IEEE SA STANDARDS ASSOCIATION

NESC

2023 NATIONAL ELECTRICAL SAFETY CODE® (NESC®)

C2-2023

IEEE

AVA Documents
Document Sharing Hub

Full document details: IEEE C2-2023

National Electrical Safety Code®

Secretariat
The Institute of Electrical and Electronics Engineers, Inc.

Approved 25 April 2022
American National Standards Institute

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

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2022 by
The Institute of Electrical and Electronics Engineers, Inc.

All rights reserved. Published 2022
Printed in the United States of America

National Electrical Safety Code and NESC are registered trademarks and service marks in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

The NESC logo is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

National Electrical Code, NEC, and NFPA 70 are registered trademarks in the U.S. Patent & Trademark Office, owned by the National Fire Protection Association.

ISBN 978-1-5044-8421-3

Public authorities who would like to request access to, or use of, this document can send a request to IEEE SA Intellectual Property Rights (https://standards.ieee.org/ipr/copyright-permissions-form/). No other party may reproduce in any form, in an electronic retrieval system or otherwise, any portion of this document,without the prior written permission of the publisher.

1 August 2022 STD25236

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Recognized as an American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review and users are cautioned to obtain the latest edition.

Authorization to photocopy portions of any individual standard for internal or personal use is granted by The Institute of Electrical and Electronics Engineers, Inc., provided that the appropriate fee is paid to Copyright Clearance Center. To arrange for payment of licensing fee, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; (978) 750-8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Important Notices and Disclaimers Concerning the NESC®

The National Electrical Safety Code® (NESC®) is made available for use subject to important notices and legal disclaimers.

Notice and Disclaimer of Liability Concerning the Use of the NESC

The NESC is developed through an accredited consensus development process, which brings together volunteers representing varied viewpoints and interests to achieve the final product. The NESC is developed by volunteers with scientific, academic, and industry-based expertise in technical working groups. Volunteers are not necessarily members of IEEE or IEEE SA, and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE makes no warranties or representations concerning its standards, and expressly disclaims all warranties, express or implied, concerning this standard, including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In addition, IEEE does not warrant or represent that the use of the material contained in its standards is free from patent infringement. IEEE standards documents are supplied "AS IS" and "WITH ALL FAULTS."

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity, nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE standard should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: THE NEED TO PROCURE SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE is the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with IEEE policies shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on this standard shall make it clear that the presenter's views should be

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

considered the personal views of that individual rather than the formal position of IEEE, IEEE SA, or the NESC. Any statements made by a volunteer may not represent the formal position of their employer(s) or affiliation(s).

Comments on standards

Comments for revision of NESC documents are welcome from any interested party, regardless of membership affiliation with IEEE, IEEE SA, or NESC during specific time periods during the current revision cycle. NESC Main Committee will consider interpretations to NESC documents at any point during the code cycle (https://standards.ieee.org/products-programs/nesc/products/#interp).

Suggestions for changes in documents should be submitted via the change proposal template consisting of the proposed change of text, together with appropriate supporting comments. Since NESC documents represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, NESC Subcommittee members will only consider text changed during the comment submittal period. Interpretation requests will be considered at any time, only if submitted via the interpretations request form to the NESC Secretariat (NESC-support@ieee.org). Any person who would like to participate in evaluating comments or revisions to the NESC documents is welcome to apply to join the relevant NESC Subcommittee. You can submit a resume and letter of intent to the NESC Secretariat for consideration by the NESC Executive Subcommittee.

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not constitute compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Data privacy

Users of IEEE Standards documents should evaluate the standards for considerations of data privacy and data ownership in the context of assessing and using the standards in compliance with applicable laws and regulations.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under US and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate licensing fees, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400; https://www.copyright.com/. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Documents
Document Sharing Hub
Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

Updating of NESC documents

The NESC completes a full review and revision of the Code every five years, following a predetermined schedule for comment submittal, review, preprint, and publication. The schedule can be found at https://standards.ieee.org/wp-content/uploads/2022/05/nesc-2028-schedule.pdf.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit IEEE Xplore or https://standards.ieee.org/about/contact/. For more information about the NESC standards development process, visit https://standards.ieee.org/products-programs/nesc/process/.

Errata

Users are encouraged to periodically check for errata. Errata, if any, for NESC documents can be accessed on the IEEE SA Website at https://standards.ieee.org/products-programs/nesc/process/errata/.

Patents

The NESC is developed in compliance with the ANSI Patent Policy (see Clause 3.1 of the ANSI Essential Requirements).

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Assurance Statement, then the statement is listed on the IEEE SA Website at https://standards.ieee.org/products-programs/nesc/process/. Assurance Statements indicate whether the Submitter is willing to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which an Assurance Statement has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of an Assurance Statement, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

IMPORTANT NOTICE

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. IEEE Standards development activities consider research and information presented to the standards development group in developing any safety recommendations. Other information about safety practices, changes in technology or technology implementation, or impact by peripheral systems also may be pertinent to safety considerations during implementation of the standard. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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

Documents
Document Sharing Hub
Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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.

Documents
Document Sharing Hub
Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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.

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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.
https://standards.ieee.org/about/contact/

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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.

In addition, the NESC Committee and the IEEE Standards Association are thankful to the following officers who already have left or who will be leaving their positions at the conclusion of the 2023 Code cycle:

— Robert Molde—Subcommittee 2 Chair
— James Houston—Subcommittee 3 Chair
— Gregory Wolven—Subcommittee 3 Secretary
— Joseph Rempe—Subcommittee 5 Chair
— Bruce Freimark—Subcommittee 5 Secretary

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

NESC Main Committee Membership

At the time this Code was approved, the NESC Main Committee had the following membership:

Nelson Bingel, *Chair*
Danna Liebhaber, *Vice Chair*
Jennifer Santulli, *Secretary*

