Compliance Guide No. OSHA 6
|Revised 11/2007

Electrical Safety

Description:

The OSHA electrical safety standard applies to employees whose duties may expose them to the risk of electrocution, burns or other bodily harm due to contact with live electrical parts or conductors.

Regulatory Reference

29 CFR 1910, Subpart S—Electrical

29 CFR § 1910.301	Introduction
29 CFR § 1910.302	Electric utilization systems
29 CFR § 1910.303	General requirements
29 CFR § 1910.304	Wiring design and protection
29 CFR § 1910.305	Wiring methods, components, and equipment for general use
29 CFR § 1910.306	Specific purpose equipment and installations
29 CFR § 1910.307	Hazardous (classified) locations
29 CFR § 1910. 331	Scope
29 CFR § 1910.332	Training
29 CFR § 1910.333	Selection and use of work practices
29 CFR § 1910.334	Use of equipment
29 CFR § 1910.335	Safeguards for personnel protection
29 CFR § 1910.399	Definitions applicable to this subpart
1910 Subpart S Appendix A Reference Documents	

Applies to:

Managers, supervisors, service technicians, plant operations personnel, and other employees who may be exposed to electricity during maintenance or customer service operations.

General Requirements:

Subpart S of 29 CFR 29 addresses electrical safety requirements that are necessary for the practical safeguarding of employees in their workplaces. It is divided into four major divisions:

- Design safety standards for electrical systems – §§1910.302 through 1910.330
- Safety-related work practices – §§1910.331 through 1910.360
- Safety-related maintenance requirements – §§1910.361 through 1910.380
- Safety requirements for special equipment – §§1910.381 through 1910.398

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:

(a) Yards,
(b) Parking and other lots,
(c) Mobile homes,

(d) Recreational vehicles
(e) Industrial substations,
(f) Conductors that connect the installations to a supply of electricity, and
(g) Other outside conductors on the premises

(1) The electrical safety regulations set out different requirements for "qualified" and "unqualified persons". A q*ualified person* is one familiar with the construction and operation of the equipment and the hazards involved.

Note 1: Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. (See §1910.332(b)(3) for training requirements that specifically apply to qualified persons.)

Note 2: An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

The regulations apply to covered work by both qualified and unqualified persons. The provisions of §§1910.331 through 1910.335 cover electrical safety-related work practices for both qualified persons (those who have training in avoiding the electrical hazards of working on or near exposed energized parts) and unqualified persons (those with little or no such training) working on, near, or with the following installations: **(Note**: In general, unless a service technician, manager or supervisor is a master or journeyman electrician, for the purposes of the regulations, he or she would not be considered a "qualified person.")

(2) Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

Electrically live parts to which an employee may be exposed shall be deenergized before the employee works on or near them, unless the employer can demonstrate that deenergizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. Live parts that operate at less than 50 volts to ground need not be deenergized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

If the exposed live parts are not deenergized (i.e., for reasons of increased or additional hazards or infeasibility), other safety-related work practices shall be used to protect employees who may be exposed to the electrical hazards involved. Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object. The work practices that are used shall be suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts

(3) Lockout and tagging. While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged. The lockout and tagout procedures must comply with 29 CFR §1910.147. The employer shall maintain a written copy of the procedures used for lockout and tagout and working near deenergized electrical equipment.

(4) Before working on deenergized electrical equipment, a qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted. Further, A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately before and immediately after this test.

(5) Before circuits or equipment are reenergized, even temporarily, a qualified person shall conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized. Employees exposed to the hazards associated with reenergizing the circuit or equipment shall be warned to stay clear of circuits and equipment. The written lockout and tagout procedures must be followed during this process. There shall be a visual determination that all employees are clear of the circuits and equipment

(6) *exposed energized parts*— Only qualified persons may work on electric circuit parts or equipment that have not been deenergized.

(7) *Working on or near 0verhead lines*—When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:

(a) For voltages to ground 50kV or below-10 feet
(b) For voltages to ground over 50kV-10 feet, plus 4 inches for every 10kV over 50kV

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage. Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless:

(a) The employee is using protective equipment rated for the voltage; or
(b) The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted.

(8) *Portable ladders* – Portable ladders shall have nonconductive siderails if they are used where the employee or the ladder could contact exposed energized parts.

(9) *Portable electric equipment* – Portable equipment shall be handled in a manner which will not cause damage. Flexible electric cords connected to equipment may not be used for raising or lowering the equipment. Flexible cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation. Portable cord- and plug-connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket). Cord- and plug-connected equipment and flexible cord sets (extension cords) which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated. If there is a defect or evidence of damage that might expose an

employee to injury, the defective or damaged item shall be removed from service, and no employee may use it until repairs and tests necessary to render the equipment safe have been made. A flexible cord used with grounding-type equipment shall contain an equipment grounding conductor. Attachment plugs and receptacles may not be connected or altered in a manner which would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles.

(10) *Test instruments and equipment* – Only qualified persons may perform testing work on electric circuits or equipment. Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service, and no employee may use it until repairs and tests necessary to render the equipment safe have been made. Test instruments and equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used.

(11) 29 CFR § 1910.335 “Safeguards for personnel protection” specifies personal protective equipment that must be provided for employees performing electrical work.

Training Requirements:

Training requirements are found in 29 CFR §1910.332.

The training requirements contained in 29 CFR §1910.332 apply to employees who face a risk of electric shock that is not reduced to a safe level by the electrical installation requirements of §§1910.303 through 1910.308.

Note: Employees in occupations listed in Table S-4 (of 29 CFR §1910.332) face such a risk and are required to be trained. Other employees who also may reasonably be expected to face a comparable risk of injury due to electric shock or other electrical hazards must also be trained.

Content of training.

(1) Employees shall be trained in and familiar with the safety-related work practices required by §§1910.331 through 1910.335 that pertain to their respective job assignments.

(2) Additional requirements for unqualified persons. Employees who are covered by paragraph (a) of this section but who are not qualified persons shall also be trained in and familiar with any electrically related safety practices not specifically addressed by §§1910.331 through 1910.335 but which are necessary for their safety.

(3) Additional requirements for qualified persons. Qualified persons (i.e., those permitted to work on or near exposed energized parts) shall, at a minimum, be trained in and familiar with the following:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment,
- The skills and techniques necessary to determine the nominal voltage of exposed live parts, and
- The clearance distances specified in §1910.333(c) and the corresponding voltages to which the qualified person will be exposed.

Note 1: For the purposes of §§1910.331 through 1910.335, a person must have the training required by paragraph (b)(3) of this section in order to be considered a qualified person.

Note 2: Qualified persons whose work on energized equipment involves either direct contact or contact by means of tools or materials must also have the training needed to meet §1910.333(c)(2).

Type of training. The training required by this section shall be of the classroom or on-the-job type. The degree of training provided shall be determined by the risk to the employee.

Maintenance and Review

Many companies conduct scheduled periodic inspections of bulk plants, buildings and facilities to determine if electrical equipment and tools comply with the standards. Special attention should be directed to the condition of extension cords, hand tools, and wiring and outlets near wet environments. Electrical fixtures, equipment and wiring in classified areas near LP-gas transfer areas, dispensers, cylinder docks, fill rooms or stored flammable or combustible materials should conform with the National Electric Code classification Class I, Group D.

Periodic employee training should be fully documented.

Additional Information and Resources

NFPA 70, *National Electric Code*, National Fire Protection Association, Quincy, MA

NFPA 70E, *Electrical Safety Requirements of Employee Workplaces*, National Fire Protection Association, Quincy, MA

[This page intentionally left blank.]