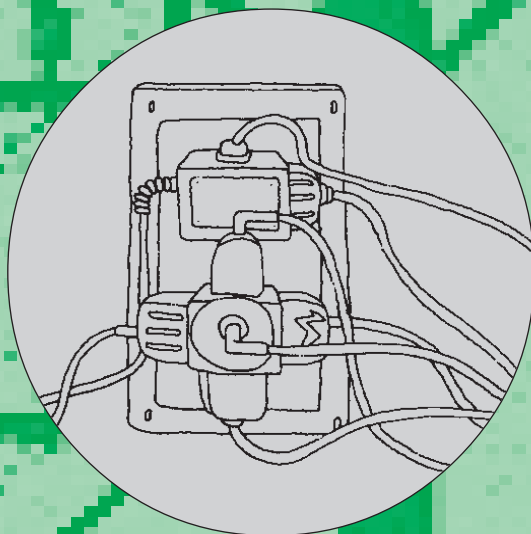


# Controlling Electrical Hazards



U.S. Department of Labor  
Occupational Safety and Health Administration

OSHA 3075  
1997 (Revised)



## Report Documentation Page

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This informational booklet is intended to provide a generic, non-exhaustive overview of a particular standards-related topic. This publication does not itself alter or determine compliance responsibilities, which are set forth in OSHA standards themselves and the *Occupational Safety and Health Act*. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements, the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts.

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# Controlling Electrical Hazards



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U.S. Department of Labor  
Alexis M. Herman, Secretary

Occupational Safety and Health Administration  
Gregory R. Watchman, Acting Assistant Secretary

OSHA 3075  
1997 (Revised)

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This booklet provides an overview of basic electrical safety for individuals with little or limited training or familiarity with electrical hazards. The concepts and principles presented will help further an understanding of OSHA's electrical safety standards for general industry, *Title 29 Code of Federal Regulations (CFR), Part 1910.302, Subpart S—Design Safety Standards for Electrical Systems*, and *1910.331 Electrical Safety-Related Work Practices Standard (1990)*.

In general, OSHA's electrical standards are based on the National Fire Protection Associations' Standard NFPA 70E, *Electrical Safety Requirements for Employee Workplaces*, and in turn, from the National Electrical Code (NEC).

OSHA also has electrical standards for construction and maritime,<sup>1</sup> but recommends that employers in these industries follow the general industry electrical standards whenever possible for hazards that are not addressed by their industry-specific standards.

OSHA's electrical standards address concerns that electricity has long been recognized as a serious workplace hazard, exposing employees to such dangers as electric shock, electrocution, burns, fires, and explosions. In 1992, for example, the Bureau of Labor Statistics<sup>2</sup> reported that 6,210 work-related deaths occurred in private sector workplaces employing 11 workers or more. Six percent of the fatalities, or around 347 deaths, were the direct result of electrocutions at work. What makes these statistics more tragic is that, for the most part, these fatalities could have been easily avoided.

OSHA's electrical standards help minimize these potential hazards by specifying safety aspects in the design and use of

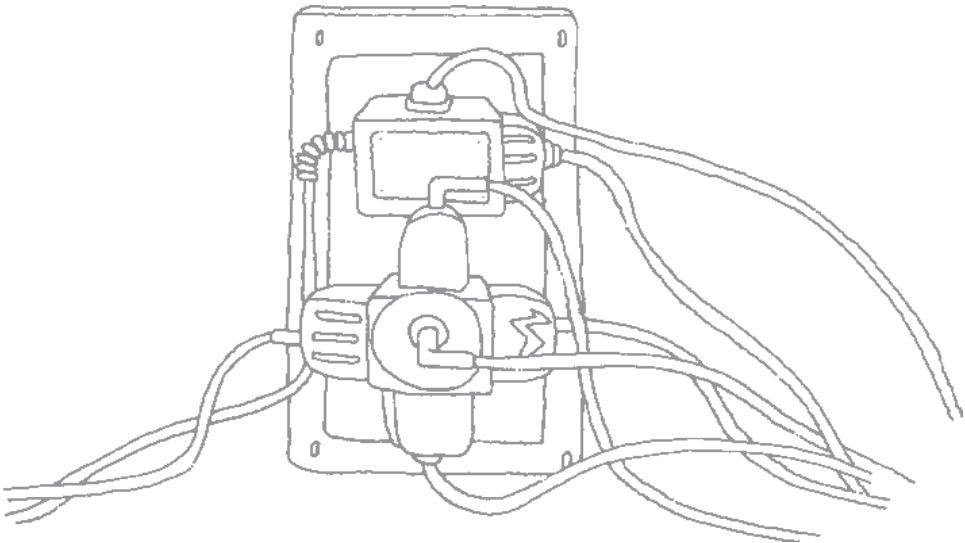
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<sup>1</sup> OSHA's Construction Standards, 29 CFR 1926, Subpart K—equivalent to those in Subpart S but contain fewer safety-related work practices—comprise electrical safety requirements. OSHA's Maritime Standards, 29 CFR Parts 1915, 1917, 1918, and 1919 contain fewer electrical requirements.

<sup>2</sup> *Fatal Workplace Injuries in 1995: A Collection of Data and Analysis*, Table A-15. Bureau of Labor Statistics Report 913. U.S. Department of Labor, Washington, DC.

electrical equipment and systems. The standards cover only those parts of any electrical system that an employee would normally use or contact. For example, the exposed and/or operating elements of an electrical installation—lighting, equipment, motors, machines, appliances, switches, controls, and enclosures—must be constructed and installed so as to minimize workplace electrical dangers.

For employers and employees in the 25 states operating OSHA’s approved workplace safety and health plans,<sup>3</sup> their states may be enforcing standards and other procedures that while “at least effective” federal standards are not always identical to federal requirements.