Representing	*Principal*	*Alternate*	*Employer*	*Classification*
AAR	Robert Verhelle		HNTB Corporation	OU
AEIC	Swapan Dey		Eversource Energy	EPR
APPA	Alex Hofmann		American Public Power Association	EPU
APPA		Nathan Mitchell	APPA	EPU
APTA	Narayana Sundaram		American Public Transit Association	GEN
APTA		Nathan Leventon	American Public Transit Association	GEN
ATIS	Lawrence M. Slavin		Outside Plant Consulting Services, Inc.	CPR
ATIS		Trevor Bowmer	Bunya Telecom Consulting LLC	CPR
BPA	Danna Liebhaber		Bonneville Power Administration	EPU
EEI	Eric K. Engdahl		American Electric Power	EPR
EEI		Lauren E. Gaunt	Avangrid	EPR
Federated Rural Elec	Chad Knutson		Federated Rural Electric Insurance Exchange	I
Federated Rural Elec		Jason Springs	Federated Rural Electric Insurance Exchange	I
IBEW	George Arhos		IBEW	ECL
IBEW		David Mullen	IBEW	ECL
IEC	David Hittinger		Independent Electrical Contractors, Inc.	CEC
IEC		Jason Todd	Independent Electrical Contractors, Inc.	CEE
IEEE	Otto Lynch		Power Line Systems	PS
IEEE/IAS		Charles Ward, Jr.	Central Virginia Electric Cooperative	PS
IMSA	Jeffrey G. Knight		IMSA Educational Foundation	OU
NARUC	Mark Rettmann		Oregon Public Utility Commission	CG
NECA	Stephen Poholski		Newkirk Electric	CEE
NECA		Michael Johnston	NECA	CEE
NECA		Mike Cannady	NECA	GEN/OU
NEMA	Paul Orr		NEMA	M
NRECA	Robert Harris		National Rural Electric Cooperative Association (NRECA)	EPU
NSC	Kenneth Schriner		Western Area Power Administration	PS
NSPE	Robert Fuller		Texas-New Mexico Power Co.	PS
Past Chair	Michael Hyland		American Public Power Association	EPU
RUS	Donald Junta		USDA	GOV
SCTE	Timothy Cooke		Amphenol Broadband Solutions	CPS
SEIA	Lee Kraemer		First Solar	EPR
SEIA		Greg Ball	Tesla	EPR
TVA	Stephen Cantrell		TVA Transmission	EPU

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

Key to Main Committee and Subcommittee membership lists

Organizations represented

AAR—Association of American Railroads
ACMA—American Composites Manufacturers Association
AEIC—Association of Edison Illuminating Companies
AISI—American Iron and Steel Institute
APPA—American Public Power Association
APTA—American Public Transit Association
ASCE—American Society of Civil Engineers
ATIS—Alliance for Telecommunications Industry Solutions
BPA—Bonneville Power Admin., U. S. Dept. of Energy
EEI—Edison Electric Institute
Federated Rural Elec—Federated Rural Electric Insurance Exchange
IBEW—International Brotherhood of Electrical Workers
IEC—Independent Electrical Contractors
IEEE—The 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
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
NWPPA—Northwest Public Power Association
REMC—Rutherford EMC
RUS—Rural Utilities Services, U. S. Dept. of Agriculture
SCTE—Society of Cable Telecommunications Engineers
SEEX—Southeastern Electric Exchange
SEIA—Solar Energy Industries Association
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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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.

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Documents
Document Sharing Hub
Full document details: IEEE C2-2023

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).

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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.

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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.

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

Contents

Section 1. Introduction to the National Electrical Safety Code® ... 1
010. Purpose ... 1
011. Scope ... 1
012. General rules ... 3
013. Application ... 4
014. Waiver for emergency and temporary installations ... 5
015. Intent ... 5
016. Effective date ... 6
017. Units of measure ... 6
018. Method of calculation ... 6

Section 2. Definitions of special terms ... 7

Section 3. References ... 20

Section 9. Grounding methods for electric supply and communications facilities ... 23
090. Purpose ... 23
091. Scope ... 23
092. Point of connection of grounding conductor ... 23
093. Grounding conductor and means of connection ... 26
094. Grounding electrodes ... 29
095. Method of connection to electrode ... 32
096. Ground resistance requirements ... 33
097. Separation of grounding conductors ... 34
098. Number 098 not used in this edition. ... 35
099. Additional requirements for grounding and bonding of communication apparatus ... 35

Part 1. Safety Rules for the Installation and Maintenance of Electric Supply Stations and Equipment

Section 10. Purpose and scope of rules ... 37
100. Purpose ... 37
101. Scope ... 37
102. Application of rules ... 37
103. Referenced sections ... 37

Section 11. Protective arrangements in electric supply stations ... 38
110. General requirements ... 38
111. Illumination ... 41
112. Floors, floor openings, passageways, and stairs ... 43
113. Exits ... 43

Section 12. Installation and maintenance of equipment ... 45
120. General requirements ... 45
121. Inspections ... 45
122. Guarding shaft ends, pulleys, belts, and suddenly moving parts ... 45
123. Protective grounding ... 45
124. Guarding live parts ... 46
125. Working space about electric equipment ... 53
126. Equipment for work on energized parts ... 54
127. Classified locations ... 54

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

128. Identification ... 57
129. Mobile hydrogen equipment ... 57

Section 13. Rotating equipment ... 58
130. Speed control and stopping devices ... 58
131. Motor control ... 58
132. Number 132 not used in this edition. ... 59
133. Short-circuit protection ... 59

Section 14. Storage batteries ... 60
140. General ... 60
141. Switchgear and plant batteries ... 61
142. Grid storage batteries ... 61

Section 15. Transformers and regulators ... 62
150. Current-transformer secondary circuits protection when exceeding 600 V ... 62
151. Grounding secondary circuits of instrument transformers ... 62
152. Location and arrangement of power transformers and regulators ... 62
153. Short-circuit protection of power transformers ... 63

Section 16. Conductors ... 64
160. Application ... 64
161. Electrical protection ... 64
162. Mechanical protection and support ... 64
163. Isolation ... 64
164. Conductor terminations ... 64

Section 17. Circuit breakers, reclosers, switches, fuses, and other equipment ... 66
170. General ... 66
171. Arrangement ... 66
172. Application ... 66
173. Circuit breakers, reclosers, and switches containing oil ... 66
174. Switches and disconnecting devices ... 66
175. Disconnection of fuses ... 67
176. Open gaps and breaks ... 67
177. Arresters ... 67

Section 18. Switchgear and metal-enclosed bus ... 68
180. Switchgear assemblies ... 68
181. Metal-enclosed bus ... 69

Section 19. Photovoltaic generating stations ... 71

Part 2. Safety Rules for the Installation and Maintenance of Overhead Electric Supply and Communication Lines

Section 20. Purpose, scope, and application of rules ... 72
200. Purpose ... 72
201. Scope ... 72
202. Application of rules ... 72

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Section 21. General requirements ... 73
210. Referenced sections ... 73
211. Number 211 not used in this edition. ... 73
212. Induced voltages ... 73
213. Accessibility ... 73
214. Inspection and tests of lines and equipment ... 73
215. Grounding and bonding ... 74
216. Arrangement of switches ... 76
217. General ... 77
218. Vegetation management ... 79

Section 22. Relations between various classes of lines and equipment ... 80
220. Relative levels ... 80
221. Avoidance of conflict ... 81
222. Joint use of structures ... 82
223. Communications protective requirements ... 82
224. Communication circuits located within the supply space and supply circuits located within the communication space ... 82
225. Electric railway construction ... 84

