. Previously, the Table 242-1 showed a requirement of Grade C with a footnote stating that Grade B was required if the supply would not be promptly de-energized. Footnote 11 was also added to Table 242-1 to specify that Grade N construction can be used for dielectric fiber-optic supply cables when certain grounding requirements are met.

Rule 250D has additional language that clarifies the objects that have ice added to them for loading analysis and those objects where ice is not added. Rule 261H has an added requirement that the potential for damage from Aeolian vibration must be considered for all conductors. In addition, when limiting tension is the only method applied for mitigation, initial and final tension limits are specified.

Several changes to requirements for insulators were adopted into Section 27. The industry has developed new insulator ratings over the last 10 years and the changes in Section 27 were made to coincide with manufacturers' current rating practices.

Separate allowed percentage of strength ratings are now specified for Rule 250B loads versus Rules 250C and 250D loads. In addition, new classifications were adopted to differentiate distribution and transmission insulators and the allowable values were changed for those insulators that have a new rating methodology.

In Part 3, rules requiring underground conductor neutrals and any other conductors that are intentionally grounded were revised to require grounding where they are exposed to personnel contact.

Rule 354D contains exceptions that allow grounding and bonding between underground communication and supply cables at equipment locations in lieu of grounding and bonding the underground cable between equipment locations.

The rules covering burial depths for direct buried underground cables and duct not part of a conduit system were revised to require burial depths; an exception was added if the requirement cannot be met.

The conductance requirement in the random separation between supply and communication rules was deleted.

Several noteworthy changes were made to Part 4. Specifically, revisions to Rule 410A, Rule 420K, Rule 441, and the associated tables were adopted to align these work rules with changes to OSHA federal regulations (Title 29 of the Code of Federal Regulations) published in April 2014.

Rule 410A3 was revised to recognize the possible necessity to protect the head, face, hand, and feet of employees working on or near energized lines, parts, or equipment at voltages 50 V to 800 000 V (ac) and also includes a recommendation for voltages 50 V to 250 V (dc).

Rule 420K was revised and expanded to address and provide guidance fall protection and fall arrest equipment and its use.

Rule 441 (and the associated tables) was extensively revised to: address situations where the grounding of lines operating at 600 V (ac) or less is impractical; include definitions for *reach* and *extended reach*; address work on exposed grounded lines 301 V to 72.5 kV (ac); clarify the use of the Rubber Glove Work Method for lines 301 V to 72.5 kV (ac); and address work position when performing live-line work on lines 72.5 kV and above. Table 441-1 was revised to include material changes to the default minimum approach distance values for ac live-line work for lines 72.6 kV and above. Corresponding to the revisions to Rule 441A4, new Table 441-2, Table 441-3, and Table 441-4 were added to supplement Table 441-1 where the per unit transient overvoltage value has been determined through an engineering analysis.

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:

Secretary
National Electrical Safety Code Committee
Institute of Electrical and Electronics Engineers, Inc.
http://standards.ieee.org/contact/form.html

Interpretations

Previously rendered interpretations of the NESC can be found at http://standards.ieee.org/about/nesc/interps.html.

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 home page: http://standards.ieee.org/about/nesc/interps.html.

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 http://standards.ieee.org/about/nesc/interps.html.

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 2022 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 Standards website at http://standards.ieee.org/about/nesc/index.html.

Acknowledgments

On behalf of the National Electrical Safety Code (NESC) Committee, the IEEE Standards Association would like to express thanks and gratitude to Michael J. Hyland for his 10-year tenure as Chair of the NESC, from 2006 to 2016. Mike has served with an enthusiasm and leadership unsurpassed in the NESC. The support by the American Public Power Association and its membership for Mike in his role as NESC Chair is sincerely appreciated.

On behalf of the NESC Committee, the IEEE Standards Association gratefully thanks James R. Tomaseski for his 10-year tenure as Vice Chair of the NESC.

Beginning 1 September 2016, the NESC Committee looks forward to leadership for the next Code edition by welcoming Nelson G. Bingel, III, Osmose Utilities Services, as Chair of the NESC, and Danna Liebhaber, Bonneville Power Administration, as Vice Chair of the NESC.

