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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

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SECTION 1. INTRODUCTION

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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 70-1999¹ 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.

¹Information on references can be found in Section 3.

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SECTION 2. DEFINITIONS

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limited access highways. As used herein, limited access highways are fully controlled highways where access is controlled by a governmental authority for purposes of improving traffic flow and safety. Fully controlled access highways have no grade crossings and have carefully designed access connections.

lines.

1. **communication lines.** The conductors and their supporting or containing structures that are used for public or private signal or communications service, and which operate at potentials not exceeding 400 V to ground or 750 V between any two points of the circuit, and the transmitted power of which does not exceed 150 W. When operating at not more than 90 V ac or 150 V dc, no limit is placed on the transmitted power of the system. Under specified conditions, communication cables may include communication circuits exceeding the preceding limitation where such circuits are also used to supply power solely to communications equipment.

NOTE: Telephone, telegraph, railroad-signal, data, clock, fire, police-alarm, cable-television, and other systems conforming with the above are included. Lines used for signaling purposes, but not included under the above definition, are considered as supply lines of the same voltage and are to be so installed.

2. **electric supply lines.** Those conductors used to transmit electric energy and their necessary supporting or containing structures. Signal lines of more than 400 V are always supply lines within the meaning of the rules, and those of less than 400 V may be considered as supply lines, if so run and operated throughout. *Syn:* supply lines.

line-worker's body belt. A belt that consists of a belt strap and D-rings and which may include a cushion section or a tool saddle.

live. *See:* energized.

manhole. A subsurface enclosure that personnel may enter used for the purpose of installing, operating, and maintaining submersible equipment and cable.

manhole cover. A removable lid that closes the opening to a manhole or similar subsurface enclosure.

manhole grating. A grid that provides ventilation and a protective cover for a manhole opening.

manual. Capable of being operated by personal intervention.

minimum approach distance. The closest distance a qualified employee is permitted to approach either an energized or a grounded object, as applicable for the work method being used.

multigrounded/multiple grounded system. A system of conductors in which a neutral conductor is intentionally grounded solidly at specified intervals. A multigrounded or multiple grounded system may or may not be effectively grounded. *See:* **effectively grounded.**

neutral conductor. A system conductor other than a phase conductor that provides a return path for current to the source. Not all systems have a neutral conductor. An example is an ungrounded delta system containing only three energized phase conductors.

out of service. Lines and equipment are considered out of service when disconnected from the system and when not intended to be capable of delivering energy or communications signals.

pad-mounted equipment. A general term describing enclosed equipment, the exterior of which enclosure is at ground potential, positioned on a surface-mounted pad.

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SECTION 2. DEFINITIONS

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traveled way. The portion of the roadway for the movement of vehicles, exclusive of shoulders and full-time parking lanes.

ungrounded system. A system of conductors in which no conductor or point is intentionally grounded, either solidly or through a noninterrupting current-limiting device.

unigrounded system. *See: single grounded system/unigrounded system.*

unloaded tension.

1. **initial.** The longitudinal tension in a conductor prior to the application of any external load.

2. **final.** The longitudinal tension in a conductor after it has been subjected for an appreciable period to the loading prescribed for the loading district in which it is situated, or equivalent loading, and the loading removed. Final unloaded tension shall include the effect of inelastic deformation (creep).

urban districts. Thickly settled areas (whether in cities or suburbs) or where congested traffic often occurs. A highway, even though in thinly settled areas, on which the traffic is often very heavy, is considered as urban.

utility. An organization responsible for the installation, operation, or maintenance of electric supply or communications systems.

utility interactive system. An electric power production system that is operating in parallel with and capable of delivering energy to a utility electric supply system.

utilization equipment. Equipment, devices, and connected wiring that utilize electric energy for mechanical, chemical, heating, lighting, testing, or similar purposes and are not a part of supply equipment, supply lines, or communication lines.

vault. A structurally solid enclosure, including all sides, top, and bottom, above or below ground where entry is limited to personnel qualified to install, maintain, operate, or inspect the equipment or cable enclosed. The enclosure may have openings for ventilation, personnel access, cable entrance, and other openings required for operation of equipment in the vault.

voltage.

1. The effective (rms) potential difference between any two conductors or between a conductor and ground. Voltages are expressed in nominal values unless otherwise indicated. The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation. The operating voltage of the system may vary above or below this value.

2. **voltage of circuit not effectively grounded.** The highest nominal voltage available between any two conductors of the circuit.

NOTE: If one circuit is directly connected to and supplied from another circuit of higher voltage (as in the case of an autotransformer), both are considered to be of the higher voltage, unless the circuit of the lower voltage is effectively grounded, in which case its voltage is not determined by the circuit of higher voltage. Direct connection implies electric connection as distinguished from connection merely through electromagnetic or electrostatic induction.

3. **voltage of a constant-current circuit.** The highest normal full-load voltage of the circuit.

4. **voltage of an effectively grounded circuit.** The highest nominal voltage available between any conductor of the circuit and ground unless otherwise indicated.

Section 31.
General Requirements
Applying to Underground Lines

310. Referenced Sections

The Introduction (Section 1), Definitions (Section 2), List of Referenced Documents (Section 3), and Grounding Methods (Section 9) of this code shall apply to the requirements of Part 3.

311. Installation and Maintenance

- A. Persons responsible for underground facilities shall be able to indicate the location of their facilities.
- B. Reasonable advance notice should be given to owners or operators of other proximate facilities that may be adversely affected by new construction or changes in existing facilities.

312. Accessibility

All parts that must be examined or adjusted during operation shall be arranged so as to be readily accessible to authorized persons by the provision of adequate working spaces, working facilities, and clearances.

313. Inspection and Tests of Lines and Equipment

- A. When In Service
 - 1. Initial Compliance With Safety Rules
Lines and equipment shall comply with these safety rules upon being placed in service.
 - 2. Inspection
Accessible lines and equipment shall be inspected by the responsible party at such intervals as experience has shown to be necessary.
 - 3. Tests
When considered necessary, lines and equipment shall be subjected to practical tests to determine required maintenance.
 - 4. Record of Defects
Any defects affecting compliance with this code revealed by inspection, if not promptly corrected, shall be recorded; such record shall be maintained until the defects are corrected.
 - 5. Remedying Defects
Lines and equipment with recorded defects that would endanger life or property shall be promptly repaired, disconnected, or isolated.
- B. When Out of Service
 - 1. Lines Infrequently Used
Lines and equipment infrequently used shall be inspected or tested as necessary before being placed into service.
 - 2. Lines Temporarily Out of Service
Lines and equipment temporarily out of service shall be maintained in a safe condition.
 - 3. Lines Permanently Abandoned
Lines and equipment permanently abandoned shall be removed or maintained in a safe condition.

314. Grounding of Circuits and Equipment

- A. Methods
The methods to be used for grounding of circuits and equipment are given in Section 9.
- 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 or are exposed to contact with open supply

conductors of greater than 300 V 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 with voltages exceeding 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.