Section 23. Clearances ... 86
230. General ... 86
231. Clearances of supporting structures from other objects ... 93
232. Vertical clearances of wires, conductors, cables, and equipment aboveground, roadway, rail, or water surfaces ... 94
233. Clearances between wires, conductors, and cables carried on different supporting structures ... 105
234. Clearance of wires, conductors, cables, and equipment from buildings, bridges, rail cars, swimming pools, supporting structures, and other installations ... 114
235. Clearance for wires, conductors, or cables carried on the same supporting structure ... 138
236. Climbing space ... 157
237. Working space ... 161
238. Clearances at the support between specified communications and supply facilities located on the same structure ... 162
239. Clearance of vertical and lateral facilities from other facilities and surfaces on the same supporting structure ... 167

Section 24. Grades of construction ... 173
240. General ... 173
241. Application of grades of construction to different situations ... 173
242. Grades of construction for conductors ... 174
243. Grades of construction for line supports ... 176

Section 25. Structural loadings for Grades B and C ... 178
250. General loading requirements and maps ... 178
251. Conductor loading ... 195
252. Loads on line supports ... 196
253. Load factors for structures, crossarms, support hardware, guys, foundations, and anchors ... 198

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Section 26. Strength requirements 200
260. General (see also Section 20) 200
261. Grades B and C construction 201
262. Number 262 not used in this edition. 210
263. Grade N construction 210
264. Guying and bracing 212

Section 27. Line insulation 214
270. Application of rule 214
271. Material and marking 214
272. Ratio of flashover to puncture voltage 214
273. Insulation level 214
274. Factory tests 215
275. Special insulator applications 215
276. Number 276 not used in this edition. 216
277. Mechanical strength of insulators 216
278. Aerial cable systems 217
279. Guy and span insulators 218
28. Section number 28 not used in this edition. 219
29. Section number 29 not used in this edition. 219

Part 3. Safety Rules for the Installation and Maintenance of Underground Electric Supply and Communication Lines

Section 30. Purpose, scope, and application of rules 220
300. Purpose 220
301. Scope 220
302. Application of rules 220

Section 31. General requirements applying to underground lines 221
310. Referenced sections 221
311. Installation and maintenance 221
312. Accessibility 221
313. Inspection and tests of lines and equipment 221
314. Grounding of circuits and equipment 222
315. Communications protective requirements 222
316. Induced voltage 223

Section 32. Underground conduit systems 224
320. Location 224
321. Excavation and backfill 225
322. Conduit, ducts, and joints 226
323. Manholes, handholes, and vaults 227

Section 33. Supply cable 231
330. General 231
331. Sheaths and jackets 231
332. Shielding 231
333. Cable accessories and joints 231

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Section 34. Cable in underground structures 233
340. General 233
341. Installation 233
342. Grounding and bonding 234
343. Number not used in this edition. 235
344. Communication cables containing special supply circuits 235

Section 35. Direct-buried cable and cable in duct not part of a conduit system 236
350. General 236
351. Location and routing 237
352. Installation 238
353. Deliberate separations—Equal to or greater than 12 in (300 mm) from underground structures or other cables 240
354. Random separation—Separation less than 12 in (300 mm) from underground structures or other cables 240
355. Additional rules for duct not part of a conduit system 243

Section 36. Risers 244
360. General 244
361. Installation 244
362. Pole risers—Additional requirements 244
363. Pad-mounted installations 244

Section 37. Supply cable terminations 245
370. General 245
371. Support at terminations 245
372. Identification 245
373. Clearances in enclosures or vaults 245
374. Grounding 245

Section 38. Equipment 246
380. General 246
381. Design 246
382. Location in underground structures 247
383. Installation 247
384. Grounding and bonding 247
385. Identification 247

Section 39. Installation in tunnels 248
390. General 248
391. Environment 248

Part 4. Work Rules for the Operation of Electric Supply and Communications Lines and Equipment

Section 40. Purpose and scope 249
400. Purpose 249
401. Scope 249
402. Referenced sections 249

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Section 41. Supply and communications systems—Rules for employers 250
410. General requirements 250
411. Protective methods and devices 257

Section 42. General rules for employees 259
420. General 259
421. General operating routines 263
422. Overhead line operating procedures 264
423. Underground line operating procedures 264

Section 43. Additional rules for communications employees 267
430. General 267
431. Approach to energized conductors or parts 267
432. Joint-use structures 269
433. Attendant on surface at joint-use manhole 269
434. Sheath continuity 269

Section 44. Additional rules for supply employees 270
440. General 270
441. Energized conductors or parts 270
442. Switching control procedures 280
443. Work on energized lines and equipment 281
444. De-energizing equipment or lines to protect employees 283
445. Protective grounds 285
446. Live work 286
447. Protection against arcing and other damage while installing and maintaining insulators and conductors 287

Appendix A—Uniform system of clearances adopted in the 1990 Edition 288

Appendix B—Uniform clearance calculations for conductors under ice and wind conditions adopted in the 2007 Edition 293

Appendix C—Example applications for Rule 250C, Table 250-2, Table 250-3(a), and Table 250-3(b) 296

Appendix D—Practical Approaches to Reducing Transient Overvoltages Factors for Live Work 311

Appendix E—Bibliography 316

Annex 1—Metric tables and figures 321

Annex 2—Letter symbols for units 357

Index 359

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Figures

Figure 011-1—Service point—General illustration of what is covered and not covered by the NESC 3
Figure D-1—Communication space 8
Figure D-2—Sag 14
Figure D-3—Wind span 16
Figure D-4—Weight span 16
Figure D-5—Supply space 17
Figure 110-1—Safety clearance to electric supply station fences 40
Figure 110-2—Safety clearance to electric supply station impenetrable fence 40
Figure 124-1—Clearance from live parts 48
Figure 124-2—Railings or fences used as guards 48
Figure 124-3—Taut-string measurement of vertical clearance to energized parts of equipment or behind barriers 49
Figure 230-1—Clearance zone map of the United States 91
Figure 233-1—Use of clearance envelope and conductor movement envelopes to determine applicable clearance 109
Figure 233-2—Conductor movement envelope 110
Figure 233-3—Clearance envelope 111
Figure 234-1(a)—Clearance diagram for building 122
Figure 234-1(b)—Clearance diagram for other structures 123
Figure 234-1(c)—Transitional clearance when H is greater than V 123
Figure 234-2(a)—Clearance of service drop terminating on support mast attached to side of building 124
Figure 234-2(b)—Clearance of service drop terminating on support mast attached to decks or balconies 124
Figure 234-2(c)—Clearances of service drop terminating on support mast 125
Figure 234-3(a)—Swimming pool clearances 125
Figure 234-3(b)—Aboveground swimming pool with deck 126
Figure 234-3(c)—Aboveground swimming pool without deck. Required clearance is maintained aboveground 126
Figure 234-4(a)—Clearance envelope for grain bins filled by permanently installed augers, conveyors, or elevators 127
Figure 234-4(b)—Clearance envelope for grain bins filled by portable augers, conveyors, or elevators 128
Figure 234-5—Rail car clearances 129
Figure 235-1—Clearance diagram for an energized wire, conductor, or cable 147
Figure 236-1—Rule 236G, EXCEPTION 3 159
Figure 237-1—Obstruction of working space by buckarm 162
Figure 250-1—General loading map of United States with respect to loading of overhead lines 181
Figure 250-2(a)—Grade B, 100 year Mean Recurrence Interval (MRI) 3 s gust wind speed map in mph (m/s) at 33 ft (10 m) aboveground 182
Figure 250-2(b)—Grade C, 50 year Mean Recurrence Interval (MRI) 3 s gust wind speed map in mph (m/s) at 33 ft (10 m) aboveground 184
Figure 250-3(a)—Uniform ice thickness with concurrent wind 186
Figure 250-3(b)—Uniform ice thickness with concurrent wind 187
Figure 250-3(c)—Uniform ice thickness with concurrent wind 188
Figure 250-3(d)—Uniform ice thickness with concurrent wind 188
Figure 250-3(e)—Uniform ice thickness with concurrent wind 189