NESC Main Committee Membership

At the time this Code was approved, Accredited Standards Committee C2 had the following membership:

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		Stephen Cantrell	Tennessee Valley Authority
WAPA	Patrick Nies		Western Area Power Administration, U.S. Department of Energy

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

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	Ewell T. Robeson	SC2	Duke Energy
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	David J. Marne	SC3	Marne and Associates, Inc.
Eric K. Engdahl		SC4	American Electric Power
	Mickey B. Gunter	SC4	Georgia Power Company, Consultant
Nelson G. Bingel, III		SC5	Osmose Utilities Services, Inc.
	Bruce Freimark	SC5	American Electric Power
Charles C. Bleakley		SC7	Georgia Power Company, Consultant
	Lauren E. Gaunt	SC7	Eversource Energy
James R. Tomaseski		SC8	PAR Electric Contractors, Inc.
	Samuel Stonerock	SC8	Southern California Edison Co.

AAR—Association of American Railroads
AEIC—Association of Edison Illuminating Companies
AISI—American Iron and Steel Institute
APPA—American Public Power Association
APTA—American Public Transit Association
ATIS—Alliance for Telecommunications Industry Solutions
AWPA—American Wood Preserves Association
BPA—Bonneville Power Admin., U.S. Dept. of Energy
EEI—Edison Electric Institute
EIA—Electronic Industries Association
IBEW—International Brotherhood of Electrical Workers
IEA—Infrastructure Energy Alternatives
IEC—Independent Electrical Contractors
IEEE—Institute of Electrical and Electronics Engineers, Inc.
IMSA—International Municipal Signal Association
NARUC—National Association of Regulatory Utility Commissioners
NAWPC—North American Wood Pole Council
NCEMC—North Carolina Electric Membership Corporation
NCTA—National Cable Television Association
NECA—National Electrical Contractors Association
NEMA—National Electrical Manufacturers Association
NRECA—National Rural Electric Cooperative Association
NSC—National Safety Council
NSPE—National Society of Professional Engineers
RUS—Rural Utilities Services, U.S. Dept. of Agriculture
SCTE—Society of Telecommunication Engineers
SEEX—Southeastern Electric Exchange
SEIA—Solar Energy Industries Association
TVA—Tennessee Valley Authority
TWC—Treated Wood Council
WAPA—Western Area Power Administration, U.S. Dept. of Energy

NESC Subcommittee 2—Grounding Methods
Section 9

John B. Dagenhart, *Chair*
Ewell T. Robeson, *Secretary*

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Ewell T. Robeson		EEI	Duke Energy
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	Donald Guinn	EEI	Duke Energy
	Ron Wellman	EEI	American Electric Power
David Mullen		IBEW	International Brotherhood of Electrical Workers
Donald W. Zipse		IEEE/IAS	Zipse Electrical Engineering Inc.
John Dagenhart		IEEE/PES/T&D	Dagenhart Consulting Services
Steven Johnson		NCTA	Johnson Telecomm LLC
James R. Tomaseski		NECA	PAR Electrical Contractors, Inc.
Roger J. Montambo		NEMA	Galvan Industries
Bob Dew		NRECA	Hi-Line Engineering
	Robert D. Saint	NRECA	National Rural Electric Cooperative Association
Ted Pejman		RUS	USDA, Rural Utilities Service
	Trung Hiu	RUS	USDA, Rural Utilities Service
Timothy Cooke		SCTE	Times Fiber Communications, Inc.
Keith Reese		SEEX	Georgia Power Company
	John Bruce	SEEX	Dominion Virginia Power

NESC Subcommittee 3—Electric Supply Stations
Sections 10–19

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David J. Marne, *Secretary*

Principle	*Alternate*	*Organization represented*	*Employer*
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	Timothy Jyrkas	EEI	Xcel Energy
	Kenneth Posey	EEI	American Electric Power
David Mullen		IBEW	International Brotherhood of Electrical Workers
Drew Szabo		IEA	Infrastructure Energy Alternatives
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D. J. Christofersen		IEEE/PES/SUB	CeCe
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	Ted Pejman	RUS	USDA, Rural Utilities Service
Mark A. Konz		SEEX	Gulf Power Company
	Christopher A. Carson	SEEX	Alabama Power Company

For the 2022 Edition, David J. Marne assumes the position of Subcommittee 3 Chair, and Gregory Wolven assumes the position of Subcommittee 3 Secretary.

