Accredited
Standards
Committee
C2-2007

National Electrical Safety Code®

Secretariat
Institute of Electrical and Electronics Engineers, Inc.

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Institute of Electrical and Electronics Engineers, Inc.

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American National Standards Institute

2007 Edition

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 2007 Edition of the National Electrical Safety Code.

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

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Foreword

This foreword is not a part of Accredited Standards Committee C2-2007, 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of the 6th edition; Part 2, Section 29, did not cover the same subject matter as the 5th edition; and Part 3 was withdrawn in 1970.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® (NEC®)(NFPA 70, 2005 Edition), and the Rules for Radio Installation (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. Converted metric values, for information only, were added. Gender-related terminology was deleted. Section 1—Introduction, Section 2—Definitions, Section 3—References, and Section 9—Grounding Methods, were made applicable to each of the Parts 1, 2, 3, and 4.

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 communications 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.

The major revisions for the 2007 Edition include 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.

Subcommittee 1 concerned itself with assuring continuity between subcommittees and supervising the addition of definitions and references. Definitions included work on ducts, conduits, conduit systems raceways, overvoltage/transient conditions, shield wires/static wires, flashover/sparkover, sag, creep, readily climbable/not readily climbable, and others. Inspection and work rules as related to Rule 13 were clarified. The extensive changes made by Working Group 4.10 on overhead clearances was reviewed and accepted for inclusion in Section 23 as well as in a new Appendix B to the Code. A similar review of the work by Subcommittee 5 led to creation of new Appendix C to cover application of extreme wind loading covered in Rule 250C.

Section 9—Based on extensive studies, steel poles are now permitted as grounding electrodes, and Rule 97G mandates common bonding between communication and power grounding electrodes, with additional information on common bonding given in Rule 99. Metallic water piping systems are no longer a preferred grounding electrode. Changes to Rule 96 clarify ground resistance requirements, and changes to Rule 94B clarify dimensional requirements for ground rods.

Part 1—Selected column headings have been revised for clarity, and inconsistencies in Tables 124-1 and 125-1 corrected.

Part 2—Overhead clearances. A new approach for calculating clearances is detailed in new Section 23 and Appendix B. Rules related to sag calculation for conductor sags as related to clearances were moved from Sections 25 and 26 (loading and strength) into sections covering clearances. All calculations in which both loaded and unloaded conductors involving ice and wind when used for strength calculations remain in Sections 25 and 26. Rule 215C2 was revised to require all guys regardless of exposure to be insulated or grounded. Rules related to guy and span wire insulators moved from Rule 279 to Rule 215C2 to improve subject matter retrieval from the Code. The vertical clearance of a service drop attached to a mast, porch, deck, or balcony has been increased from 2.45 to 3 m (8 to 10 ft). Rule 235G has been changed to allow multiplex line cable up to 750 V to attach to the same support bracket as neutral conductors meeting Rule 230E1.

Part 2—Strength and loading. No modifications were made to Rule 250C to remove the exemption that excludes structures of less than 18 m (60 ft) height from having to meet the extreme wind requirements. The efficacy of doing so will be considered again for the 2012 Edition. Insulator strength ratings and conductor tensions are scheduled for study with possible changes to the 2012 Edition. Specific load factors in Tables 253-1 and 253-2 have been reduced. Tables 253-2 and 261-1B covering alternate load factors and strength factors, respectively, will be phased out in July 2010. They will be replaced by Tables 253-1 and 261-1A that are applicable to all materials. Load and strength factors have been specified for fiber reinforced plastic (FRP) materials, and strength factors for FRP structures, crossarms, and braces have been added. Rules 250A, 253, and 261N have been made more specific in dealing with construction maintenance loads.

Rule 261A2e, which permitted poles of reduced strength to remain in service under the specific condition of being supported by stronger poles on each side of the pole, has been removed. In the long-term view, pole design is tending to move in the direction of Probabilistic Design (LRFD) away from Deterministic Design, a trend which is in concert with a majority of other industries.

Part 3—Rule 311C was added to permit supply and communication cables to be laid directly on grade, providing they do not obstruct traffic or pedestrians and meet other applicable rules. Rule 351C1 was clarified to better describe the limitations of where aboveground pools may be located relative to supply cable, and also state the rule that applies to aboveground pools. It is now recognized that all flammable material transported in pipelines is under some conditions considered hazardous because of location. The Code now requires the same radial separation of 300 mm (12 in) for supply and communication cables from all lines that transport flammable material, not only fuel lines. The rule now defines a flammable liquid.

Part 4—Work revolved largely around expanding guidelines for use of fire resistant (FR) clothing and other safety equipment such as voltage protection devices. These guidelines include arc hazard analysis and reference tables. A new rule was introduced to address high-frequency radiation effects on workers in both the supply and communications spaces arising from communication antennas mounted in those spaces. A new rule requiring phase-to-phase cover-up when guarding against phase-to-phase contact was added. Changes were made to existing minimum approach distance tables. These distances agree with those published in IEEE Std IEEE 516™.①

Substantive changes in the 2007 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:

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National Electrical Safety Code Committee
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A representative Interpretations Subcommittee 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 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 ordered or accessed online at no cost at http://standards.ieee.org/nsec.

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

①Information on references can be found in Section 3.

status of the NESC in any particular state or locality within a state, the authority having jurisdiction should be contacted.

The revision cycle for the 2012 Edition of the NESC will be fully electronic. Change proposals and comments 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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APPA—American Public Power Association
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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
IBEW—International Brotherhood of Electrical Workers
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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A = All areas, P1 = Part 1, P2 = Part 2, P3 = Part 3, P4 = Part 4, S9 = Section 9

Contents

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

Letter symbols for units

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

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

Errata to
2007 Edition
National Electrical Safety Code®

Correction Sheet
Issued 14 May 2007

The following corrections should be made:

Page 92: There is an error in Table 232-1 (ft). The footnote that appears in the first column of the fourth row should be "㉖" and not "㉔."

Table 232-1—Vertical clearance of wires, conductors, and cables above ground, roadway, rail, or water surfaces

4. Other land traversed by vehicles, such as cultivated, grazing, forest, orchards, etc. ㉖	15.5	16.0	16.5	18.5	—	—

Page 101: There is an error in one of the arrow descriptions in Figure 233-1. The arrow description associated with the double arrows located to the top and right of the figure should read "CONDUCTOR MOVEMENT ENVELOPES DEVELOPED UNDER RULE 233A1..." and not "CONDUCTOR MOVEMENT ENVELOPES DEVELOPED UNDER RULE 233AI..."

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, 2005 Edition)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.

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①Information on references can be found in Section 3.