Copyright © 2022 IEEE. All rights reserved.
Documents
Document Sharing Hub
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

Figure 250-3(f)—Uniform ice thickness with concurrent wind 190
Figure 279-1—Insulator used for BIL insulation 219
Figure 323-1—Roadway vehicle load 229
Figure 323-2—Wheel load area 230
Figure 350-1—Symbols for identification of buried cables 237
Figure A-1—Clearance at maximum sag 292

Annex 1 (metric)

Figure 233-2—Conductor movement envelope 332

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Tables

Table 110-1—Values for use with Figure 110-1 41
Table 111-1—Illumination levels 42
Table 124-1—Clearances from live parts—PART A—Low, medium, and high voltages 50
Table 124-1—Clearances from live parts—PART B—Extra-high voltages (switching surge factors) 51
Table 124-1—Clearances from live parts—PART C—Extra-high voltages (BIL factors) 52
Table 124-1—Clearances from live parts—PART D—High-voltage direct current 52
Table 125-1—Working space 54
Table 230-1—Ice thickness for purposes of calculating clearances 92
Table 230-2—Ice, wind pressures, temperatures, and additive constants for purposes of calculating final inelastic deformation 92
Table 232-1—Vertical clearance of wires, conductors, and cables above ground, roadway, rail, or water surfaces 97
Table 232-2—Vertical clearance of equipment cases, support arms, platforms, braces and unguarded rigid live parts above ground, roadway, or water surfaces 101
Table 232-3—Reference heights 104
Table 232-4—Electrical component of clearance in Rule 232D3a 105
Table 233-1—Vertical clearance between wires, conductors, and cables carried on different supporting structures 112
Table 233-2—Clearance between supply wires, conductors, and cables in Rule 233A and 233C3b(1) 113
Table 233-3—Reference heights 114
Table 234-1—Clearance of wires, conductors, cables, and unguarded rigid live parts adjacent but not attached to buildings and other installations except bridges 130
Table 234-2—Clearance of wires, conductors, cables, and unguarded rigid live parts from bridges 133
Table 234-3—Clearance of wires, conductors, cables, or unguarded rigid live parts over or near swimming pools 134
Table 234-4—Electrical component of clearance of buildings, bridges, and other installations 135
Table 234-5—Reference distances 136
Table 234-6—Clearance over roof not readily accessible 136
Table 234-7—Wind clearance values 137
Table 235-1—Horizontal clearance between wires, conductors, or cables at supports 148
Table 235-2—Horizontal clearances between line conductors smaller than AWG No. 2 at supports, based on sags 149
Table 235-3—Horizontal clearances between line conductors AWG No. 2 or larger at supports, based on sags 150
Table 235-4—Electrical clearances in Rule 235B3a(1) 151
Table 235-5—Vertical clearance between conductors at supports 152
Table 235-6—Clearance in any direction from line conductors at or near a support to supports, and to vertical or lateral conductors, service drops, and span or guy wires attached to the same supporting structure 153
Table 235-7—Clearance in any direction from line conductors to supports 155
Table 235-8—Vertical spacing between conductors supported on vertical racks or separate brackets 156
Table 236-1— Horizontal clearance between conductors bounding the climbing space 160

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Table 238-1—Vertical clearance between supply conductors and communications equipment, between communication conductors and supply equipment, and between supply and communications equipment 164
Table 238-2—Vertical clearance of span wires and brackets from communication lines and equipment 165
Table 238-3—Clearance in the supply space from antennas and equipment cases that support or are adjacent to an antenna to line conductors attached to the same supporting structure 166
Table 239-1—Clearance of open vertical and lateral conductors 172
Table 239-2—Clearance between open vertical conductors and pole surface 172
Table 242-1— Grades of construction for conductors and cables alone, at crossing, ... 175
Table 250-1—Ice, wind pressures, and temperatures 191
Table 250-2—Velocity pressure exposure coefficient k_z 192
Table 250-3(a)—Structure Gust Response Factor (G_{RF}) 193
Table 250-3(b)—Wire Gust Response Factor (G_{RF}) up to 250 ft (76 m) average height above ground or water level of all wire attachment points to the structure 194
Table 250-4—Wind speed conversions to pressure—To be used only with the extreme ice with concurrent wind loading of Rule 250D and Figure 250-3. 194
Table 251-1—Temperatures and constants 196
Table 253-1—Load factors for structures,1 crossarms, support hardware, guys, foundations, and anchors to be used with the strength factors of Table 261-1 199
Table 261-1—Strength factors for structures,1 crossarms, braces, support hardware, guys, foundations, and anchors 209
Table 261-2—Dimensions of crossarm cross section of select Southern Pine and Douglas Fir 210
Table 263-1—Sizes for Grade N supply line conductors 211
Table 263-2—Sizes of service drops of 750 V or less 212
Table 273-1—Insulation level requirements 215
Table 277-1—Allowed percentages of strength ratings 216
Table 341-1—Clearance between supply and communications facilities in joint-use manholes and vaults 234
Table 352-1—Supply cable, conductor, or duct burial depth 239
Table 410-1—Clothing and clothing systems (cal/cm2) for voltages 50 V to 600 V (ac) 252
Table 410-2—Clothing and clothing systems—voltage, fault current, and maximum clearing time for voltages 1.1 kV to 46 kV ac 253
Table 410-3—Live-line tool work clothing and clothing systems—voltage, fault current, and maximum clearing time for voltages 46.1 kV to 800 kV ac 254
Table 410-4—Clothing and clothing systems—voltage, fault current, and maximum clearing time for medium voltage 1 kV to 36 kV enclosed equipment 256
Table 431-1—Communication work minimum approach distances 268
Table 441-1—AC live work minimum approach distance 274
Table 441-2— AC live work minimum approach distances for altitudes less than 3000 ft above sea level, where T has been determined according to Rule 441A4 275
Table 441-3—AC live work minimum approach distances for altitudes less than 3000 ft above sea level, where T has been determined according to Rule 441A4 276
Table 441-4—AC live work minimum approach distances for altitudes less than 3000 ft above sea level, where T has been determined according to Rule 441A4 277
Table 441-5—DC live work minimum approach distance 278
Table 441-6—Altitude correction factor 279
Table 441-7—Maximum use voltage for rubber insulating equipment 279

