Accredited Standards Committee C2-1997

National Electrical Safety Code®

Secretariat

Institute of Electrical and Electronics Engineers, Inc.

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American National Standards Institute

1997 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 1997 Edition of the National Electrical Safety Code.

Keywords: communications industry safety; construction of communication lines; construction of electric supply lines; electric supply stations, electric utility stations; electrical safety; 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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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 editions.

Dedication

Joseph M. Van Name, P. E.

2 January 1926—29 May 1995

This edition of the National Electrical Safety Code is dedicated to the memory of Joseph M. Van Name, P. E., Chair of NESC Subcommittee 8 for three Code editions, and pivotal contributor to electric power supply safety. Van Name is considered the father of modern live-line maintenance and working methods. His broad experience, great wisdom, and clear vision guided many areas of power industry standardization, education, development, and research. NESC colleagues and friends fondly acknowledge his profound and positive influence of electric power supply safety worldwide.

This dedication recognizes that the electrical standards community, electrical workers, and the public receive continuing benefit from the remarkable life and career of Joseph M. Van Name.

Foreword

(This foreword is not a part of Accredited Standards Committee C2-1997, 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, a revision of the 6th Edition; Part 2, Section 29, did not cover the same subject matter as the 5th Edition; and Part 3 had been 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, were 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. Sections 1—*Introduction*, 2—*Definitions*, 3—*References*, and 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 were 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.

For 1997, several changes were made that affected all or several parts of the Code. The most significant of these, which is stated in Section 1, is to show numerical values in the metric (SI) system first, with the customary inch-foot-pound values (inside parentheses) following.

The second general change was the addition of NOTES referring to several ANSI standards on safety signs.

Finally, in order to reduce the probability of misinterpretation, words such as “minimize the possibility” or “prevent” were changed to “limit the likelihood” or similar language. One exception to this type of change is Part 4.

In Section 2, definitions of several items related to worker safety, and a definition of limited access highways, were added. The definition of a generating station was changed and relocated as one type of an electric supply station.

The list of references in Section 3 was reorganized and revised so as to include only documents referred to in one or more sections of the Code.

In Section 9—*Grounding Methods*, changes were made in rules affecting the grounding of fences so as to state only the methods of grounding to be used when the grounding of fences is required by other parts of the Code. The wording of rules affecting Ampacity and Strength Underground Installations, Separation of Grounding Conductors, and Communication Apparatus was changed for clarity.

In Section 9 and Parts 1 and 2, rules were extended or clarified to include HVDC Systems.

In Part 1—*Electric Supply Stations*, requirements for a safety clearance zone for fences relative to exposed live parts were added. In most cases, requirements copied from the National Electrical Code®, NFPA 70 were replaced by direct references to the applicable rules of the NEC document. A requirement for short circuit protection of power transformers was added.

In Part 2—*Overhead Lines*, changes were made to the clearance rules applicable to emergency and temporary installations to allow for the proper choice of methods for assuring safety. Footnotes to several tables regarding the requirements applicable to ungrounded guys and ungrounded portions of span guys were added, as were clearance requirements for unguarded rigid live parts over or near swimming pools. Clearance requirements between different facilities located on the same structure were changed. Strength requirements contained in Sections 24, 25, and 26 were revised completely.

In Part 3—*Underground Lines*, the requirements for random separation of direct-buried supply and communication cables were modified with respect to sequential marking of the identification symbol with other data on the cable. A requirement for a continuous metallic shield for some communication cables was added.

In Part 4—*Work Rules*, a requirement that warning signs and tags comply with the provisions of applicable ANSI standards, and extensive requirements for fall protection were added. The rule on tagging electric supply circuits was revised to clarify its application to Supervisory Control and Data Acquisition (SCADA) Systems.

A bibliography, Appendix B, was added to this edition, which consists of a list of resources identified in notes or recommendations. Only those sources identified in rules are included in the references of Section 3.

Substantive changes in the 1997 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.

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.

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ATIS—Alliance for Telephone Industry Solutions
AISG—American Insurance Services Group, Inc.
APPA—American Public Power Association
APTA—American Public Transit Association
AAR—Association of American Railroads
AEIC—Association of Edison Illuminating Companies
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
RUS—Rural Utilities Services, US Department of Agriculture
SEEX—Southeastern Electric Exchange
TVA—Tennessee Valley Authority
WAPA—Western Area Power Administration, US Dept. of Energy

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(Sections 40–44)

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IEEE Standards Project Editor

Contents

SECTION PAGE

FIGURES

TABLES

APPENDIX PAGE

APPENDIX FIGURES

APPENDIX TABLES

Letter Symbols for Units

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

A	ampere
c	centi (10^{-2})
cm	centimeter
cm^3	cubic centimeter
C	degree Celsius
ft	foot
g	gram
g/cm^3	grams per cubic centimeter
ha	hectare
Hz	hertz
h	hour
h	hecto (10^2)
in	inch
J	joule
k	kilo (10^3)
kV	kilovolt (1000 volts)
kvar	kilovar
kVA	kilovoltampere
kW	kilowatt
l	liter
lm	lumen
m	meter
m	milli (10^{-3})
mA	milliampere
mg	milligram
mi	mile (statute)
mV	millivolt
min	minute (time)
N	newton
Pa	pascal
lb	pound
s	second (time)
ft^2	square feet
in^2	square inch
var	var
V	volt
VA	voltampere
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

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.

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. For building utilization wiring requirements, see the National Electrical Code® (NEC®), NFPA 70-1993.[1]

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.

2. Types of construction and methods of installation other than those specified in the rules may be used experimentally to obtain information, if done where qualified supervision is provided.

B. Existing Installations

1. Where an existing installation meets, or is altered to meet, these rules, such installation is considered to be in compliance with this edition and 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 these rules except as may be required for safety reasons by the administrative authority.

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