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

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	Keith Reese	AEIC	Georgia Power Company
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Trevor Bowmer		ATIS	Ericsson
Lawrence M. Slavin		ATIS	Outside Plant Consulting Services, Inc.
	Dennis Henry	ATIS	Ericsson
Danna Liebhaber		BPA	Bonneville Power Administration
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Alan Kuipers		EEI	Consumers Energy
Jeffrey Steiner		EEI	National Grid
Barrett Thomas		EEI	American Electric Power
	Frank Tucker	EEI	American Electric Power
	Jeffery Hall	EEI	Florida Power & Light
	David D'Hooge	EEI	Commonwealth Edison Co.
David Mullen		IBEW	International Brotherhood of Electrical Workers
Marc Candels		IEC	Candels Consulting
Jason Jenks		IEEE/IAS	Intermountain Rural Electric Assoc
	Jason Hoskins	IEEE/IAS	Ulteig Engineers
Douglas Proctor		IEEE/PES/T&D	Proctor Engineering Services
Darren Gill		NARUC	Pennsylvania Public Utility Commission
	Steve Mace	NCTA	National Cable & Telecommunications Association
Ernest H. Neubauer		NRECA	Southern Rivers Energy
	Robert Harris	NRECA	National Rural Electric Cooperative Association
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	Norris Nicholson	RUS	USDA, Rural Utilities Service
Joseph J. White		SEEX	BGE
	Branch Davis	SEEX	Entergy Corporation
	Donnie Trivitt	SEEX	OG&E Electric Services

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

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	Richard Aichinger	AISI	Valmont-Newmark
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Joseph Rempe		APPA	Tacoma Power
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	Jason Rollins	NAWPC	H. M. Rollins Company, Inc.
Jacob Joplin		NCEMC	Carteret-Craven Electric Cooperative
	Russell Guerry	NCEMC	Edgecombe-Martin County EMC
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	Steve Mace	NCTA	National Cable & Telecommunications Association
Robert Harris		NRECA	National Rural Electric Cooperative Association
Robert S. Fuller		NSPE	Texas-New Mexico Power Co.
	Grant Glaus	NSPE	Columbia Rural Electric Association
Otto J. Lynch		Power Line Systems	Power Line Systems, Inc.
Thomas Haire		REMC	Rutherford EMC
Wilson Johnson		RUS	USDA, Rural Utilities Service
	Norris Nicholson	RUS	USDA, Rural Utilities Service
Timothy Cooke		SCTE	Times Fiber Communications, Inc.
Frank Agnew		SEEX	Alabama Power
Wade Shultz		SEEX	Alabama Power Company
	David West	SEEX	Duke Power Company

NESC Subcommittee 5 *(continued)*

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	John Trentham	SEEX	Southern Company
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	Joseph Procopio	Consultant	TRC Companies
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	Stephen Cantrell	TVA	Tennessee Valley Authority
Jim Fixsen		TWC	Bell Lumber & Pole
	Bob Reisdorf	TWC	Laminated Wood Systems, Inc.
Douglas Hanson		WAPA	Western Area Power Administration, U.S. Department of Energy

NESC Subcommittee 7—Underground Lines
Sections 30–39

Charles C. Bleakley, *Chair*
Lauren E. Gaunt, *Secretary*

Principle	*Alternate*	*Organization represented*	*Employer*
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Trevor Bowmer		ATIS	Ericsson
	Dennis Henry	ATIS	Ericsson
Lauren E. Gaunt		EEI	Eversource Energy
Donald Guinn		EEI	Progress Energy
William Eanes		EEI	Duke Energy
John C. Spence		EEI	Baltimore Gas & Electric Co.
	Jonathan Gonynor	EEI	National Grid
David Mullen		IBEW	International Brotherhood of Electrical Workers
Richard S. Vencus		IEEE	United Illuminating Company
Jorge Camacho		NARUC	Public Service Commission of the District of Columbia
	Steve Mace	NCTA	National Cable & Telecommunications Association
James R. Tomaseski		NECA	Wilson Construction Company Inc.
Robert Emgarten		NRECA	National Rural Electric Cooperative Association
	Robert D. Saint	NRECA	National Rural Electric Cooperative Association
David J. Marne		NSPE	Marne and Associates, Inc.
Trung Hiu		RUS	USDA, Rural Utilities Service
	Donald Junta	RUS	USDA, Rural Utilities Service
Timothy Cooke		SCTE	Times Fiber Communications, Inc.
Charles C. Bleakley		SEEX	Georgia Power Company, Consultant
Mickey B. Gunter		SEEX	Georgia Power Company, Consultant
	Keith Reese	SEEX	Georgia Power Company
	Lee Welch	SEEX	Southern Company