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Table 444-1—Minimum clearances for open air gaps 285
Table A-1 289
Table A-2(a)—Reference components of Rule 232 290
Table A-2(b)—Reference components of Rule 234 291

Annex 1 (metric)

Table 124-1—Clearances from live parts—PART A—Low, medium, and high voltages 321
Table 124-1—Clearances from live parts—PART B—Extra-high voltages (switching surge factors)..... 322
Table 124-1—Clearances from live parts—PART C—Extra-high voltages (BIL factors)..... 323
Table 124-1—Clearances from live parts—PART D—High-voltage direct current 323
Table 232-1—Vertical *c*learance of wires, conductors, and cables above ground, roadway, rail, or water surfaces 325
Table 232-2—Vertical clearance of equipment cases, support arms, platforms, braces and unguarded rigid live parts above ground, roadway, or water surfaces 329
Table 233-1—Vertical clearance between wires, conductors, and cables carried on different supporting structures..... 333
Table 233-2—Clearance between supply wires, conductors, and cables in Rules 233A and 233C3b(1) 334
Table 234-1—Clearance of wires, conductors, cables, and unguarded rigid live parts adjacent but not attached to buildings and other installations except bridges 336
Table 234-2—Clearance of wires, conductors, cables, and unguarded rigid live parts from bridges..... 339
Table 234-3—Clearance of wires, conductors, cables, or unguarded rigid live parts over or near swimming pools 341
Table 234-6—Clearance over roof not readily accessible..... 342
Table 235-2—Horizontal clearances between line conductors smaller than AWG No. 2 at supports, based on sags 343
Table 235-3—Horizontal clearances between line conductors AWG No. 2 or larger at supports, based on sags 344
Table 235-5—Vertical clearance between conductors at supports..... 345
Table 235-6—Clearance in any direction from line conductors at or near a support to supports, and to vertical or lateral conductors, service drops, and span or guy wires attached to the same supporting structure 346
Table 238-3—Clearance in the supply space from antennas and equipment cases that support or are adjacent to an antenna to line conductors attached to the same supporting structure..... 348
Table 239-1—Clearance of open vertical and lateral conductors..... 349
Table 239-2—Clearance between open vertical conductors and pole surface 349
Table 250-3(a)—Structure Gust Response Factor (G_{RF}) 350
Table 250-3(b)—Wire Gust Response Factor (G_{RF}) up to 76 m average height above ground or water level of all wire attachment points to the structure 351
Table 431-1—Communication work minimum approach distances 352
Table 441-2—AC live work minimum approach distances for altitudes less than 900 m above sea level, where T has been determined according to Rule 441A4 353
Table 441-3— AC live work minimum approach distances for altitudes less than 900 m above sea level, where T has been determined according to Rule 441A4 354
Table 441-4— AC live work minimum approach distances for altitudes less than 900 m above sea level, where T has been determined according to Rule 441A4 355
Table A-2(a)—Reference components of Rule 232 356

Copyright © 2022 IEEE. All rights reserved.
Documents
Document Sharing Hub
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

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

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

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 maintained and/or installed 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®) 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.

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

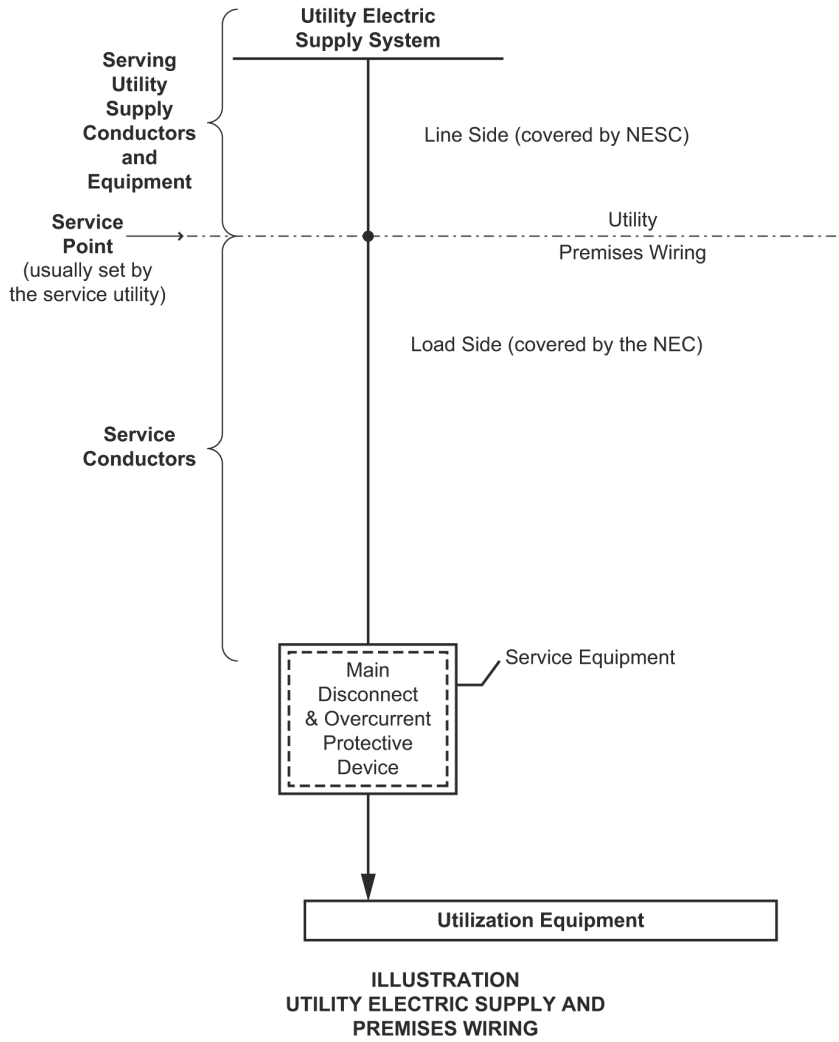

Figure 011-1—Service point—General illustration of what is covered and not covered by the NESC

012. General rules

A. All electric supply and communication lines and equipment shall be designed, constructed, operated, and maintained to meet the requirements of these rules.

