

Chapter E 195

GENERAL

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E 195.01 Scope. This chapter includes provisions applicable generally in installations of electric wiring and equipment.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.02 Approval. The conductors and equipment required or permitted by this code shall be acceptable only when approved. See definition of "approved" in chapter E 100.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.03 Mandatory and advisory rules. Mandatory rules of this code are characterized by the use of the word "shall". Advisory rules are characterized by the use of the word "should", or are stated as recommendations of that which is advised but not required.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.04 Examination of equipment. Materials, devices, fittings, apparatus and appliances designed for use under this code shall be judged chiefly with reference to the following considerations which also determine the classification by types, size, voltages, current capacities, and specific use.

(1) Suitability for installation and use in conformity with the provisions of this code.

(2) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.

(3) Electrical insulation.

(4) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service.

(5) Arcing effects.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.05 Voltages. Throughout this code the voltage considered shall be that at which the circuit operates.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.06 Conductor gauges. Conductor sizes are given in American Wire Gauge (AWG).

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.07 Conductors. Conductors normally used to carry current shall be of copper unless otherwise provided in this code. Where conductor sizes are given in this code, they shall apply to copper conductors. Where other materials are used, the size shall be changed accordingly.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.08 Wiring methods. (1) Only wiring methods recognized as suitable are included in this code. The recognized methods of wiring may be installed in any type of building or occupancy except as otherwise provided in this code.

(2) All conductors shall be guarded in an approved manner when brought closer to floor or platform than 8 feet, or when exposed to mechanical injury above that level.

(a) *Exception:* Trolley conductors, grounding conductors size No. 4 or larger, lightning arrester ground conductors, pendants, and portable cords are exempt from this rule.

(3) Bus-bars and other open bare ungrounded conductors which are elevated less than 8 feet above floor or platform, shall be enclosed by suitable guards.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.09 Interrupting capacity. Devices intended to break current shall have an interrupting capacity sufficient for the voltage employed and for the current which must be interrupted.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.10 Deteriorating agencies. Unless approved for the purpose, no conductors or equipment shall be located in a damp or wet location; where exposed to gases, fumes, vapors, liquids or other agents having a deteriorating effect on the conductors or equipment; nor where exposed to excessive temperatures.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.11 Mechanical execution of work. Electrical equipment shall be installed in a neat and workmanlike manner.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.12 Mounting of equipment. Electrical equipment shall be firmly secured to the surface on which it is mounted. Wooden plugs driven into holes in masonry, concrete, plaster or similar materials shall not be depended on for security.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.13 Connections to terminals. Connection of conductors to terminal parts shall insure a thoroughly good connection without damaging the conductors and shall be made by means of pressure connectors (including set screw type), solder lugs or splices to flexible leads except that No. 8 or smaller solid conductors and No. 10 or smaller stranded conductors may be connected by means of clamps or screws with terminal plates having upturned lugs. Terminals for more than one conductor shall be of a type approved for the purpose.

Note: Because of different characteristics of copper and aluminum the devices and fittings, such as pressure connectors, splices, solder lugs, solder, and fluxes employed where making connections, should be suitable for the material of the conductor.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.14 Splices. Conductors shall be spliced or joined with approved splicing devices or by brazing, welding or soldering with a fusible metal or alloy. Soldered splices shall first be so spliced or joined as to be mechanically and electrically secure without solder and then soldered. All splices and joints and the free ends of conductors shall be covered with an insulation equivalent to that on the conductors.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.15 Working space about electrical equipment. Suitable working space shall be provided and maintained about all electrical equipment.

(1) **HORIZONTAL DIMENSIONS.** Except as elsewhere required or permitted in this code, the horizontal dimensions of the working space in front of live parts, operating at not more than 600 volts, which must be handled while alive, shall not be less than:

(a) For parts of more than 150 volts to ground on one side of the working space and no bare live or grounded parts on the other side of the working space, 2½ feet.