<sup>3</sup> Section 18(b), P.L. 95-596, encourages states to develop and operate, under OSHA guidance, job safety and health plans. An OSHA-approved state plan must have safety and health requirements at least as effective as those of Federal OSHA and must adopt, within 6 months of promulgation of federal standards, comparable state standards.

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Electricity is essential to modern life, both at home and on the job. Some employees work with electricity directly, as is the case with engineers, electricians, electronic technicians, and power line workers. Others, such as office workers and salespeople, work with it indirectly. As a source of power, electricity is accepted without much thought to the hazards encountered. Perhaps because it has become such a familiar part of our surroundings, it often is not treated with the respect it deserves.

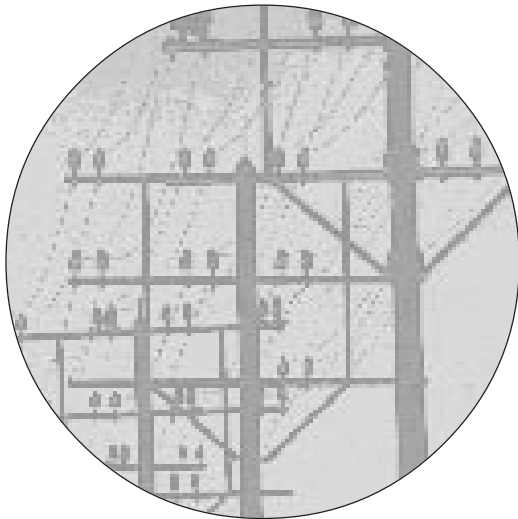
To handle electricity safely, it is necessary to understand how it acts, how it can be directed, what hazards it presents, and how these hazards can be controlled. Operating an electric switch may be considered analogous to turning on a water faucet. Behind the faucet or switch there must be a source of water or electricity, with something to transport it, and with pressure to make it flow. In the case of water, the source is a reservoir or pumping station; the transportation is through pipes; and the force to make it flow is pressure, provided by a pump. For electricity, the source is the power generating station; current travels through electric conductors in the form of wires; and pressure, measured in volts, is provided by a generator.

Resistance to the flow of electricity is measured in ohms and varies widely. It is determined by three factors: the nature of the substance itself, the length and cross-sectional area (size) of the substance, and the temperature of the substance.

Some substances, such as metals, offer very little resistance to the flow of electric current and are called conductors. Other substances, such as bakelite, porcelain, pottery, and dry wood, offer such a high resistance that they can be used to prevent the flow of electric current and are called insulators.

Dry wood has a high resistance, but when saturated with water its resistance drops to the point where it will readily conduct electricity. The same thing is true of human skin.

When it is dry, skin has a fairly high resistance to electric current; but when it is moist, there is a radical drop in resistance. Pure water is a poor conductor, but small amounts of impurities, such as salt and acid (both of which are contained in perspiration), make it a ready conductor. When water is present either in the environment or on the skin, anyone working with electricity should exercise even more caution than they normally would.



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Electricity travels in closed circuits, and its normal route is through a conductor. Electric shock occurs when the body becomes a part of the electric circuit. The current must enter the body at one point and leave at another. Electric shock normally occurs in one of three ways. Individuals—while in contact with the ground—must come in contact with both wires of the electric circuit, one wire of an energized circuit and the ground, or a metallic part that has become “hot” by contact with an energized conductor.

The metal parts of electric tools and machines may become energized if there is a break in the insulation of the tool or machine wiring. The worker using these tools and machines is made less vulnerable to electric shock when there is a low-resistance path from the metallic case of the tool or machine to the ground. This is done through the use of an equipment grounding conductor—a low-resistance wire that causes the unwanted current to pass directly to the ground, thereby greatly reducing the amount of current passing through the body of the person in contact with the tool or machine. If the equipment grounding conductor has been properly installed, it has a low resistance to ground, and the worker is protected.

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The severity of the shock received when a person becomes a part of an electric circuit is affected by three primary factors: the amount of current flowing through the body (measured in amperes), the path of the current through the body, and the length of time the body is in the circuit. Other factors that may affect the severity of shock are the frequency of the current, the phase of the heart cycle when shock occurs, and the general health of the person.

The effects of electric shock depend upon the type of circuit, its voltage, resistance, current, pathway through the body, and duration of the contact. Effects can range from a barely perceptible tingle to immediate cardiac arrest. Although there are no absolute limits or even known values that show the exact injury from any given current, the table shows the general relationship between the degree of injury and amount of current for a 60-cycle hand-to-foot path of one second's duration of shock.

The table also illustrates that a difference of less than 100 milliamperes exists between a current that is barely perceptible and one that can kill. Muscular contraction caused by stimulation may not allow the victim to free himself or herself from the circuit, and the increased duration of exposure increases the dangers to the shock victim. For example, a current of 100 milliamperes for 3 seconds is equivalent to a current of 900 milliamperes applied for .03 seconds in causing ventricular fibrillation. The so-called low voltages can be extremely dangerous because, all other factors being equal, the degree of injury is proportional to the length of time the body is in the circuit.

**LOW VOLTAGE DOES NOT IMPLY LOW HAZARD!**

A severe shock can cause considerably more damage to the body than is visible. For example, a person may suffer internal hemorrhages and destruction of tissues, nerves, and muscles. In addition, shock is often only the beginning in a chain of events. The final injury may well be from a fall, cuts, burns, or broken bones.

