Accredited Standards Committee C2-2002

National Electrical Safety Code®

Secretariat

Institute of Electrical and Electronics Engineers, Inc.

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Abstract: This standard covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of 1) conductors and equipment in electric supply stations, and 2) overhead and underground electric supply and communication lines. It also includes work rules for the construction, maintenance, and operation of electric supply and communication lines and equipment.

The standard is applicable to the systems and equipment operated by utilities, or similar systems and equipment, of an industrial establishment or complex under the control of qualified persons.

This standard consists of the introduction, definitions, grounding rules, list of referenced and bibliographic documents, and Parts 1, 2, 3, and 4 of the 2002 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.
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Foreword

(This foreword is not a part of Accredited Standards Committee C2-2002, National Electrical Safety Code®.)

This publication consists of the parts of the National Electrical Safety Code® (NESC®) currently in effect. The former practice of designating parts by editions has not been practical for some time. In the 1977 Edition, Parts 1 and 4 were 6th Editions; Part 2 was a 7th Edition; Part 3 was a revision of the 6th Edition; Part 2, Section 29, did not cover the same subject matter as the 5th Edition; and Part 3 was withdrawn in 1970.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 5th 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, 6th Edition, was issued as NBS Handbook H81, ANSI C2.2-1960, in November 1961, but work on other parts was not actively in process 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 5th Edition), now largely covered by the National Electrical Code (ANSI/NFPA 70), and the Rules for Radio Installations (Part 5 of the 5th Edition) from future editions. The Discussion of the NESC, issued as NBS Handbook H4 (1928 Edition) for the 4th Edition of the NESC and as NBS Handbook H39 for Part 2 of the Grounding Rules of the 5th Edition, was not published for the 6th 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. Rounded metric values, for information only, were added. Gender-related terminology was deleted. Section 1—Introduction, Section 2—Definitions, Section 3—References, and Section 9— Grounding Methods, were made applicable to each of the Parts 1, 2, 3, and 4.

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.

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.

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 communication systems were modified for consistency and clarity, as was the rule in Part 4 on tagging electric supply circuits.

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.

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 street lights and area lights. Also included is clarification for situations between utility workers and their

authorized contractors and installations on industrial complexes.

In Section 2, definitions for communication lines, de-energized, fiber-optic cable—communications, fiber-optic cable—supply, readily climbable supporting structures, and vault were either modified or added.

No changes were made in the 2002 Edition regarding use of earth or sea as a continuous conductor in HVDC systems. Subcommittee 1 reviewed a change proposal with regard to using earth or sea as a continuous conductor and did not see an immediate need to revise the NESC for this type of operation for HVDC systems in the United States. Although several systems in Europe and one in the Philippines currently use sea as a conductor, there are concerns that should be addressed before revising the Code. The subcommittee recognized the comments submitted by members of the IEEE Power Engineering Society Substations Committee and Transmission and Distribution Committee, the work accomplished within joint working groups in IEEE and NACE International, and further endorsements received from recognized HVDC experts. If there is desire by some to design and install a monopolar system, it is permissible under Rule 013A2 to do so as an experimental system. The subcommittee also recommended that any such system be limited to using sea, not land, as a sole conductor for any part of the circuit.

In Section 9—Grounding Methods, a new rule was added to cover grounding requirements for a communication entity that wishes to use its own separate ground electrode. This requires that the communication ground be bonded with the grounding electrode conductor of the supply system to assure equal potential between the two systems.

In Part 1—Electric Supply Stations, the rules were clarified to be applicable to both ac and dc circuits. DC station clearances were added to the appropriate table. Requirements were revised to allow exceptions from prohibiting storage of equipment within an electrical supply station. The exception allows storage of material essential for maintenance and temporary storage of material related to work in progress in the station or a nearby transmission line. Restrictions are required to maintain safe clearances and working conditions. A Tentative Interim Amendment (TIA) was approved to remove the implication that grounding may be omitted when working on conductors normally operating at 25 kV or less where a visible open switch exists. The statement is not applicable to Part 1, and it may be a leftover practice that is no longer valid.