(b) For parts of more than 150 volts to ground on one side of the working space and bare live or grounded parts on the other side of the working space, 4 feet.

(c) For parts of 150 volts or less to ground on one side of the working space and no bare live or grounded parts on the other side of the working space, 1½ feet.

(d) For parts of 150 volts or less to ground on one side of the working space and bare live or grounded parts on the other side of the working space, 2½ feet.

Note: For voltages above 600, see chapter E 710.

(2) **CLEAR SPACES.** Working spaces adjacent to exposed live parts shall not be used as passageways, or for storage.

(3) **ELEVATION OF EQUIPMENT.** The elevation of the equipment at least 8 feet above ordinarily accessible working platforms, usually affords protection at least equivalent to that provided by the horizontal clearances of subsection E 195.15 (1) and may be used in lieu thereof.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.16 Guarding of live parts. Except as elsewhere required, or permitted by this code, exposed live parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by enclosure or by locating the equipment as follows:

(1) In a room or enclosure which is accessible only to qualified persons;

(2) On a suitable balcony, gallery, or platform, so elevated and arranged as to exclude unqualified persons;

(3) Elevated 8 feet or more above the floor;

(4) So that it will be protected by a guard rail if the equipment operates at 600 volts or less.

Note: For motors see section E 430.132. For voltages above 600 volts see chapter E 710.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.17 Arcing parts. Parts of electrical equipment which in ordinary operation produce arcs, sparks, flames or molten metal, shall be enclosed unless separated and isolated from all combustible material.

For hazardous locations see chapters E 500-517, inclusive. For motors see section E 430.014.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.18 Light and power from railway conductors. Circuits for lighting and power shall not be connected to any system containing trolley wires with a ground return, except in electric railway cars, car houses, power houses, or passenger and freight stations operated in connection with electric railways.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.19 Insulation resistance. All wiring shall be so installed that when completed the system will be free from short-circuits and from grounds other than as provided in chapter E 250. In order that a reasonable factor of safety may be provided, the following table of insulation resistances is suggested as a guide where the insulation is subjected to test:

(1) For circuits of No. 14 or No. 12 wire, 1,000,000 ohms. For circuits of No. 10 or larger conductor, a resistance based upon the allowable current-carrying capacity of conductors as fixed in Tables E 310.12 through E 310.15 as follows:

25 to 50 amperes, inclusive	250,000 ohms
51 to 100 amperes, inclusive	100,000 ohms
101 to 200 amperes, inclusive	50,000 ohms
201 to 400 amperes, inclusive	25,000 ohms
401 to 800 amperes, inclusive	12,000 ohms
Over 800 amperes	5,000 ohms

(2) The above values are to be determined with all switchboards, panelboards, fuseholders, switches, receptacles and overcurrent devices in place.

(3) If lampholders, fixtures, or appliances are also connected, the minimum resistances permitted for branch circuits supplying same shall be one-half the values specified in subsection E 195.19 (1).

(4) Where climatic conditions are such that the wiring or equipment is exposed to excessive humidity, it may be necessary to modify the foregoing provisions.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.20 Marking. The maker's name, trademark, or other identification shall be placed on all electrical equipment. Other markings shall be provided giving voltage, current, wattage, or other ratings as are prescribed elsewhere in this code.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 195.21 Readily accessible. Disconnect switches and circuit breakers shall be readily accessible and have the center of the operating means in its highest position not more than 6½ feet above the floor or operating level, and it is recommended that it be at least 3 feet above this level. Fuses shall be readily accessible with the location of their midpoint governed by the same dimensions as for switches and circuit breakers. The operating means of disconnect switches and circuit breakers may function through rods or cables when the switches or breakers are located outside the above range. This requirement does not cover installations specifically exempted elsewhere in this code.

(1) **EXCEPTION NO. 1.** This section does not apply to switchboards, unit substations, motor control centers, or equipment exceeding 600 volts.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.