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## Effects of Electric Current in the Human Body

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| Current                   | Reaction                                                                                                                                                                 |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Milliampere             | Perception level. Just a faint tingle.                                                                                                                                   |
| 5 Milliamperes            | Slight shock felt; not painful but disturbing.<br><br>Average individual can let go. However, strong involuntary reactions to shocks in this range can lead to injuries. |
| 6-25 Milliamperes (women) | Painful shock, muscular control is lost.                                                                                                                                 |
| 9-30 Milliamperes (men)   | This is called the freezing current or “let-go” range.                                                                                                                   |
| 50-150 Milliamperes       | Extreme pain, respiratory arrest, severe muscular contractions.* Individual cannot let go. Death is possible.                                                            |
| 1,000-4,300 Milliamperes  | Ventricular fibrillation. (The rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is most likely.                          |
| 10,000- Milliamperes      | Cardiac arrest, severe burns and probable death.                                                                                                                         |

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\*If the extensor muscles are excited by the electric shock, the person may be thrown away from the circuit.

Source: W.B. Kouwenhoven, “Human Safety and Electric Shock,” *Electrical Safety Practices*, Monograph, 112, Instrument Society of America, p. 93. (Papers delivered at the third presentation of the Electrical Safety Course given in Wilmington, DE, in November 1968.)

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The most common shock-related injury is a burn. Burns suffered in electrical accidents may be of three types: electrical burns, arc burns, and thermal contact burns.

Electrical burns are the result of the electric current flowing through tissues or bone. Tissue damage is caused by the heat generated by the current flow through the body. Electrical burns are one of the most serious injuries you can receive and should be given immediate attention.

Arc or flash burns, on the other hand, are the result of high temperatures near the body and are produced by an electric arc or explosion. They should also be attended to promptly.

Finally, thermal contact burns are those normally experienced when the skin comes in contact with hot surfaces of overheated electric conductors, conduits, or other energized equipment. Additionally, clothing may be ignited in an electrical accident and a thermal burn will result. All three types of burns may be produced simultaneously.

Electric shock can also cause injuries of an indirect or secondary nature in which involuntary muscle reaction from the electric shock can cause bruises, bone fractures, and even death resulting from collisions or falls. In some cases, injuries caused by electric shock can be a contributory cause of delayed fatalities.

In addition to shock and burn hazards, electricity poses other dangers. For example, when a short circuit occurs, hazards are created from the resulting arcs. If high current is involved, these arcs can cause injury or start a fire. Extremely high-energy arcs can damage equipment, causing fragmented metal to fly in all directions. Even low-energy arcs can cause violent explosions in atmospheres that contain flammable gases, vapors, or combustible dusts.

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Electrical accidents appear to be caused by a combination of three possible factors—unsafe equipment and/or installation, workplaces made unsafe by the environment, and unsafe work practices. There are various ways of protecting people from the hazards caused by electricity. These include: insulation, guarding, grounding, electrical protective devices, and safe work practices.

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## Insulation

One way to safeguard individuals from electrically energized wires and parts is through insulation. An insulator is any material with high resistance to electric current.

Insulators—such as glass, mica, rubber, and plastic—are put on conductors to prevent shock, fires, and short circuits. Before employees prepare to work with electric equipment, it is always a good idea for them to check the insulation before making a connection to a power source to be sure there are no exposed wires. The insulation of flexible cords, such as extension cords, is particularly vulnerable to damage.

The insulation that covers conductors is regulated by Subpart S of 29 *Code of Federal Regulations (CFR) Part 1910.302, Design Safety Standards for Electrical Systems*, as published in the *Federal Register* on January 16, 1981.

Subpart S generally requires that circuit conductors (the material through which current flows) be insulated to prevent people from coming into accidental contact with the current. Also, the insulation should be suitable for the voltage and existing conditions, such as temperature, moisture, oil, gasoline, or corrosive fumes. All these factors must be evaluated before the proper choice of insulation can be made.

Conductors and cables are marked by the manufacturer to show the maximum voltage and American Wire Gage size, the type letter of the insulation, and the manufacturer's name or

trademark. Insulation is often color coded. In general, insulated wires used as equipment grounding conductors are either continuous green or green with yellow stripes. The grounded conductors that complete a circuit are generally covered with continuous white or natural gray-colored insulation. The ungrounded conductors, or “hot wires,” may be any color other than green, white, or gray. They are often colored black or red.

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## Guarding

Live parts of electric equipment operating at 50 volts or more must be guarded against accidental contact. Guarding of live parts may be accomplished by:

- location in a room, vault, or similar enclosure accessible only to qualified persons;
- use of permanent, substantial partitions or screens to exclude unqualified persons;
- location on a suitable balcony, gallery, or platform elevated and arranged to exclude unqualified persons; or
- elevation of 8 feet (2.44 meters) or more above the floor.

Entrances to rooms and other guarded locations containing exposed live parts must be marked with conspicuous warning signs forbidding unqualified persons to enter.

Indoor electric wiring more than 600 volts and that is open to unqualified persons must be made with metal-enclosed equipment or enclosed in a vault or area controlled by a lock. In addition, equipment must be marked with appropriate caution signs.

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## Grounding

Grounding is another method of protecting employees from electric shock; however, it is normally a secondary protective measure. The term “ground” refers to a conductive body, usually the earth, and means a conductive connection, whether intentional or accidental, by which an electric circuit or equipment is connected to earth or the ground plane. By “grounding” a tool or electrical system, a low-resistance path to the earth is intentionally created. When properly done, this path offers sufficiently low resistance and has sufficient current carrying capacity to prevent the buildup of voltages that may result in a personnel hazard. This does not guarantee that no one will receive a shock, be injured, or be killed. It will, however, substantially reduce the possibility of such accidents—especially when used in combination with other safety measures discussed in this booklet.

There are two kinds of grounds required by *Design Safety Standards for Electrical Systems* (Subpart S). One of these is called the “service or system ground.” In this instance, one wire—called “the neutral conductor” or “grounded conductor”—is grounded. In an ordinary low-voltage circuit, the white (or gray) wire is grounded at the generator or transformer and again at the service entrance of the building. This type of ground is primarily designed to protect machines, tools, and insulation against damage.

