NFPA 70

National Electrical Code®

1999 Edition

This edition of NFPA 70, *National Electrical Code*, was prepared by the National Electrical Code Committee and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 18–21, 1998, in Cincinnati, OH. It was issued by the Standards Council on July 16, 1998, with an effective date of August 5, 1998, and supersedes all previous editions.

This edition of NFPA 70 was approved as an American National Standard on August 6, 1998.

History and Development of the *National Electrical Code*

The National Fire Protection Association has acted as sponsor of the *National Electrical Code* since 1911. The original *Code* document was developed in 1897 as a result of the united efforts of various insurance, electrical, architectural, and allied interests.

In accordance with the provisions of the NFPA Regulations Governing Committee Projects, a National Electrical Code Committee Report on Proposals containing proposed amendments to the 1996 *National Electrical Code* was published by the NFPA in June 1997. This report recorded the actions of the various Code-Making Panels and the Correlating Committee of the National Electrical Code Committee on each proposal that had been made to revise the 1996 *Code*. The report was circulated to all members of the National Electrical Code Committee and was made available to other interested NFPA members and to the public for review and comment. Following the close of the public comment period, the Code-Making Panels met, acted on each comment, and reported their action to the Correlating Committee. The NFPA published the National Electrical Code Committee Report on Comments in April 1998, which recorded the actions of the Code-Making Panels and the Correlating Committee on each public comment to the National Electrical Code Committee Report on Proposals. The National Electrical Code Committee Report on Proposals and the National Electrical Code Committee Report on Comments were presented to the 1998 NFPA Annual Meeting for adoption.

NFPA has an Electrical Section that provides particular opportunity for NFPA members interested in electrical safety to become better informed and to contribute to the development of the *National Electrical Code* and other NFPA electrical standards. Each of the Code-Making Panels and the Chairman of the Correlating Committee reported their recommendations to meetings of the Electrical Section at the 1998 NFPA Annual Meeting. The Electrical Section thus had opportunity to discuss and review the report of the National Electrical Code Committee prior to the adoption of this edition of the *Code* by the Association.

This 1999 edition supersedes all other previous editions, supplements, and printings dated 1897, 1899, 1901, 1903, 1904, 1905, 1907, 1909, 1911, 1913, 1915, 1918, 1920, 1923, 1925, 1926, 1928, 1930, 1931, 1933, 1935, 1937, 1940, 1942, 1943, 1947, 1949, 1951, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1962, 1965, 1968, 1971, 1975, 1978, 1981, 1984, 1987, 1990, 1993, and 1996.

Changes in this 1999 edition of the *National Electrical Code* (as compared with the 1996 edition) are indicated by vertical lines in the margin.

The location (in the 1996 edition) of material not appearing in the 1999 edition, and not identified as a change by a vertical line, is identified by a bullet (•) in the margin. Changes in section and table numbers are not identified.

Material identified by the superscript letter "x" includes text extracted from other NFPA documents as identified in Appendix A.

This *Code* is purely advisory as far as NFPA and ANSI are concerned, but is offered for use in law and for regulatory purposes in the interest of life and property protection. Anyone noticing any errors should notify the Secretary of the National Electrical Code Committee at the NFPA Executive Office.

as provided in Section 800-30(a)(1), or (4) meet the requirements of Section 800-12(a) and are used to extend circuits to a building from a cable having a grounded metallic sheath. Raceways or bushings shall slope upward from the outside or, where this cannot be done, drip loops shall be formed in the communications wires and cables immediately before they enter the building.

Raceways shall be equipped with an approved service head. More than one communications wire and cable shall be permitted to enter through a single raceway or bushing. Conduits or other metal raceways located ahead of the primary protector shall be grounded.

800-13. Lightning Conductors. Where practicable, a separation of at least 6 ft (1.83 m) shall be maintained between communications wires and cables on buildings and lightning conductors.

C. Protection

800-30. Protective Devices.

(a) Application. A listed primary protector shall be provided on each circuit run partly or entirely in aerial wire or aerial cable not confined within a block. Also, a listed primary protector shall be provided on each circuit, aerial or underground, located within the block containing the building served so as to be exposed to accidental contact with electric light or power conductors operating at over 300 volts to ground. In addition, where there exists a lightning exposure, each interbuilding circuit on a premises shall be protected by a listed primary protector at each end of the interbuilding circuit. Installation of primary protectors shall also comply with Section 110-3(b).

FPN No. 1: On a circuit not exposed to accidental contact with power conductors, providing a listed primary protector in accordance with this article will help protect against other hazards, such as lightning and above-normal voltages induced by fault currents on power circuits in proximity to the communications circuit.

FPN No. 2: Interbuilding circuits are considered to have a lightning exposure unless one or more of the following conditions exist.