NESC Subcommittee 8—Work Rules
Sections 40–43

James R. Tomaseski, *Chair*
Samuel Stonerock, *Secretary*

Principle	*Alternate*	*Organization represented*	*Employer*
Bill McGough		AEIC	Alabama Power Company
	Bernie D. (Donnie) Bell	AEIC	Gulf Power Company
Brent McKinney		APPA	City Utilities of Springfield
	Kevin Dody	APPA	City Utilities of Springfield
Trevor Bowmer		ATIS	Ericsson
	Dennis Henry	ATIS	Ericsson
Michael Granata		EEI	Appalachian Power Company
Tommy Russell		EEI	Southwestern Electric Power Company
Samuel Stonerock		EEI	Southern California Edison Co.
	Patrick Geoffrey	EEI	PG&E
	Stephen Barnard	EEI	Dominion Virginia Power
	Thuy Nguyen	EEI	American Electric Power
David Mullen		IBEW	International Brotherhood of Electrical Workers
John Masarick		IEC	Independent Electrical Contractors
	James C. Tuggle	IEC	Malpaso Group Inc.
Lawrence Schweitzer		IEEE	The L. E. Myers Company
Thomas Verdecchio		IEEE	PSE&G (retired)
Stephen Poholski		NECA	Newkirk Electric
	James R. Tomaseski	NECA	PAR Electrical Contractors, Inc.
Mark Zavislan		NRECA	Ohio Rural Electric Cooperatives, Inc.
	Robert Harris	NRECA	National Rural Electric Cooperative Association
Steven Theis		NSC	PSE&G
Troy Little		NSPE	Brooks & Jackson, Inc.
	F. M. Brooks	NSPE	Brooks & Jackson, Inc.
Albert Smoak		NSPE	Southwestern Electric Power Company
Brian Erga		NWPPA	ESCI Inc.
David M. Wallis			Emeritus
Norris Nicholson		RUS	USDA, Rural Utilities Services
Charles Shaw		SEEX	Alabama Power Company
Bruce Gurley		SEEX	Duke Energy
	Keith Wallace	SEEX	Alabama Power Company
	Corey Ziegler	SEEX	Duke Energy
Charles W. Grose		Self	Consultant
Edward Hunt		WAPA	Western Area Power Administration, U.S. Department of Energy
	Patrick Nies	WAPA	Western Area Power Administration, U.S. Department of Energy

NESC Executive Subcommittee

Michael J. Hyland, *Chair*
James R. Tomaseski, *Vice Chair*

Name	*Organization*	*Employer*
Michael J. Hyland	APPA	American Public Power Association
Lawrence M. Slavin	ATIS	Outside Plant Consulting Services, Inc.
Leon Kempner	BPA	Bonneville Power Administration
Edward Harrel	EEI	Oncor Electric Delivery Company
Eric K. Engdahl (Alternate)	EEI	American Electric Power
Nelson G. Bingel, III	IEEE	Osmose Utilities Services, Inc.
James R. Tomaseski	NECA	National Electrical Contractors Association
Robert Harris	NRECA	National Rural Electric Cooperative Association

NESC Interpretations Subcommittee

Donald E. Hooper, *Chair*

Name	*Employer*	*Part*	*Section*
Charles C. Bleakley	Georgia Power Company	G	
D. J. Christofersen	CeCe	1	
Allen L. Clapp	PCU Training Center	G	
Alton L. Comans	Alabama Power Company	1	9
John Dagenhart	Dagenhart Consulting Services	G	
Eric K. Engdahl	American Electric Power	G	
Bruce Freimark	American Electric Power	2	
Charles W. Grose	Consultant	4	
Mickey B. Gunter	Engineering Consultant	G	
Donald E. Hooper	ES&C, Inc.	G	
Herman N. Johnson, Jr.	Pike Energy Solutions	G	
David J. Marne	Marne and Associates, Inc.	G	
Percy E. Pool	Verizon	3	9
Keith Reese	Georgia Power Company	G	
Ewell T. Robeson	Duke Energy	3	9
Wade Shultz	Alabama Power Company	G	
Lawrence M. Slavin	Outside Plant Consulting Services, Inc.	G	
Lanny L. Smith	Consultant	G	
James R. Tomaseski	PAR Electrical Contractors, Inc.	G	

Key:
G = General (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 2022 NESC revision cycle. See http://standards.ieee.org/about/nesc/general.html 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 http://standards.ieee.org/about/nesc/index.html.

   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 2022 NESC is as follows:

15 July 2018	Final date to receive change proposals from the public for revision of the 2017 Edition of the NESC, preparatory to the publication of a 2022 Edition.
September–October 2018	NESC Subcommittees consider change proposals to the NESC and prepare their recommendations.
1 September 2019	Preprint of the change proposals for incorporation into the 2022 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.
1 May 2020	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.
September–October 2020	Period for NESC Subcommittee Working Groups and NESC Subcommittees to reconsider all recommendations concerning the proposed amendments and prepare a final report.
15 January 2021	Proposed revision of the NESC, Accredited Standards Committee C2, submitted to NESC Committee for letter ballot and to ANSI for concurrent public review.
15 May 2021	NESC Committee approved revisions of the NESC submitted to ANSI for recognition as an ANSI standard.
1 August 2021	Publication of the 2022 Edition of the NESC.