To offer enhanced protection to the workers themselves, an additional ground, called the “equipment ground,” must be furnished by providing another path from the tool or machine through which the current can flow to the ground. This additional ground safeguards the electric equipment operator in the event that a malfunction causes the metal frame of the tool to become accidentally energized. The resulting heavy surge of current will then activate the circuit protection devices and open the circuit.

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## **Circuit Protection Devices**

Circuit protection devices are designed to automatically limit or shut off the flow of electricity in the event of a ground-fault, overload, or short circuit in the wiring system. Fuses, circuit breakers, and ground-fault circuit interrupters are three well-known examples of such devices.

Fuses and circuit-breakers are over-current devices that are placed in circuits to monitor the amount of current that the circuit will carry. They automatically open or break the circuit when the amount of current flow becomes excessive and therefore unsafe. Fuses are designed to melt when too much current flows through them. Circuit breakers, on the other hand, are designed to trip open the circuit by electro-mechanical means.

Fuses and circuit breakers are intended primarily for the protection of conductors and equipment. They prevent overheating of wires and components that might otherwise create hazards for operators. They also open the circuit under certain hazardous ground-fault conditions.

The ground-fault circuit interrupter, or GFCI, is designed to shutoff electric power within as little as 1/40 of a second. It works by comparing the amount of current going to electric equipment against the amount of current returning from the equipment along the circuit conductors. If the current difference exceeds 6 milliamperes, the GFCI interrupts the current quickly enough to prevent electrocution. The GFCI is used in high-risk areas such as wet locations and construction sites.

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## **Safe Work Practices**

Employees and others working with electric equipment need to use safe work practices. These include: deenergizing electric equipment before inspecting or making repairs, using electric tools that are in good repair, using good judgment when working near energized lines, and using appropriate protective

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equipment. Electrical safety-related work practice requirements are contained in Subpart S of 29 *CFR* Part 1910, in Sections 1910.331-1910.335.

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## Training

To ensure that they use safe work practices, employees must be aware of the electrical hazards to which they will be exposed. Employees must be trained in safety-related work practices as well as any other procedures necessary for safety from electrical hazards.

*Deenergizing Electrical Equipment.* The accidental or unexpected sudden starting of electrical equipment can cause severe injury or death. Before ANY inspections or repairs are made—even on the so-called low-voltage circuits—the current must be turned off at the switch box and the switch padlocked in the OFF position. At the same time, the switch or controls of the machine or other equipment being locked out of service must be securely tagged to show which equipment or circuits are being worked on.

Maintenance employees should be qualified electricians who have been well instructed in lockout procedures. No two locks should be alike; each key should fit only one lock, and only one key should be issued to each maintenance employee. If more than one employee is repairing a piece of equipment, each should lock out the switch with his or her own lock and never permit anyone else to remove it. The maintenance worker should at all times be certain that he or she is not exposing other employees to danger.

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## Overhead Lines

If work is to be performed near overhead power lines, the lines must be deenergized and grounded by the owner or operator of the lines, or other protective measures must be

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provided before work is started. Protective measures (such as guarding or insulating the lines) must be designed to prevent employees from contacting the lines.

Unqualified employees and mechanical equipment must stay at least 10 feet (3.05 meters) away from overhead power lines. If the voltage is more than 50,000 volts, the clearance must be increased by 4 inches (10 centimeters) for each additional 10,000 volts.

When mechanical equipment is being operated near overhead lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.

*Protective Equipment.* Employees whose occupations require them to work directly with electricity must use the personal protective equipment required for the jobs they perform. This equipment may consist of rubber insulating gloves, hoods, sleeves, matting, blankets, line hose, and industrial protective helmets.

*Tools.* To maximize his or her own safety, an employee should always use tools that work properly. Tools must be inspected before use, and those found questionable, removed from service and properly tagged. Tools and other equipment should be regularly maintained. Inadequate maintenance can cause equipment to deteriorate, resulting in an unsafe condition.

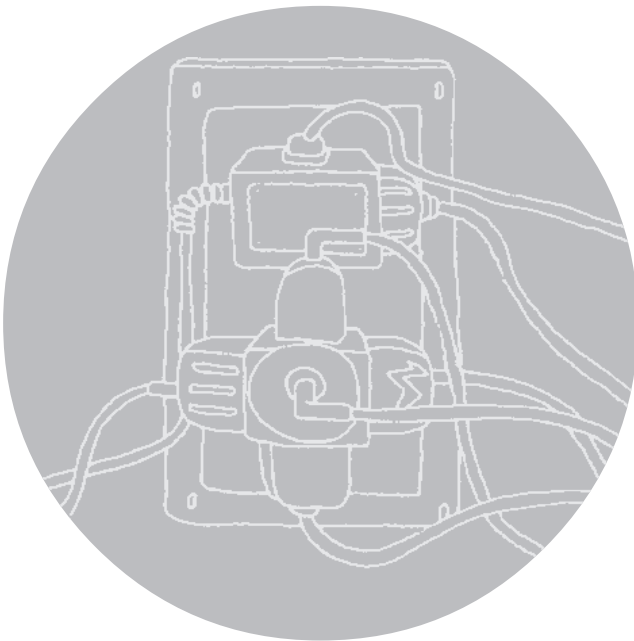
Tools that are used by employees to handle energized conductors must be designed and constructed to withstand the voltages and stresses to which they are exposed.