B. The utilities, authorized contractors, or other entities, as applicable, performing design, construction, operation, or maintenance tasks for electric supply or communication lines or equipment covered by this Code shall be responsible for meeting applicable requirements.

C. For all particulars not specified, but within the scope of these rules, as stated in Rule 011A, design, construction, operation, and maintenance should be done in accordance with accepted good practice for the given local conditions known at the time by those responsible for the communication or supply lines and equipment.

Copyright © 2022 IEEE. All rights reserved.
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

013. Application

A. New installations and extensions

1. These rules shall apply to all new installations and extensions, except that they may be waived or modified by the administrative authority. When so waived or modified, safety shall be provided in other ways.

   EXAMPLE: Alternative working methods, such as the use of barricades, guards, or other electrical protective equipment, may be implemented along with appropriate alternative working clearances as a means of providing safety when working near energized conductors.

2. Types of construction and methods of installation other than those specified in the rules may be used experimentally to obtain information if:

   a. Qualified supervision is provided,

   b. Equivalent safety is provided, and

   c. On joint-use facilities, all affected joint users are notified in a timely manner.

B. Existing installations

1. Where an existing installation meets or is altered to meet the rules in this edition, such installation is not required to comply with any previous edition.

2. Existing installations, including maintenance replacements that currently comply with prior editions of the Code need not be modified to comply with the rules in this edition.

   When an existing installation is brought into compliance with a subsequent edition, earlier editions no longer apply.

   When a supporting structure is replaced due to maintenance, the resulting supporting structure shall be not less than the required strength and an appropriate height of the supporting structure being replaced.

   EXCEPTION: When a structure is replaced, the current requirements of Rule 238C shall be met, if applicable.

   NOTE: Maintenance replacements include, but are not limited to, deterioration, actions of others, or weather related events.

3. Where conductors or equipment are added, altered, or replaced on an existing structure, the structure or the facilities on the structure need not be modified or replaced if the resulting installation will be in compliance with either:

   a. The rules that were in effect at the time of the original installation, or

   b. The rules in effect in a subsequent edition to which the installation has been previously brought into compliance.

   If the resulting installation will not be in compliance with either Rule 013B3a or 013B3b and the structure has to be modified or replaced, the new installation shall meet the rules in this edition.

   When an existing installation is brought into compliance with a subsequent edition, earlier editions no longer apply.

4. For structures that currently do not comply with Rule 013B3, if adding a new item, or replacing or rearranging existing items would not in itself, either (1) create a structural, clearance, or grounding non-conformance, or (2) worsen an existing non-conformance, then the addition, replacement, or alteration may be performed prior to correcting existing non-compliance items. For existing non-compliance items, see Rules 214A4 and A5.

EXCEPTION: For safety reasons, the administrative authority may require compliance with the rules in this edition.

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

C. Inspection and work rules

Inspection rules and work rules in the current edition of the NESC shall apply to inspection of or work on all new and existing installations.

014. Waiver for emergency and temporary installations

A. General

The person responsible for an installation may modify or waive rules in the case of emergency or temporary installations.

B. Emergency installations

1. The clearances required in Section 23 may be decreased for emergency installations. See Rule 230A.
2. The burial depth requirements in Part 3 may be waived for the duration of the emergency. See Rule 311C.
3. The strength of material and construction for emergency installations shall be not less than that required for Grade N construction. See Rule 263.
4. Emergency installations shall be removed, replaced, or relocated, as desired, as soon as practical.

C. Temporary installations

When an installation is for temporary service, or where facilities are temporarily relocated or reconfigured to facilitate other work, the resulting installation shall meet the requirements for non-temporary installation. Additionally, for overhead installations, the strength of material and construction shall be not less than that required for Grade N construction. See Rule 263.

EXCEPTION: Where conditions, such as but not limited to frozen ground, do not permit cable to meet the burial depth requirements of Rule 352D2, cable for temporary underground installations may be laid on grade provided the requirements of Rule 311C and Rule 014B4 are met.

015. Intent

A. The word *shall* indicates provisions that are mandatory.

B. The word *should* indicates provisions that are normally and generally practical for the specified conditions. However, where the word "should" is used, it is recognized that, in certain instances, additional local conditions not specified herein may make these provisions impractical. When this occurs, the difference in conditions shall be appropriately recognized and Rule 012 shall be met.

C. Footnotes to a table have the same force and effect that is required or allowed by the rule that specifies the use of the table.

D. The word *"EXCEPTION"* indicates a specified option that may be substituted for one or more of the requirements stated in the rule or table, at the option of the utility. *EXCEPTIONS* to a rule have the same force and effect that is required or allowed by the rule to which the *EXCEPTION* applies.

NOTE: EXCEPTIONS recognize alternatives to generally applied requirements that are safe under the specified conditions. In some cases, an *EXCEPTION* may merely be a less frequently used safe option that may be preferable under the particular constraints of the site or work.

E. The word *"RECOMMENDATION"* indicates provisions considered desirable, but that are not intended to be mandatory.

F. The word *"NOTE"* or the word *"EXAMPLE"* used in a rule indicates material provided for information or illustrative purposes only. *NOTES* and *EXAMPLES* are not mandatory and are not considered to be a part of Code requirements.

G. A *RECOMMENDATION, EXCEPTION,* or *NOTE* applies to all text in that rule above its location that is indented to the same level.

Copyright © 2022 IEEE. All rights reserved.

Documents Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

016. Effective date

This edition may be used at any time on or after the publication date. Additionally, this edition shall become effective no later than the first day of the month after 180 days have elapsed following its publication date for application to new installations and extensions where both design and approval were started after the expiration of that period, unless otherwise stipulated by the administrative authority. *Example*: If the NESC is published on August 1, 2022, then it will become effective on February 1, 2023.

NOTE: A period of not less than 180 days is allowed for utilities and regulatory authorities to acquire copies of the new edition and to change regulations, internal standards, and procedures as may be required. There is neither an intention to require or imply that this edition be implemented before 180 days from the publication date, nor an intention to prohibit earlier implementation.

017. Units of measure

A. Numerical values in the requirements of this Code are stated in the customary inch-foot-pound system and in the metric system. In text, the customary inch-foot-pound value is shown first with the metric value (inside parentheses) following. Tables and figures with customary inch-foot-pound values are included in the body of the Code. Select tables and figures with their equivalent metric values are included in Annex 1. Each select table and figure in the body of the Code will include a footnote that references the associated metric table or figure in Annex 1. Some tables in the body of the Code may contain both customary and metric values.