Working Group assignments and activities for the 2022 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 3, Electric Supply Stations (SC3)

See NESC Subcommittee 8, WG 8.15 (following).

Subcommittee 4, Overhead Lines—Clearances (SC4)

Working Group 4.3

SC4 formed WG 4.3 to address all rules and tables for Rule 232 water crossing and to clarify the definition of "bodies and levels of water" (e.g., high water mark, flood level).

Chair: Douglas Proctor

Members: David D'Hooge, Alan Kuipers, Joseph L. White

Working Group 4.4

SC4 formed WG 4.4 to review the clearances between energized parts and down guys. Table 235-6, Row 2, a, b, c.

Chair: Branch Davis

Members: David D'Hooge, Mickey B. Gunter, Jeffery Hall, Douglas Proctor, Jeffrey Steiner

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

Working Group 5.1

Coordination of loading calculations in Sections 24, 25, and 26

WG 5.1/Task Force 5.1.3: Inconsistencies, clarifications, and modifications of Sections 24, 25, and 26.

WG 5.1/Task Force 5.1.5: Review/update, as required, the extreme wind methodology.

WG 5.1/Task Force 5.1.11: Eliminate the conductor constant (k factor).

Subcommittee 8—Work Rules (SC8)

Working Group 8.14

Work Group 8.14 was formed to address possible gaps in Part 4 rules applicable in generating stations.

Working Group 8.15

SC8 formed a working group to address remaining concerns regarding CP4176 and Rule 420G, Liquid-cell batteries. New working group may include SC3 members.

Contents

Letter symbols for units

This Code uses standard symbols for units. They have the following meanings:

A	ampere
C	degree Celsius
ft	foot
ft^2	square foot
ft^3	cubic foot
F	degree Fahrenheit
g	gram
Hz	hertz
h	hour
in	inch
in^2	square inch
k	kilo (10^3)
kg	kilogram
kPa	kilopascal
km^2	square kilometer
kV	kilovolt (1000 V)
kVA	kilovoltampere
kW	kilowatt
m	meter
m^2	square meter
m^3	cubic meter
m	milli (10^{-3})
mA	milliampere
mi	mile (international)
mm	millimeter
min	minute (time)
N	newton
Pa	pascal
lb	pound
s	second (time)
V	volt
W	watt

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 and utility facilities 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:

1. The public,
2. Utility workers (employees and contractors), and
3. Utility facilities.

C. This Code is not intended as a design specification or as an instruction manual.

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, 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 installed under the exclusive control of utilities (including their authorized contractors or other qualified persons).
5. Utility facilities and functions on the line side of the service point supplied by underground or overhead conductors installed and/or maintained under exclusive control of utilities located on public or private property in accordance with legally established easements or rights-of-way, contracts, other agreements (written or by conditions of service), or as authorized by a regulating or controlling body.

   NOTE: Agreements to locate utility facilities on property may be required where easements are either (a) not obtainable (such as locating utility facilities on existing rights-of-way of railroads or other entities, military bases, federal lands, Native American reservations, lands controlled by a port authority, or other governmental agency), or (b) not necessary (such as locating facilities necessary for requested service to a site).
6. Wiring within a supply station or in an underground facility that is (a) installed in accordance with Part 1 or Part 3 of this Code and maintained under the exclusive control of utilities and (b) necessary for the operation of the supply station or underground facility.
7. Utility facilities installed, maintained, and controlled by utilities on surface or underground mine sites, including overhead or underground distribution systems providing service up to buildings or outdoor equipment locations on the line side of the service point.
8. Similar systems to those listed above that are under the exclusive control of qualified persons and authorized by a regulating or controlling body, including those associated with an industrial complex or utility interactive system.

B. Not covered

See Figure 011-1.

NESC rules do not cover:

1. Utilization equipment or premises wiring located beyond utility service points to buildings or outdoor installations, or
2. Underground mine wiring or installations in ships, railway rolling equipment, aircraft, or automotive equipment, or
3. Luminaires not installed or maintained under exclusive control by utilities, or
4. Industrial complex or utility interactive systems that are not controlled exclusively under utilities or qualified persons or are located on the premises wiring side of the service point.

   NOTE: The National Electrical Code® (NEC®) (NFPA 70®, 2011 Edition) covers utilization wiring requirements beyond the service point and luminaires that are not controlled exclusively by utilities.[1]

[1]Information on references can be found in Section 3.