*Good Judgment.* Perhaps the single most successful defense against electrical accidents is the continuous exercising of good judgment or common sense. All employees should be thor-

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oughly familiar with the safety procedures for their particular jobs. When work is performed on electrical equipment, for example, some basic procedures are:

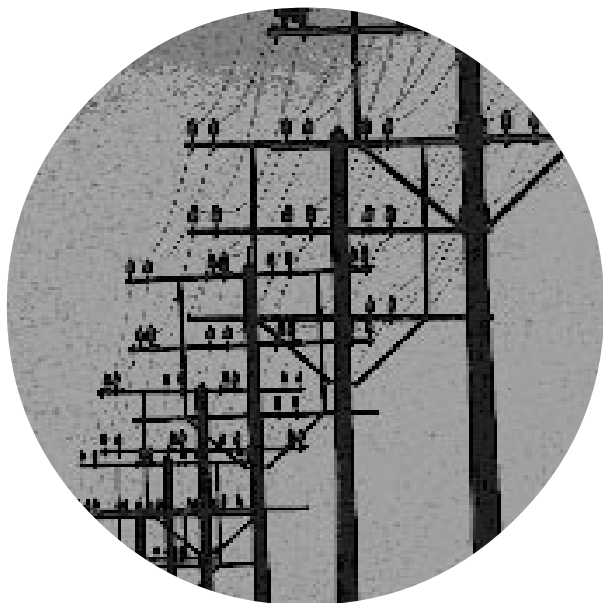
1. Have the equipment deenergized.
2. Ensure that the equipment remains deenergized by using some type of lockout and tag procedure.
3. Use insulating protective equipment.
4. Keep a safe distance from energized parts.



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The control of electrical hazards is an important part of every safety and health program. The measures suggested in this booklet should be of help in establishing such a program of control. The responsibility for this program should be delegated to individuals who have a complete knowledge of electricity, electrical work practices, and the appropriate OSHA standards for installation and performance.

Everyone has the right to work in a safe environment. Through cooperative efforts, employers and employees can learn to identify and eliminate or control electrical hazards.



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### **Safety and Health Program Management Guidelines**

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Program Management Guidelines* (*Federal Register* 54(18): 3908-3916, January 26, 1989). These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four general elements that are critical to the development of a successful safety and health management program:

- Management commitment and employee involvement,
- Worksite hazard analysis,
- Hazard prevention and control, and
- Safety and health training.

The guidelines recommend specific actions under each of these general elements. A single free copy of the guidelines can be obtained from the OSHA Publications Office.

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### **State Programs**

*The Occupational Safety and Health Act of 1970* encourages states to develop and operate their own job safety and health plans. States with plans approved under section 18(b) of the Act must adopt standards and enforce requirements that are at least as effective as federal requirements. There are currently 25 state plan states and territories: 23 covering both private and public (state and local government) employees and two covering public sector employees only.

Plan states must adopt standards comparable (but not necessarily identical) to the federal within 6 months of a federal standard's promulgation. Until a state standard is promulgated,

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OSHA will provide interim enforcement assistance, as appropriate, in these states. A listing of states with approved plans appears at the end of this publication.

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### **Free Onsite Consultation**

Free onsite safety and health consultation services are available in all states to employers who want help in establishing and maintaining a safe and healthful workplace. Primarily developed for smaller employers with more hazardous operations, the OSHA Consultation Service is largely funded by OSHA and is delivered by state governments employing professional safety consultants and health consultants. The comprehensive assistance that is offered includes an appraisal of all mechanical systems, physical work practices, and environmental hazards of the workplace, and all aspects of the employer's present job safety and health program. In addition, the service offers assistance to employers in developing and implementing an effective workplace safety and health program that corrects and continuously addresses safety and health concerns.

This program is separate from OSHA's inspection efforts. No penalties are proposed or citations issued for any safety or health problems identified by the consultant. The service is confidential. The employer's name, the firm's name, and any information about the workplace, plus any unsafe or unhealthful working conditions that the consultant uncovers, will not be reported routinely to the OSHA inspection staff. The only obligation is the employer's commitment to correct serious job safety and health hazards in a timely manner. The employer is asked to make this commitment prior to the actual visit.

For more information on consultation services, see the list of state consultation projects at the end of this publication.

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## **Voluntary Protection Programs**

The Voluntary Protection Programs (VPP) are designed to recognize and promote effective safety and health program management. In the VPP, management, labor, and OSHA establish cooperative relationships at workplaces that have implemented strong programs. Sites approved for VPP's Star, Merit, and Demonstration programs have met, and must continue to meet, rigorous participation standards. Benefits of VPP participation include improved employee motivation to work safely, leading to better quality and productivity; lost workday case rates that generally are 60 to 80 percent below industry averages; reduced workers' compensation and other injury- and illness-related costs; positive community recognition and interaction; further improvement and revitalization of already good safety and health programs; and partnership with OSHA. VPPs and onsite consultation services, when coupled with an effective enforcement program, expand worker protection to help meet the goals of the OSH Act.

For additional information about the VPP, contact the VPP Manager in your OSHA regional office list at the end of this publication.

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## **Training and Education**

OSHA area offices offer a variety of information services, such as publications, audiovisual aids, technical advice, and speakers for special engagements. OSHA's Training Institute in Des Plaines, IL, provides basic and advanced courses in safety and health for federal and state compliance officers, state consultants, federal agency personnel, and private sector employers, employees, and their representatives.

The OSHA Training Institute also has established OSHA Training Institute Education Centers to address the increased demand from the private sector and other federal agencies for its courses. These centers are nonprofit colleges, universi-

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ties, and other organizations that have been selected after a competition for participation in the program.

OSHA also provides funds to nonprofit organizations, through grants, to conduct workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually. Grant recipients are expected to contribute 20 percent of the total grant cost.

For more information on grants, training, and education, contact the OSHA Training Institute, Office of Training and Education, 1555 Times Drive, Des Plaines IL 60018, (847) 297-4810, fax (847) 297-4874.

For further information on any OSHA program, contact your nearest OSHA area or regional office listed at the end of this publication.

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### **Electronic      Information**

**Internet**—OSHA standards, interpretations, directives, and additional information are now on the World Wide Web at <http://www.osha.gov>.

**CD-ROM**—A wide variety of OSHA materials including standards, interpretations, directives, and more can be purchased on CD-ROM from the Government Printing Office.