The SI values and the customary inch-foot-pound values are not, nor are they intended to be, identical measures. The values shown in each system of measurement have been rounded to convenient numbers in order to simplify measurement and to minimize errors. The values shown in each system are functional equivalents for safety purposes.

The values required in this Code have been carefully developed and evaluated to ensure that the intended levels of safety are provided in both systems; neither is distinguishable from the other for safety purposes. The values specified in either system of measurement may be used, or the values of the two systems may be intermixed, as desired.

NOTE 1: Le Système Internationale d'Unités (The International System of Units [or SI] is the modern version of the metric system). For basic information and conversion factors, see IEEE/ASTM SI 10™-2016 [B35]. [2]

NOTE 2: It is recognized that many equivalent utility system components may be purchased in both SI and customary units.

B. Unless dimensions are specifically stated in this Code, the dimensions of physical items referenced in this Code, such as wires, are "nominal values" assigned for the purpose of convenient designation. Due to manufacturing limitations or other restraints, other standards may set tolerances, variations, or ranges for the dimensions of such items.

018. Method of calculation

Where calculations are required by these rules, the resultant value shall be rounded off to the nearest significant digit, unless otherwise specified in the applicable rule(s).

[2] The numbers in brackets correspond to those of the bibliography in Appendix E.

Copyright © 2022 IEEE. All rights reserved.

Documents Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

Section 2.
Definitions of special terms

The following definitions are for use with the National Electrical Safety Code. For other use, and for definitions not contained herein, the *IEEE Standards Dictionary Online* should be referenced. Standard dictionary definitions are intended to apply to all terms that are not specifically defined in the NESC or the *IEEE Standards Dictionary Online.*

NOTE: IEEE Standards Dictionary Online is available at: https://dictionary.ieee.org. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

administrative authority. The governmental authority exercising jurisdiction over application of this Code.

ampacity. The current-carrying capacity, expressed in amperes, of an electric conductor under stated thermal conditions.

anchorage. A secure point of attachment to which the fall protection system is connected.

area lighting. An electrical installation that provides lumens on public or private property.

NOTE: Area lighting installations under the exclusive control of a utility are covered by the NESC. All other area lighting installations are covered by the NEC.

authorized person. A person who has been authorized by the controlling utility or its designated representative to perform specified duties in, on, or in the vicinity of utility facilities, as applicable.

automatic. Self-acting, operating by its own mechanism when actuated by some impersonal influence—as, for example, a change in current strength; not manual; without personal intervention. Remote control that requires personal intervention is not automatic, but manual.

backfill (noun). Materials such as sand, crushed stone, or soil, that are placed to fill an excavation.

ballast section (railroads). The section of material, generally trap rock, that provides support under railroad tracks.

bonding. The electrical interconnecting of conductive parts, designed to maintain a common electrical potential.

cable. A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

cable jacket. A protective covering over the insulation, core, or sheath of a cable.

cable sheath. A conductive protective covering applied to cables.

NOTE: A cable sheath may consist of multiple layers, of which one or more is conductive.

circuit. A conductor or system of conductors through which an electric current is intended to flow.

circuit breaker. A switching device capable of making, carrying, and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal conditions such as those of short circuit.

clearance. The clear distance between two objects measured surface to surface, and usually filled with a gas such as air.

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

climbing. The vertical movement (ascending and descending) and horizontal movement to access or depart the worksite.

common use. Simultaneous use by two or more utilities of the same kind.

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

communication lines. *See:* **lines.**

communication space. The space on structures where communication facilities are separated from the supply space by the communication worker safety zone. See Figure D-1.

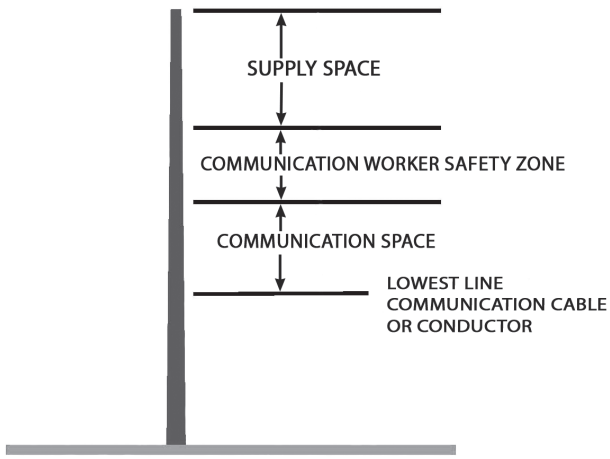

Figure D-1—Communication space

conductor. A material, usually in the form of a wire, cable, or bus bar, suitable for carrying an electric current.

1. **bare conductor.** A metallic conductor without a covering.
2. **bundled conductor.** An assembly of two or more conductors used as a single conductor and employing spacers to maintain a predetermined configuration. The individual conductors of this assembly are called subconductors.
3. **covered conductor.** A conductor covered with a dielectric having no rated insulating strength or having a rated insulating strength less than the voltage of the circuit in which the conductor is used.
4. **fiber-optic cable.** *See:* **fiber-optic cable—communication** or **fiber-optic cable—supply**.
5. **functional grounded pv dc conductor.** A dc conductor that is intentionally grounded through a fuse, circuit breaker, resistance device, non-isolated grounded ac circuit, or electronic means that is part of a ground-fault protection system.
6. **grounded conductor.** A conductor that is intentionally grounded, either solidly or through a noninterrupting current-limiting device.
7. **grounding conductor.** A conductor that is used to connect the equipment or the wiring system with a grounding electrode or electrodes.
8. **insulated conductor.** A conductor covered with a dielectric (other than air) having a rated insulating strength equal to or greater than the voltage of the circuit in which it is used.
9. **lateral conductor.** A wire or cable entirely supported on one structure and extending in a general horizontal, vertical, or diagonal direction to make connections to line conductors, service drops,

Copyright © 2022 IEEE. All rights reserved.
Documents Document Sharing Hub
Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.
Full document details: IEEE C2-2023

equipment, or other facilities supported on the same structure. Lateral conductors may be attached directly to the structure or supported away from the structure.

10. **line conductor.** (Overhead supply or communication lines.) A wire or cable intended to carry electric currents, extending along the route of the line, supported by poles, towers, or other structures, but not including vertical or lateral conductors.
11. **open conductor.** A type of electric supply or communication line construction in which the conductors are (a) bare, covered, or insulated, (b) do not have grounded shielding, and (c) are individually supported at the structure either directly or with insulators. *Syn:* **open wire.**
12. **vertical conductor.** Either a wire or cable riser attached to a pole or a vertical portion of a lateral conductor.

conductor shielding. An envelope that encloses the conductor of a cable and provides an equipotential surface in contact with the cable insulation.

conduit. A structure containing one or more ducts.

conduit system. Any combination of duct, conduit, conduits, manholes, handholes, and/or vaults joined to form an integrated whole.

current-carrying part. A conducting part intended to be connected in an electric circuit to a source of voltage. Non-current-carrying parts are those not intended to be so connected.

de-energized. Disconnected from all sources of electrical supply by open switches, disconnectors, jumpers, taps, or other means.