In Part 2—Overhead Lines, additional wording was added to address the situation of supply workers working in close proximity to communication antennas. New wording was also added to cover clearance of line conductors from communication antennas, and to clarify clearances of conductors from grain bins, boat launching areas, service drops, support arms, and lighting luminaires. Clarification was added to relationship of approach distances for non-utility workers from overhead lines and associated equipment. A major revision to Sections 25 and 26 on Strength and Loadings has begun and will span at least 3 Code cycles by the time it is completed. This is due to more sophisticated structural calculations that will be required, e.g., Load and Resistance Factor Design (LRFD), updated and improved input data from new wind and ice maps, and new pole materials that will supplement wood. Some change proposals were incorporated into the 2002 edition; others will be deferred until a later edition when the industry has become more familiar with the nature of these changes. For this edition, proposals were accepted to 1) treat wood, steel, and concrete poles with consistent Overhead Factors, and 2) include a new Extreme Wind Map that uses a new 3-s gust criteria, replacing the existing fastest mile wind. In addition, expanded calculations are required due to the use of gust response factor, importance factor, and velocity pressure coefficient.

In Part 3—Underground Lines, the requirements for random separation changed to prohibit both communication lines and power from being any closer than 12 in from fuel or steam lines. Other new rules address location of pad-mounted equipment and pedestals and cable protection by means of climbing devices required to be installed within the manhole. Also included are revised rules on burial depth for streetlight cables and security of above ground equipment.

In Part 4—Work Rules, the maximum use voltage rating of rubber protective equipment was added as a requirement.

Substantive changes in the 2002 edition are identified by a 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.

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 National Bureau of Standards.

Comments on the rules and suggestions for their improvement are invited, especially from those who have experience in their practical application. In future editions every effort will be made to improve the rules, both

in the adequacy of coverage and in the clarification of requirements. Comments should be addressed to:

Secretary
National Electrical Safety Code Committee
Institute of Electrical and Electronics Engineers, Inc.
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331

A representative Committee on Interpretations has been 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 sent to the address above.

If the request is suitable for processing, it will be sent to the Interpretations Committee. 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 ordered or accessed online at no cost at **http://standards.ieee.org/nesc**.

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 National Electrical Safety Code in any particular state or locality within a state, the authority having jurisdiction should be contacted.

The revision cycle for the 2007 edition of the NESC will be fully electronic. Change proposals and comments will no longer be accepted in hard copy, but will be submitted to the NESC Secretary online via the Internet. 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 Zone on the IEEE Standards Web site at **http://standards.ieee.org/nesc**.

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AISI—American Iron and Steel Institute
APPA—American Public Power Association
APTA—American Public Transit Association
ATIS—Alliance for Telephone Industry Solutions
AWPA—American Wood Preserves Assocation
BPA—Bonneville Power Admin., US Dept. of Energy
EEI—Edison Electric Institute
EIA—Electronic Industries Association
IAGLO—Int'l. Assoc. of Government Labor Officials
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IEEE—Institute of Electrical and Electronics Engineers, Inc.
IMSA—International Municipal Signal Association
NARUC—National Association of Regulatory Utility Commissioners
NCTA—National Cable Television Association
NECA—National Electrical Contractors Association
NEMA—National Electrical Manufacturers Association
NSC—National Safety Council
NSPE—National Society of Professional Engineers
RUS—Rural Utilities Services, US Dept. of Agriculture
SEEX—Southeastern Electric Exchange
TVA—Tennessee Valley Authority
WAPA—Western Area Power Administration, US Dept. of Energy

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Letter Symbols for Units

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

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

Section 1.
Introduction to the
National Electrical Safety Code®

010. Purpose

The purpose of these rules is the practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication lines and associated equipment.

These rules contain the basic provisions that are considered necessary for the safety of employees and the public under the specified conditions. This code is not intended as a design specification or as an instruction manual.

011. Scope

A. These rules cover supply and communication lines, equipment, and associated work practices employed by a public or private electric supply, communications, railway, or similar utility in the exercise of its function as a utility. They cover similar systems under the control of qualified persons, such as those associated with an industrial complex or utility interactive system.

B. The NESC covers utility facilities and functions up to the service point.

NOTE: The National Electrical Code® (NEC®), NFPA 70-1999[1] covers utilization wiring requirements beyond the service point.

C. NESC rules cover street and area lights (supplied by underground or overhead conductors) under the exclusive control of utilities (including their authorized contractors) or other qualified persons (such as those associated with an industrial complex).

NOTE: Luminaires not under such exclusive control are governed by the requirements of the NEC.

D. NESC rules do not cover installations in mines, ships, railway rolling equipment, aircraft, or automotive equipment, or utilization wiring except as covered in Parts 1 and 3.

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 in these rules, construction 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 construction or maintenance of the communication or supply lines and equipment.

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.

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