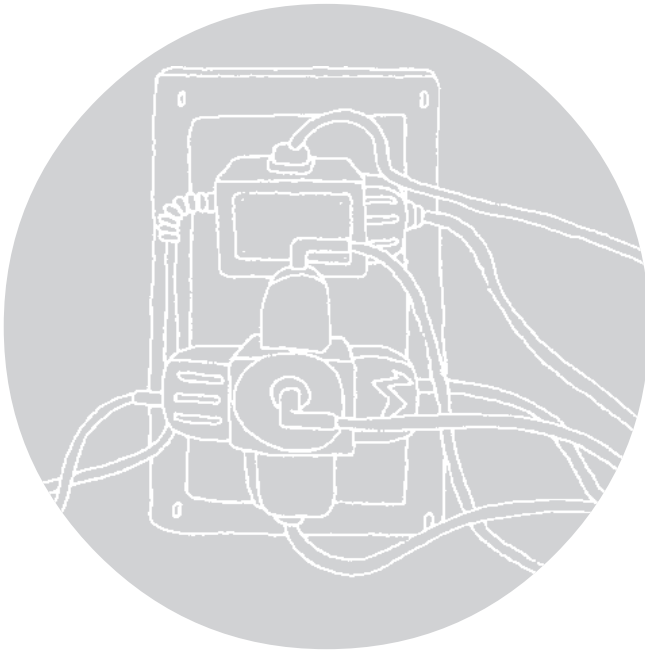
To order, write to Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. Specify *OSHA Regulations, Documents and Technical Information on CD-ROM, (ORDT)*, S/N 729-1300000-5. The price is \$38 per year (\$47.50 foreign); single copy \$15.00 (\$18.75 foreign).

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## Emergencies

For life-threatening situations, call (800) 321-OSHA. Complaints will go immediately to the nearest OSHA area or state office for help.

For further information on any OSHA program, contact your nearest OSHA area or regional office listed at the end of this publication.



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A single, free copy of the following publications can be obtained from the U.S. Department of Labor, OSHA Publications, P.O. Box 37535, Washington, DC 20013-7535, (202) 219-4677, fax (202) 219-9266. Enclose a self-addressed mailing label with your request.

***All About OSHA*** – OSHA 2056

***Consultation Services for the Employer*** – OSHA 3047

***Control of Hazardous Energy (Lockout/Tagout)*** –  
OSHA 3120

***Employee Workplace Rights*** – OSHA 3021

***Employer Rights and Responsibilities Following  
an OSHA Inspection*** – OSHA 3000

***Ground-Fault Protection on Construction Sites*** –  
OSHA 3007

***How to Prepare for Workplace Emergencies*** – OSHA 3088

***Safety and Health Guide for the Chemical Industry*** –  
OSHA 3091

***Shipyard Industry*** – OSHA 2268

The following publications are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, telephone (202) 512-1800, fax (202) 512-2250. Include GPO Order No. and make checks payable to Superintendent of Documents.

***Construction Industry Digest*** – OSHA 2202  
Order 029-016-00151-4. Cost \$2.25

***Job Hazard Analysis*** – OSHA 3071  
Order 029-016-00142-5. Cost \$1.00

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**Commissioner**

Alaska Department of Labor  
1111 West 8th Street  
Room 306  
Juneau, AK 99801  
(907) 465-2700

**Director**

Industrial Commission  
of Arizona  
800 W. Washington  
Phoenix, AZ 85007  
(602) 542-5795

**Director**

California Department  
of Industrial Relations  
45 Fremont Street  
San Francisco, CA 94105  
(415) 972-8835

**Commissioner**

Connecticut Department  
of Labor  
200 Folly Brook Boulevard  
Wethersfield, CT 06109  
(860) 566-5123

**Director**

Hawaii Department of Labor  
and Industrial Relations  
830 Punchbowl Street  
Honolulu, HI 96813  
(808) 586-8844

**Commissioner**

Indiana Department of Labor  
State Office Building  
402 West Washington Street  
Room W195  
Indianapolis, IN 46204  
(317) 232-2378

**Commissioner**

Iowa Division of Labor Services  
1000 E. Grand Avenue  
Des Moines, IA 50319  
(515) 281-3447

**Secretary**

Kentucky Labor Cabinet  
1047 U.S. Highway, 127 South,  
Suite 2  
Frankfort, KY 40601  
(502) 564-3070

**Commissioner**

Maryland Division of Labor  
and Industry  
Department of Labor Licensing  
and Regulation  
1100 N. Eutaw Street, Room 613  
Baltimore, MD 21202-2206  
(410) 767-2999

**Director**

Michigan Department  
of Consumer and Industry Services  
4th Floor, Law Building  
P.O. Box 30004  
Lansing, MI 48909  
(517) 373-7230

**Commissioner**

Minnesota Department of Labor  
and Industry  
443 Lafayette Road  
St. Paul, MN 55155  
(612) 296-2342

**Director**

Nevada Division of Industrial  
Relations  
400 West King Street  
Carson City, NV 89710  
(702) 687-3032

**Secretary**

New Mexico Environment  
Department  
1190 St. Francis Drive  
P.O. Box 26110  
Santa Fe, NM 87502  
(505) 827-2850

**Commissioner**

New York Department of Labor  
W. Averell Harriman State Office  
Building -12  
Room 500  
Albany, NY 12240  
(518) 457-2741

**Commissioner**

North Carolina Department  
of Labor  
319 Chapanoke Road  
Raleigh, NC 27603  
(919) 662-4585

**Administrator**

Department of Consumer  
and Business Services  
Occupational Safety and Health  
Division (OR-OSHA)  
350 Winter Street, N.E.  
Room 430  
Salem, OR 97310  
(503) 378-3272

