

for the practical safeguarding of employees in their workplaces and is divided into four major divisions as follows:

(a) *Design safety standards for electrical systems.* These regulations are contained in §§ 1910.302 through 1910.330. Sections 1910.302 through 1910.308 contain design safety standards for electric utilization systems. Included in this category are all electric equipment and installations used to provide electric power and light for employee workplaces. Sections 1910.309 through 1910.330 are reserved for possible future design safety standards for other electrical systems.

(b) *Safety-related work practices.* These regulations will be contained in §§ 1910.331 through 1910.360.

(c) *Safety-related maintenance requirements.* These regulations will be contained in §§ 1910.361 through 1910.380.

(d) *Safety requirements for special equipment.* These regulations will be contained in §§ 1910.381 through 1910.398.

(e) *Definitions.* Definitions applicable to each division are contained in § 1910.399.

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DESIGN SAFETY STANDARDS FOR ELECTRICAL SYSTEMS

SOURCE: Sections 1910.302 through 1910.308 appear at 72 FR 7190, Feb. 14, 2007, unless otherwise note.

§ 1910.302 Electric utilization systems.

Sections 1910.302 through 1910.308 contain design safety standards for electric utilization systems.

(a) *Scope—(1) Covered.* The provisions of §§ 1910.302 through 1910.308 cover electrical installations and utilization equipment installed or used within or on buildings, structures, and other premises, including:

- (i) Yards;
- (ii) Carnivals;
- (iii) Parking and other lots;
- (iv) Mobile homes;
- (v) Recreational vehicles;
- (vi) Industrial substations;
- (vii) Conductors that connect the installations to a supply of electricity; and

(viii) Other outside conductors on the premises.

(2) *Not covered.* The provisions of §§ 1910.302 through 1910.308 do not cover:

(i) Installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles;

(ii) Installations underground in mines;

(iii) Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communication purposes;

(iv) Installations of communication equipment under the exclusive control of communication utilities, located outdoors or in building spaces used exclusively for such installations; or

(v) Installations under the exclusive control of electric utilities for the purpose of communication or metering; or for the generation, control, transformation, transmission, and distribution of electric energy located in buildings used exclusively by utilities for such purposes or located outdoors on property owned or leased by the utility or on public highways, streets, roads, etc., or outdoors by established rights on private property.

(b) *Extent of application—(1) Requirements applicable to all installations.* The following requirements apply to all electrical installations and utilization equipment, regardless of when they were designed or installed:

§ 1910.303(b)—Examination, installation, and use of equipment

§ 1910.303(c)(3)—Electrical connections—Splices

§ 1910.303(d)—Arcing parts

§ 1910.303(e)—Marking

§ 1910.303(f), except (f)(4) and (f)(5)—Disconnecting means and circuits

§ 1910.303(g)(2)—600 volts or less—Guarding of live parts

§ 1910.304(a)(3)—Use of grounding terminals and devices

§ 1910.304(f)(1)(i), (f)(1)(iv), and (f)(1)(v)—Overcurrent protection—600 volts, nominal, or less

§ 1910.304(g)(1)(ii), (g)(1)(iii), (g)(1)(iv), and (g)(1)(v)—Grounding—Systems to be grounded

§ 1910.304(g)(4)—Grounding—Grounding connections

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- § 1910.304(g)(5)—Grounding—Grounding path
- § 1910.304(g)(6)(iv)(A) through (g)(6)(iv)(D), and (g)(6)(vi)—Grounding—Supports, enclosures, and equipment to be grounded
- § 1910.304(g)(7)—Grounding—Nonelectrical equipment
- § 1910.304(g)(8)(i)—Grounding—Methods of grounding fixed equipment
- § 1910.305(g)(1)—Flexible cords and cables—Use of flexible cords and cables
- § 1910.305(g)(2)(ii) and (g)(2)(iii)—Flexible cords and cables—Identification, splices, and terminations
- § 1910.307, except as specified in § 1910.307(b)—Hazardous (classified) locations
 - (2) *Requirements applicable to installations made after March 15, 1972.* Every electrical installation and all utilization equipment installed or overhauled after March 15, 1972, shall comply with the provisions of §§ 1910.302 through 1910.308, except as noted in paragraphs (b)(3) and (b)(4) of this section.
 - (3) *Requirements applicable only to installations made after April 16, 1981.* The following requirements apply only to electrical installations and utilization equipment installed after April 16, 1981:
 - § 1910.303(h)(4)—Over 600 volts, nominal—Entrance and access to work space
 - § 1910.304(f)(1)(vii) and (f)(1)(viii)—Overcurrent protection—600 volts, nominal, or less
 - § 1910.304(g)(9)(i)—Grounding—Grounding of systems and circuits of 1000 volts and over (high voltage)
 - § 1910.305(j)(6)(ii)(D)—Equipment for general use—Capacitors
 - § 1910.306(c)(9)—Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts—Interconnection between multicar controllers
 - § 1910.306(i)—Electrically driven or controlled irrigation machines
 - § 1910.306(j)(5)—Swimming pools, fountains, and similar installations—Fountains
 - § 1910.308(a)(1)(ii)—Systems over 600 volts, nominal—Aboveground wiring methods
 - § 1910.308(c)(2)—Class 1, Class 2, and Class 3 remote control, signaling, and power-limited circuits—Marking
 - § 1910.308(d)—Fire alarm systems