(1) Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.
(2) Interbuilding cable runs of 140 ft (42.7 m) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.
(3) Areas having an average of five or fewer thunderstorm days per year and earth resistivity of less than 100 ohm-meters. Such areas are found along the Pacific coast.

(1) Fuseless Primary Protectors. Fuseless-type primary protectors shall be permitted under any of the following conditions:

(a) Where conductors enter a building through a cable grounded metallic sheath member(s) and if the conductors in the cable safely fuse on all currents greater the current-carrying capacity of the primary protector and of the primary protector grounding conductor
(b) Where insulated conductors in accordance with Sec 800-12(a) are used to extend circuits to a building from a cable with an effectively grounded metallic sh member(s) and if the conductors in the cable or c stub, or the connections between the insulated con tors and the exposed plant, safely fuse on all curr greater than the current-carrying capacity of the prim protector, or the associated insulated conductors an the primary protector grounding conductor
(c) Where insulated conductors in accordance with Sec 800-12(a) or (b) are used to extend circuits to a build from other than a cable with a metallic sheath membe if (1) the primary protector is listed for this purp and (2) the connections of the insulated conductor the exposed plant or the conductors of the exposed pl safely fuse on all currents greater than the current-c rying capacity of the primary protector, or the associa insulated conductors and of the primary protec grounding conductor
(d) Where insulated conductors in accordance with Sect 800-12(a) are used to extend circuits aerially to a bui ing from an unexposed buried or underground circu
(e) Where insulated conductors in accordance with Sect 800-12(a) are used to extend circuits to a building fr cable with an effectively grounded metallic sheath me ber(s) and if (1) the combination of the primary protec and insulated conductors is listed for this purpose, a (2) the insulated conductors safely fuse on all curre greater than the current-carrying capacity of the prim protector and of the primary protector grounding co ductor

(2) Fused Primary Protectors. Where the requiremer listed under Sections 800-30(a)(1)(a) through (e) are n met, fused-type primary protectors shall be used. Fused-ty primary protectors shall consist of an arrester connecte between each line conductor and ground, a fuse in seri with each line conductor, and an appropriate mountir arrangement. Primary protector terminals shall be marke to indicate line, instrument, and ground, as applicable.

(b) Location. The primary protector shall be located i on, or immediately adjacent to the structure or buildin served and as close as practicable to the point at which th exposed conductors enter or attach.

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National Electrical Safety Code®

Secretariat

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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 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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B. Conductive Parts to Be Grounded

Cable sheaths and shields (except conductor shields), equipment frames and cases (including pad-mounted devices), and conductive lighting poles shall be effectively grounded. Conductive-material ducts and riser guards that enclose electric supply lines shall be effectively grounded.

EXCEPTION: This rule does not apply to parts that are 2.45 m (8 ft) or more above readily accessible surfaces or are otherwise isolated or guarded.

C. Circuits

1. Neutrals

Primary neutrals, secondary and service neutrals, and common neutrals shall be effectively grounded as specified in Rule 314A.

EXCEPTION: Circuits designed for ground-fault detection and impedance current-limiting devices.

2. Other Conductors

Conductors, other than neutral conductors, that are intentionally grounded, shall be effectively grounded as specified in Rule 314A.

3. Surge Arresters

Surge arresters shall be effectively grounded as specified in Rule 314A.

4. Use of Earth as Part of Circuit

a. Supply circuits shall not be designed to use the earth normally as the sole conductor for any part of the circuit.

b. Monopolar operation of a bipolar HVDC system is permissible for emergencies and limited periods for maintenance.

315. Communications Protective Requirements

A. Where Required

Where communications apparatus is handled by other than qualified persons, it shall be protected by one or more of the means listed in Rule 315B if such apparatus is permanently connected to lines subject to any of the following:

1. Lightning
2. Contact with supply conductors whose voltage exceeds 300 V
3. Transient rise in ground potential exceeding 300 V
4. Steady-state induced voltage of a level that may cause personal injury

NOTE: When communication cables will be in the vicinity of supply stations where large ground currents may flow, the effect of these currents on communication circuits should be evaluated.

B. Means of Protection

Where communications apparatus is required to be protected under Rule 315A, protective means adequate to withstand the voltage expected to be impressed shall be provided by insulation, protected where necessary by surge arresters. Severe conditions may require the use of additional devices such as auxiliary arresters, drainage coils, neutralizing transformers, or isolating devices.

316. Induced Voltage

Rules covering supply-line influence and communication-line susceptiveness have not been detailed in this code. Cooperative procedures are recommended to minimize steady-state voltages induced from proximate facilities. Therefore, reasonable advance notice should be given to owners or operators of other known proximate facilities that may be adversely affected by new construction or changes in existing facilities.