**Secretary**

Puerto Rico Department  
of Labor and Human Resources  
Prudencio Rivera Martinez  
Building  
505 Munoz Rivera Avenue  
Hato Rey, PR 00918  
(809) 754-2119

**Commissioner**

South Carolina Department  
of Labor, Licensing,  
and Regulation  
110 Centerview Drive  
P.O. Box 11329  
Columbia, SC 29211-1329  
(803) 734-9594

**Commissioner**

Tennessee Department of Labor  
Attention: Robert Taylor  
710 James Robertson Parkway  
Nashville, TN 37243-0659  
(615) 741-2582

**Commissioner**

Industrial Commission of Utah  
160 East 300 South, 3rd Floor  
P.O. Box 146600  
Salt Lake City, UT 84114-6600  
(801) 530-6898

**Commissioner**

Vermont Department of Labor  
and Industry  
National Life Building -  
Drawer 20  
120 State Street  
Montpelier, VT 05620  
(802) 828-2288

**Commissioner**

Virgin Islands Department  
of Labor  
2131 Hospital Street Box 890  
Christiansted St. Croix,  
VI 00820-4666  
(809) 773-1994

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**Commissioner**

Virginia Department of Labor  
and Industry  
Powers-Taylor Building  
13 South 13th Street  
Richmond, VA 23219  
(804) 786-2377

**Director**

Washington Department  
of Labor and Industries  
General Administration Building  
P.O. Box 44001  
Olympia, WA 98504-4001  
(360) 902-4200

**Administrator**

Workers' Safety and Compensation Division (WSC)  
Wyoming Department  
of Employment  
Herschler Building  
2nd Floor East  
122 West 25th Street  
Cheyenne, WY 82002  
(307) 777-7786

| State                      | Telephone         |
|----------------------------|-------------------|
| Alabama .....              | (205) 348-7136    |
| Alaska .....               | (907) 269-4957    |
| Arizona .....              | (602) 542-5795    |
| Arkansas .....             | (501) 682-4532    |
| California .....           | (415) 972-8515    |
| Colorado .....             | (970) 491-6151    |
| Connecticut .....          | (860) 566-4550    |
| Delaware .....             | (302) 761-8219    |
| District of Columbia ..... | (202) 576-6339    |
| Florida .....              | (904) 488-3044    |
| Georgia .....              | (404) 894-2646    |
| Guam .....                 | (671) 475-0136    |
| Hawaii .....               | (808) 586-9100    |
| Idaho .....                | (208) 385-3283    |
| Illinois .....             | (312) 814-2337    |
| Indiana .....              | (317) 232-2688    |
| Iowa .....                 | (515) 965-7162    |
| Kansas .....               | (913) 296-7476    |
| Kentucky .....             | (502) 564-6895    |
| Louisiana .....            | (504) 342-9601    |
| Maine .....                | (207) 624-6460    |
| Maryland .....             | (410) 880-4970    |
| Massachusetts .....        | (617) 727-3982    |
| Michigan .....             | (517) 332-1817(H) |
| .....                      | (517) 322-1809(S) |
| Minnesota .....            | (612) 297-2393    |
| Mississippi .....          | (601) 987-3981    |
| Missouri .....             | (573) 751-3403    |
| Montana .....              | (406) 444-6418    |
| Nebraska .....             | (402) 471-4717    |
| Nevada .....               | (702) 486-5016    |
| New Hampshire .....        | (603) 271-2024    |
| New Jersey .....           | (609) 292-2424    |
| New Mexico .....           | (505) 827-4230    |
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| North Carolina .....       | (919) 662-4644    |
| North Dakota .....         | (701) 328-5188    |
| Ohio .....                 | (614) 644-2246    |
| Oklahoma .....             | (405) 528-1500    |
| Oregon .....               | (503) 378-3272    |
| Pennsylvania .....         | (412) 357-2561    |

|                      |                   |
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| Puerto Rico .....    | (787) 754-2188    |
| Rhode Island .....   | (401) 277-2438    |
| South Carolina ..... | (803) 734-9614    |
| South Dakota .....   | (605) 688-4101    |
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| Vermont .....        | (802) 828-2765    |
| Virginia .....       | (804) 786-6359    |
| Virgin Islands ..... | (809) 772-1315    |
| Washington .....     | (360) 902-5638    |
| West Virginia .....  | (304) 558-7890    |
| Wisconsin .....      | (608) 266-8579(H) |
| .....                | (414) 521-5063(S) |
| Wyoming .....        | (307) 777-3646    |

(H) - Health

(S) - Safety

| Area                        | Telephone      |
|-----------------------------|----------------|
| Albany, NY .....            | (518) 464-4338 |
| Albuquerque, NM .....       | (505) 248-5302 |
| Allentown, PA .....         | (610) 776-0592 |
| Anchorage, AK .....         | (907) 271-5152 |
| Appleton, WI .....          | (414) 734-4521 |
| Austin, TX .....            | (512) 916-5783 |
| Avenel, NJ .....            | (908) 750-3270 |
| Baltimore, MD .....         | (410) 962-2840 |
| Bangor, ME .....            | (207) 941-8177 |
| Baton Rouge, LA .....       | (504) 389-0474 |
| Bayside, NY .....           | (718) 279-9060 |
| Bellevue, WA .....          | (206) 553-7520 |
| Billings, MT .....          | (406) 247-7494 |
| Birmingham, AL .....        | (205) 731-1534 |
| Bismarck, ND .....          | (701) 250-4521 |
| Boise, ID .....             | (208) 334-1867 |
| Bowmansville, NY .....      | (716) 684-3891 |
| Braintree, MA .....         | (617) 565-6924 |
| Bridgeport, CT .....        | (203) 579-5581 |
| Calumet City, IL .....      | (708) 891-3800 |
| Carson City, NV .....       | (702) 885-6963 |
| Charleston, WV .....        | (304) 347-5937 |
| Cincinnati, OH .....        | (513) 841-4132 |
| Cleveland, OH .....         | (216) 522-3818 |
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| Columbus, OH .....          | (614) 469-5582 |
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| Dallas, TX .....            | (214) 320-2400 |
| Denver, CO .....            | (303) 844-5285 |
| Des Plaines, IL .....       | (847) 803-4800 |
| Des Moines, IA .....        | (515) 284-4794 |
| Englewood, CO .....         | (303) 843-4500 |
| Erie, PA .....              | (814) 833-5758 |
| Fort Lauderdale, FL .....   | (954) 424-0242 |
| Fort Worth, TX .....        | (817) 428-2470 |
| Frankfort, KY .....         | (502) 227-7024 |
| Harrisburg, PA .....        | (717) 782-3902 |
| Hartford, CT .....          | (860) 240-3152 |
| Hasbrouck Heights, NJ ..... | (201) 288-1700 |
| Guaynabo, PR .....          | (787) 277-1560 |
| Honolulu, HI .....          | (808) 541-2685 |