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- (4) *Requirements applicable only to installations made after August 13, 2007.* The following requirements apply only to electrical installations and utilization equipment installed after August 13, 2007:
 - § 1910.303(f)(4)—Disconnecting means and circuits—Capable of accepting a lock
 - § 1910.303(f)(5)—Disconnecting means and circuits—Marking for series combination ratings
 - § 1910.303(g)(1)(iv) and (g)(1)(vii)—600 Volts, nominal, or less—Space about electric equipment
 - § 1910.303(h)(5)(vi)—Over 600 volts, nominal—Working space and guarding
 - § 1910.304(b)(1)—Branch circuits—Identification of multiwire branch circuits
 - § 1910.304(b)(3)(i)—Branch circuits—Ground-fault circuit interrupter protection for personnel
 - § 1910.304(f)(2)(i)(A), (f)(2)(i)(B) (but not the introductory text to § 1910.304(f)(2)(i)), and (f)(2)(iv)(A)—Overcurrent protection—Feeders and branch circuits over 600 volts, nominal
 - § 1910.305(c)(3)(ii)—Switches—Connection of switches
 - § 1910.305(c)(5)—Switches—Grounding
 - § 1910.306(a)(1)(ii)—Electric signs and outline lighting—Disconnecting means
 - § 1910.306(c)(4)—Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts—Operation
 - § 1910.306(c)(5)—Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts—Location
 - § 1910.306(c)(6)—Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts—Identification and signs
 - § 1910.306(c)(7)—Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts—Single-car and multicar installations
 - § 1910.306(j)(1)(iii)—Swimming pools, fountains, and similar installations—Receptacles
 - § 1910.306(k)—Carnivals, circuses, fairs, and similar events
 - § 1910.308(a)(5)(v) and (a)(5)(vi)(B)—Systems over 600 volts, nominal—Interrupting and isolating devices

§ 1910.308(a)(7)(vi)—Systems over 600 volts, nominal—Tunnel installations
 § 1910.308(b)(3)—Emergency power systems—Signs

§ 1910.308(c)(3)—Class 1, Class 2, and Class 3 remote control, signaling, and power-limited circuits—Separation from conductors of other circuits

§ 1910.308(f)—Solar photovoltaic systems

(c) *Applicability of requirements for disconnecting means.* The requirement in § 1910.147(c)(2)(iii) that energy isolating devices be capable of accepting a lock-out device whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed after January 2, 1990, applies in addition to any requirements in § 1910.303 through § 1910.308 that disconnecting means be capable of being locked in the open position under certain conditions.

§ 1910.303 General.

(a) *Approval.* The conductors and equipment required or permitted by this subpart shall be acceptable only if approved, as defined in § 1910.399.

(b) *Examination, installation, and use of equipment—(1) Examination.* Electric equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment shall be determined using the following considerations:

(i) Suitability for installation and use in conformity with the provisions of this subpart;

NOTE TO PARAGRAPH (b)(1)(i) OF THIS SECTION: Suitability of equipment for an identified purpose may be evidenced by listing or labeling for that identified purpose.

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

(iii) Wire-bending and connection space;

(iv) Electrical insulation;

(v) Heating effects under all conditions of use;

(vi) Arcing effects;

(vii) Classification by type, size, voltage, current capacity, and specific use; and

(viii) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment.

(2) *Installation and use.* Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.

(3) *Insulation integrity.* Completed wiring installations shall be free from short circuits and from grounds other than those required or permitted by this subpart.

(4) *Interrupting rating.* Equipment intended to interrupt current at fault levels shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment. Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage sufficient for the current that must be interrupted.

(5) *Circuit impedance and other characteristics.* The overcurrent protective devices, the total impedance, the component short-circuit current ratings, and other characteristics of the circuit to be protected shall be selected and coordinated to permit the circuit protective devices used to clear a fault to do so without the occurrence of extensive damage to the electrical components of the circuit. This fault shall be assumed to be either between two or more of the circuit conductors, or between any circuit conductor and the grounding conductor or enclosing metal raceway.

(6) *Deteriorating agents.* Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

(7) *Mechanical execution of work.* Electric equipment shall be installed in a neat and workmanlike manner.

(i) Unused openings in boxes, raceways, auxiliary gutters, cabinets, equipment cases, or housings shall be effectively closed to afford protection