NOTE: De-energized conductors or equipment could be electrically charged or energized through various means, such as induction from energized circuits, portable generators, lightning, etc.

delivery point. The point at which one utility delivers energy or signals to another utility.

designated person. A qualified person designated to perform specific duties under the conditions existing. *Syn:* **designated employee.**

disconnecting or isolating switch. A mechanical switching device used for changing the connections in a circuit or for isolating a circuit or equipment from a source of power.

NOTE: It is required to carry normal load current continuously as well as abnormal or short-circuit current for short intervals, as specified. It is also required to open or close circuits either when negligible current is broken or made, or when no significant change in the voltage across the terminals of each of the switch poles occurs. *Syn:* **disconnector, isolator.**

duct. A single enclosed raceway for conductors or cable.

effective ground/effectively grounded: Bonded to an effectively grounded neutral conductor or to a grounding system designed to limit the likelihood of hazards to persons and having resistances to ground low enough to permit prompt operation of circuit protective devices.

effectively grounded neutral conductor: A neutral conductor of a multi-grounded system that is intentionally connected to the source transformer neutral directly or through an impedance to limit phase-to-ground fault current. The neutral conductor shall be of sufficient size to carry the available fault current and permit prompt operation of circuit protective devices.

NOTE: See Rule 096C.

Copyright © 2022 IEEE. All rights reserved.

Documents Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

electric supply equipment. Equipment that produces, modifies, regulates, controls, or safeguards a supply of electric energy for the electric power supply grid that is (1) transferred to supply lines, or (2) used to provide power and/or control for other electric supply equipment, or (3) used to provide power to the devices of another utility. *Syn:* **supply equipment.**

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

electric supply lines. *See:* **lines.**

electric supply station. Any building, room, or separate space within which electric supply equipment is located and the interior of which is accessible, as a rule, only to qualified persons. This includes generating stations and substations, including their associated generator, storage battery, transformer, and switchgear rooms or enclosures, but does not include facilities such as pad-mounted equipment and installations in manholes and vaults.

1. **generating station.** A plant wherein electric energy is produced by conversion from some other form of energy (e.g., fossil fuel, chemical, nuclear, solar, mechanical, wind, or hydraulic) by means of suitable apparatus. This includes all generating station auxiliaries and other associated equipment required for the operation of the plant. Not included are stations producing power exclusively for use with communications systems.
2. **substation.** An enclosed assemblage of equipment, e.g., switches, circuit breakers, buses, and transformers, under the control of qualified persons, through which electric energy is passed for the purpose of switching or modifying its characteristics to increase or decrease voltage or control frequency or other characteristics.
3. **switching station.** *See:* **substation.**

enclosed. Supply or communication facilities surrounded by case, cage, housing, fence, or wall(s) designed to protect persons and/or the contained facilities under normal conditions.

energized. Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity. *Syn:* **live.**

equipment. A general term including fittings, devices, appliances, fixtures, apparatus, and similar terms used as part of or in connection with an electric supply or communications system.

exclusive control. The installation, restricted access, operation (manual and/or automated), and maintenance of utility facilities by qualified and authorized persons.

exclusive control of utility. Where (a) energized facilities are separated from public access by a spatial or a physical barrier and accessible only to qualified personnel authorized by the serving utility, and (b) the utility is responsible for connection/disconnection of such facilities to/from energized sources of energy or signals.

exposed. Not isolated or guarded.

fall arrest system. The assemblage of equipment, such as a line-worker's body belt, aerial belt, or full body harness in conjunction with a connecting means, with or without an energy absorbing device, and an anchorage to limit the forces a worker can experience during a fall.

fall prevention system. A system, which may include a positioning device system, intended to prevent a worker from falling from an elevation.

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023

fall protection program. A program intended to protect workers from injury due to falls from elevations.

fall protection system (hardware). Consists of either a fall prevention system or a fall arrest system.

fiber-optic cable—communication. A fiber-optic cable meeting the requirements for a communication line and located in the communication space of overhead or underground facilities.

fiber-optic cable—supply (FOCS). A fiber-optic communication cable located in the supply space of overhead or underground facilities.

grounded. Connected to or in contact with earth or to a conductive body that extends the earth connection.

grounded effectively. *See:* **effective ground/effectively grounded**.

grounded system. A system of conductors in which at least one conductor or point is intentionally grounded, either solidly or through a noninterrupting current-limiting device.

guarded. Covered, fenced, enclosed, or otherwise protected, by means of suitable covers or casings, barrier rails or screens, mats or platforms, designed to limit the likelihood, under normal conditions, of dangerous approach or accidental contact by persons or objects.

> *NOTE:* Wires that are insulated but not otherwise protected are not normally considered to be guarded. See *EXCEPTIONS* under applicable rules.

handhole. An access opening, provided in equipment or in a below-the-surface enclosure in connection with underground lines, into which personnel reach but do not enter, for the purpose of installing, operating, or maintaining equipment or cable or both.

harness. A component with a design of straps that is fastened about the worker in a manner so as to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest, and shoulders with means for attaching it to other components and subsystems.

> *NOTE:* Wherever the word *harness* is used in this Code, it refers to *full body harness.*

in service. Lines and equipment are considered in service when connected to the system and intended to be capable of delivering energy or communication signals, regardless of whether electric loads or signaling apparatus are presently being served from such facilities.

insulated. Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

> *NOTE:* When any object is said to be *insulated,* it is understood to be insulated for the conditions to which it is normally subjected. Otherwise, it is, within the purpose of these rules, uninsulated.

insulation (as applied to cable). That which is relied upon to insulate the conductor from other conductors or conducting parts or from ground.

insulation shielding. An envelope that encloses the insulation of a cable and provides an equipotential surface in contact with the cable insulation.

insulator. Non-conductive device designed to provide mechanical connection and electrical separation between objects.

> *NOTE:* Examples include but are not limited to pin, post, or suspension insulators supporting conductors; electrical bus support insulators; and guy strain insulators.

isolated. Not readily accessible to persons unless special means for access are used.

Copyright © 2022 IEEE. All rights reserved.

Documents
Document Sharing Hub

Authorized licensed use limited to: Tsinghua University. Downloaded on February 26,2026 at 11:13:50 UTC from IEEE Xplore. Restrictions apply.

Full document details: IEEE C2-2023