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| Houston, TX .....        | (281) | 286-0583 |
| Houston, TX .....        | (281) | 591-2438 |
| Indianapolis, IN .....   | (317) | 226-7290 |
| Jackson, MS .....        | (601) | 965-4606 |
| Jacksonville, FL .....   | (904) | 232-2895 |
| Kansas City, MO .....    | (816) | 483-9531 |
| Lansing, MI .....        | (517) | 377-1892 |
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| Lubbock, TX .....        | (806) | 472-7681 |
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| Marlton, NJ .....        | (609) | 757-5181 |
| Methuen, MA .....        | (617) | 565-8110 |
| Milwaukee, WI .....      | (414) | 297-3315 |
| Minneapolis, MN .....    | (612) | 348-1994 |
| Mobile, AL .....         | (334) | 441-6131 |
| Nashville, TN .....      | (615) | 781-5423 |
| New York, NY .....       | (212) | 466-2482 |
| Norfolk, VA .....        | (804) | 441-3820 |
| North Aurora, IL .....   | (630) | 896-8700 |
| North Syracuse, NY ..... | (315) | 451-0808 |
| Oklahoma City, OK .....  | (405) | 231-5351 |
| Omaha, NE .....          | (402) | 221-3182 |
| Parsippany, NJ .....     | (201) | 263-1003 |
| Peoria, IL .....         | (309) | 671-7033 |
| Philadelphia, PA .....   | (215) | 597-4955 |
| Phoenix, AZ .....        | (602) | 640-2007 |
| Pittsburgh, PA .....     | (412) | 644-2903 |
| Portland, OR .....       | (503) | 326-2251 |
| Providence, RI .....     | (401) | 528-4669 |
| Raleigh, NC .....        | (919) | 856-4770 |
| Sacramento, CA .....     | (916) | 566-7470 |
| Salt Lake City, UT ..... | (801) | 487-0073 |
| San Diego, CA .....      | (619) | 557-2909 |
| Savannah, GA .....       | (912) | 652-4393 |
| Smyrna, GA .....         | (770) | 984-8700 |
| Springfield, MA .....    | (413) | 785-0123 |
| St. Louis, MO .....      | (314) | 425-4249 |
| Tampa, FL .....          | (813) | 626-1177 |
| Tarrytown, NY .....      | (914) | 524-7510 |
| Toledo, OH .....         | (419) | 259-7542 |
| Tucker, GA .....         | (770) | 493-6644 |
| Westbury, NY .....       | (516) | 334-3344 |
| Wichita, KS .....        | (316) | 269-6644 |
| Wilkes-Barre, PA .....   | (717) | 826-6538 |
| Wilmington, DE .....     | (302) | 573-6115 |

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**Region I  
(CT,\* MA, ME, NH, RI, VT\*)**

JFK Federal Building  
Room E-340  
Boston, MA 02203  
Telephone: (617) 565-9860

**Region II  
(NJ, NY,\* PR,\* VI\*)**

201 Varick Street  
Room 670  
New York, NY 10014  
Telephone: (212) 337-2378

**Region III  
(DC, DE, MD,\* PA, VA,\* WV)**

Gateway Building, Suite 2100  
3535 Market Street  
Philadelphia, PA 19104  
Telephone: (215) 596-1201

**Region IV  
(AL, FL, GA, KY,\* MS, NC,  
SC,\* TN\*)**

Atlanta Federal Center  
61 Forsyth Street, S.W., Room  
6T50  
Atlanta, GA 30303  
Telephone: (404) 562-2300

**Region V  
(IL, IN,\* MI,\* MN,\* OH, WI)**

230 South Dearborn Street  
Room 3244  
Chicago, IL 60604  
Telephone: (312) 353-2220

**Region VI  
(AR, LA, NM,\* OK, TX)**

525 Griffin Street  
Room 602  
Dallas, TX 75202  
Telephone: (214) 767-4731

**Region VII  
(IA,\* KS, MO, NE)**

City Center Square  
1100 Main Street, Suite 800  
Kansas City, MO 64105  
Telephone: (816) 426-5861

**Region VIII  
(CO, MT, ND, SD, UT,\* WY\*)**

1999 Broadway, Suite 1690  
Denver, CO 80202-5716  
Telephone: (303) 844-1600

**Region IX  
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Guam, HI,\* NV,\* Trust Territo-  
ries of the Pacific)**

71 Stevenson Street  
Room 420  
San Francisco, CA 94105  
Telephone: (415) 975-4310

**Region X  
(AK,\* ID, OR,\* WA\*)**

1111 Third Avenue  
Suite 715  
Seattle, WA 98101-3212  
Telephone: (206) 553-5930

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\*These states and territories operate their own OSHA-approved job safety and health programs (Connecticut and New York plans cover public employees only). States with approved programs must have a standard that is identical to, or at least as effective as, the federal standard.